



Determinants of Pastoral Households' Camel Milk Market Supply in Ararso District, Somali Regional State

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Abstract: *The study was carried out in Ararso woreda, Jarar zone of Somali Regional State with the objectives of identifying the factors determining the volume of camel milk market supply, effect of marketing support or institutional factors on volume of supply in the camel milk market and assessing the constraints and opportunities in the camel milk marketing of pastoral households. Multiple stage sampling technique was applied to select the sample. In order to achieve these objectives, cross-sectional data on socio-economic factors, market and institutional factors aspects were collected from 150 sample households heads drawn from four purposively selected kebeles through structured interview schedule and focus group discussion during October and November 2021. Both primary and secondary data were collected for the purpose of this study. The data were entered, manipulated, organized and analyzed using SPSS version 20 and Excel. Both descriptive and econometric statistics were used to identify and determine the household's camel milk market supply. According to the study findings some of the explanatory variables including Household Family size, Age of the household head, number of lactating camels owned by HH, Price of camel milk in wet season and Access to credit services are linearly associated with the volume of camel milk supply to market of pastoral households and statistically affect the household milk supply with a 0.05 level of significance.*

Based on the present finding camel is source of income and food. In the study area camel milk marketing for pastoral households plays a great contribution to their life as food and income generating activity. The major constraints of camel milk marketing in the study area were: most pastoralist households travel long distance to sell their milk in the market, lack of transportation facility, shortage of milk packaging materials, lack of demand and lack of market or collection center. On the other hand, during the focus group discussion the participants stated that, there are other problems which were encountered during engaging in milk marketing like: lack of access to market, price fluctuation, and poor access of transportation, infrastructures, and milk handling materials and buyers related problem.

Key words: Camel milk, constraints, camel milk market supply, Pastoral Households, opportunities.

I. INTRODUCTION

Camel dromedaries are the most efficient animal species for using marginal areas in arid and semi-arid regions, and they thrive and produce better than other livestock species in these environments. Many pastoral communities in a variety of eco-zones across the world rely on camels for their livelihood. This dependency is based on household consumption of camel meat, milk, leather, and wool, as well as the use of camels as packing, transport, and riding animals (Tadesse et al., 2014).

Pastoralism is a culture and a production style in Africa, especially in the Horn of Africa, in which pastoralists rely on their livestock (camels, sheep, goats, and cattle) and migrate seasonally depending on rainfall and pasture availability. Many researchers have described pastoralism as a proud livestock-based production system that is largely comprehensive in nature (HATFIELD & DAVIES, 2006; MUKHERJI et al., 2017).

Ethiopia is home to Africa's largest livestock population, and it is the continent's top livestock producer and exporter. While domestic demand for animal products is growing in Ethiopia, led by the urban middle and upper classes, export capacity is the driving force behind livestock expansion and intensification (MacDonald et al., 2011). The one-humped camel (*Camelus dromedarius*) plays an important role as a primary source of subsistence in the lowlands of Ethiopia, where it inhabits arid and semi-arid environments that are unsuitable for crop production and where other livestock species struggle to survive (Seifu, 2009).

Camels play a central role in providing draught power, meat, milk, and determining pastoralists' wealth and social status (R. Behnke, 2010). More than 80% of the camel population inhabits Africa, with 60% in the eastern African countries (Sudan, Somalia, Ethiopia, Kenya), which are important exporters of dromedary camels to the Arabian Peninsula and Egypt (Faye, 2015). Ethiopia hosts about 4.8 million heads of camels found in the arid and semi-arid regions of the country. This number ranks third in Africa after Somalia and Sudan, and fourth globally (FAO, 2019).

Livestock production contributes greatly to pastoral livelihoods, consumption goods, household income, and increased food security. Camels, among other animals, are a valuable commodity in Ethiopia's drylands, where they are used to improve people's lives and livelihoods. Because camels are the large mammals capable of surviving in the arid lowlands, Somali pastoralists rely on them for milk, meat, transportation, and wealth. Despite the fact that Ethiopian pastoralists raise a substantial number of camels, official polls estimate that Ethiopia's overall camel population is possibly underestimated. Since pastoralists have been overlooked in the past, the unique geographical, fiscal, social, and cultural fabric of this biosphere is less well known to the outside world, even to many Ethiopians (TEFERA et al., 2013).

The Somali regional state has vast lowland, arid to a semi-arid climate where pastoral and agro-pastoral livelihoods are dominant. The region is one of the richest in terms of livestock resources, and livestock is the main source of food and means of income for the majority of the people. The region has huge livestock resources, estimated to have 23.6 million heads of livestock like Cattle, sheep, goats, and camels are the main productive livestock reared. Livestock and their production are the major sources of income and the major source of livelihood base of the population in the region. However, the production is very traditional and not market-oriented. Moreover, widespread diseases, the inadequacy of animal health structures and professionals, range land degradation, lack of adequate livestock markets, livestock trade bans, and the absence of abattoirs and quarantine systems are still the major challenges for the development of the livestock sector (ERCS, 2013).

Somali pastoralists much favour camels' milk over other animal of milk because pastoralists claim that camel milk is healthy, thirst quenching, readily digestible, and can be stored for a longer period (Tezera, 1998). Camel milk is the main source of nutrition for Somali camel pastoralists. As a result, the majority of Somali

camel herders' husbandry and management activities are oriented toward increasing camel milk production and ensuring a steady supply of milk for the family during the season (Mohamed, 1993).

Camel milk is one of the basic income, food, and other socio-economic and cultural needs for pastoral and agro-pastoral dwellers in the region. Despite camel milk's considerable contribution to food security in the semi-dry and dry zones, it is a major component of the pastoral systems in vast pastoral areas in the Somali regional state. Based on the literatures reviewed as researcher, the most reviewed literature pay particular attention cow dairy production of the country but there are some researches were conducted about camel milk production, productivity, marketing, marketing channels, camel milk value chain of the region (Simenew et al., 2013, Gebremichael et al., 2019, Igge, 2019), still it seems there is inadequately studied on the determinants of Pastoral Households' Camel Milk Market Supply, especially in the Ararso District, was very limited. Therefore, considering this gap, the study was aimed to generate information for policy makers, development planners, and others for a focused intervention to improve the welfare of pastoral households through increasing the milk market participation of camel producers and camel milk supply.

III. RESEARCH METHODOLOGY

3.1 Population and Sample

The population of this study was 4055 pastoralist households were 150 respondents chosen from total population those rears livestock especially dairy camel in the four kebeles of Ararso district.

3.2 Theoretical framework

The Theoretical framework in Figure 1 illustrates the interrelationships in the study, the key variables involved and how they are interrelated. Socio-economic characteristics are the background factors like (age of household, household head, education level, gender, household income, frequency of milking, Household size, number of lactating camel and amount of milk yield produced per camel/day), institutional factors like (group marketing, access to extension service, contract marketing, and road infrastructure) and market factors like (prices of output, price information, marketing experience, and distance to the market) had an influence on market participation.

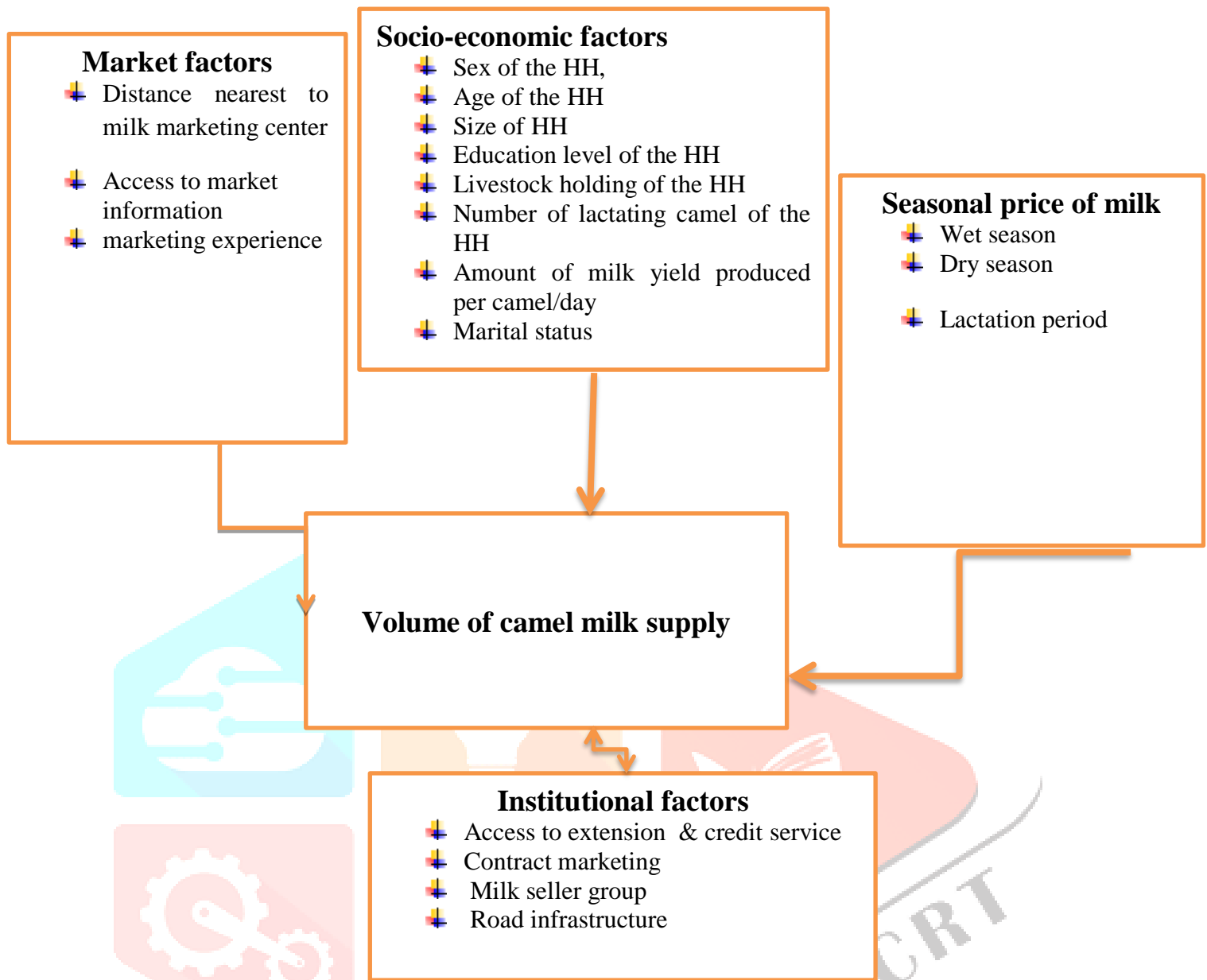


Figure 1: Theoretical framework of the study

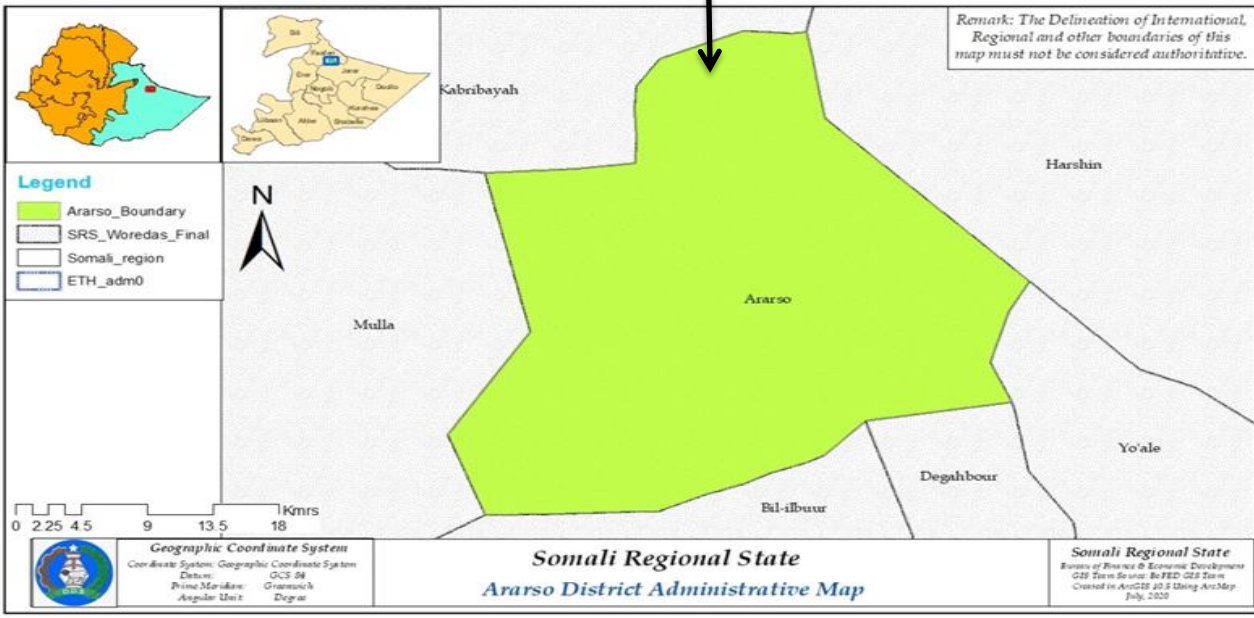
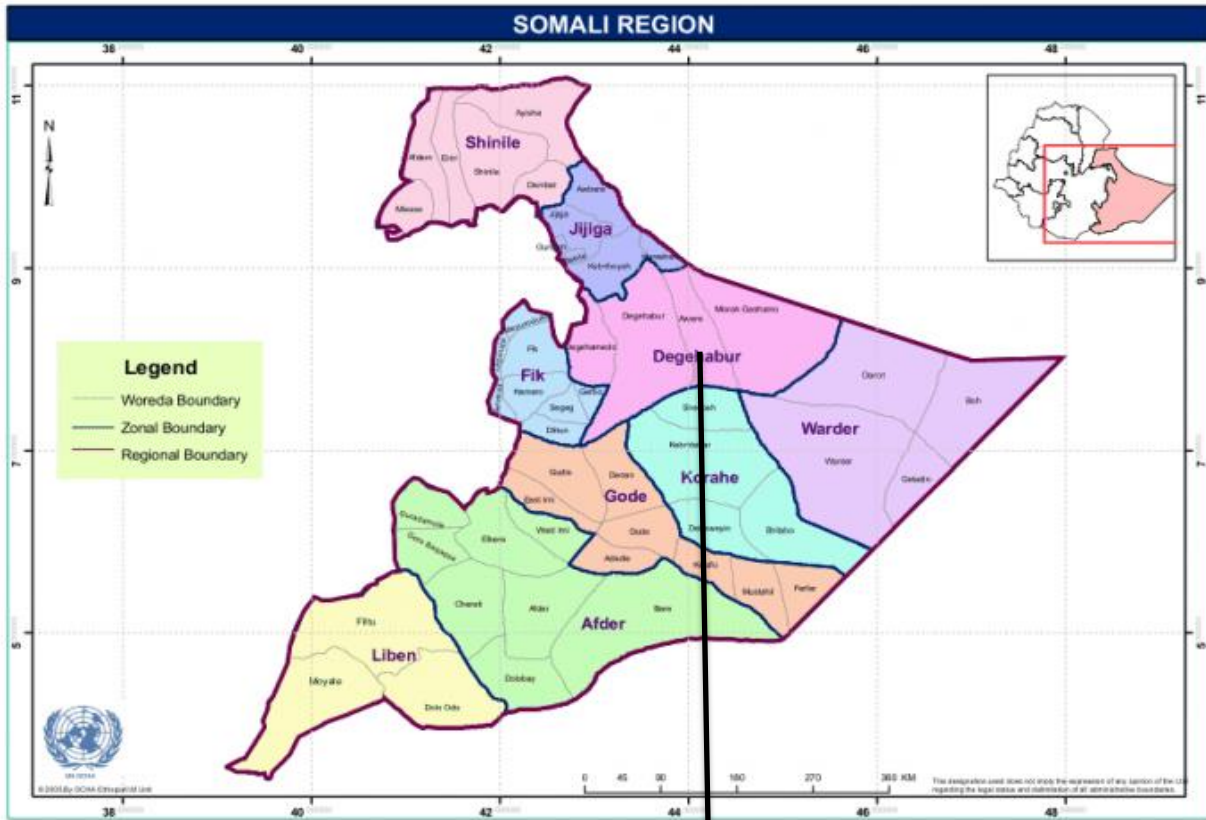
Source: own conceptualization

3.3 Description of the Study Area

The study was conducted in Ararso district, one of the eleven districts administrative in the Jarar zone of the Somali regional state (Figure 1). The district is geographically situated in the eastern part of Somali Regional State at 8° and 45' N latitude and 43 ° and 22' E longitude. It shares boundaries on the north by Kabribayah, on the northeast by Harshin and in the east by Yocale, east-south by Degahbour and on the west Bilcilbour woreda. It is far from the regional capital Jigjiga by 93km towards the East direction. Ararso district has agriculturally suitable land in terms of topography which is located 1507 meters above sea level, and there are perennial rivers, including Fafan and Jarar (BoFED, 2014).

Ararso is climatically characterized as arid agro-ecological, which is generally hot and dry in the area. The area has a bimodal rainfall pattern with two main rainy seasons which the first is 'Gu' that occurs from mid-April to the end of June. The second rainy season, known as 'Deyr' occurs from early October to late December, and Average annual rainfall is 300- 400mm from two rainy seasons. Sometimes it receives

‘Karan’ rains (July-September).The area’s mean maximum and minimum temperature is 34.40c and 16.60c, respectively (DPPB, 2001).



Source: (BoFED, 2020)

Figure 2: Map of study districts in Jarar Zone of Somali region

3.4 Research Design and Approaches

This study adopted a cross-sectional study design and applied quantitative and qualitative methods to clarify concepts, characteristics, descriptions, counts and measures. To achieve the intended objectives, a mixed research approach was used and questionnaires, key informant interviews, observation, and focus group discussion were used to collect the data. Generally both qualitative and quantitative approaches were used to collect and analyze the data.

3.5. Sampling technique and sample size determination

3.5.1. Sampling techniques and procedures

In this study, a multiple stage sampling technique was applied to select sample households. First stage, Ararso District was selected purposively since it is one of the most potential areas for camel milk production, marketing and accessibility in Somali pastoralists. In the second stage, four pastoralist Kebeles, namely Ubahle, Haljid, Magalo-ad and Dinta'ab of Ararso District, were selected purposively since they are the most camel potential area in the district out of the total 17(seventeen) Kebeles. In the third stage, sample households from each Kebele were selected using a simple random sampling method and probability proportional to the size of the population of the sample kebeles. Simple random sampling was applied to select the representative sample households as the population is homogenous and all households in the sampled kebeles supply camel milk to the market.

On the other hand, purposive sampling was used to select two focus group discussion (FGD) participants with the potential to provide rich data and thick descriptions. The FGD participants were the elders, religious leaders and community leaders. Similarly, two KII were held, one from each sample Kebele and one from the district.

3.5.2 Sample Size Determination and sample size

The sample size was determined using the simplified formula provided by Yamane (1967:886) to determine the required sample size at 95% confidence level, 0.5 degrees of variability and 8% level of precision. The numbers of respondents from each kebele was determined by using probability proportional to sample size.

The objective of this study was to identify the factors influencing pastoral households' camel milk market supply and examine camel milk marketing constraints and opportunities in the Ararso district, Somali Regional State.

3.6 Data Types and Sources

The data source of this study was both primary and secondary. The primary data were collected from a sample of pastoralist households through a questionnaire, focus group discussion, and key informant interview prepared for the study.

Secondary data were collected using available sources of information such as published and unpublished documents. This includes data extracted from publications and annual reports of livestock and pastoral development office at District and Regional and University and Public Libraries. The primary data sources were Key informants, FGD participants and questionnaire respondents who have the knowledge and

information on the proposed topic and took part in the study. In all cases, both open-ended and closed-ended questions were asked, allowing for the development of natural interactions with informants to touch on areas that the researcher might be aware of.

3.7 Methods of Data Analysis

Two types of data analysis, namely descriptive statistics and econometric models, were used to analyze the data collected from households. Both quantitative and qualitative methods were employed to complement each other in the study. The data collected via questionnaire was first coded, arranged, edited and analyzed using appropriate analytical tools like SPSS version 20.

3.7.1 Descriptive Statistics

In this study, one type of data analysis techniques was used. These were descriptive statistics data analysis. The qualitative data collected via questionnaire is first coded, arranged, edited and analyzed using SPSS version 20. Descriptive statistics such as frequency, percentage, graphs, tables, the mean and standard deviation were used to analyze the data, summarize and present the result on demographic and socio-economic characteristics of pastoralists, camel milk production and marketing.

3.7.2 Econometric Analysis

In order to achieve the second objective of the study multiple linear regression model was used.

Multiple linear regressions are an extension of simple linear regression. It is used when the user wants to predict the value of a dependent variable (target or criterion variable) based on the value of two or more independent variables (predictor or explanatory variables). Multiple regressions allow determining the overall fit (variance explained) of the model and the relative contribution of each of the predictors to the total variance explained.

Mathematically, the multiple linear regression model is represented by the following equation:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \dots + \beta_n X_{ni} + \varepsilon_i$$

Where,

Y is dependent variables (Volume of camel milk marketed or soled measured in liter);

X s are explanatory/ independent variables (Sex of the HH, Age of the HH, Size of HH, Education level of the HH, Livestock holding of the HH, Number of lactating camel of the HH, Amount of milk yield produced per camel/day, Distance nearest to milk marketing center, Access to market information, and marketing experience, Access to extension service, Contract marketing, camel milk marketing cooperative and Road infrastructure)

Y_i is dependent variables

β_0 is intercept/Constant term

β s are the coefficients of independent variables

X s are explanatory/ independent variables

ε is the error terms

IV. RESULTS AND DISCUSSION

4.1 Description of Demographic characteristics of the Respondents

Table 4. 1: Distribution of household heads by marital status, Sex and Education status

Variables	n=150	Frequency	%
Sex of the respondents	Female	88	58.7
	Male	62	43.3
Marital status of the Household head	Married	115	76.7
	Divorced	18	12.0
	Widowed	17	11.3
Education Status of the respondents	Illiterate	126	84.0
	Read and write	21	14.0
	Primary level	3	2.0

Source: Survey result, 2022 %= Percentage n=Number of household interviewed

The above Table 4.1 reveals that about, 88(58.7%) of the respondents was female whereas 62(43.3%) was male. In Somali society male is the traditional head of the family and women can take this responsibility in case of husband death or divorced. It is also normal for women to act as the head of the family in the absence of husband or respond when issues of domestic affairs are in place such as milk marketing. This result revealed that came milk handling and marketing are carried out by women than male in pastoralist's area but Males are involved in the activities of milk marketing usually when herds are taken away from the principal residence of the family and this study finding is in line with Igge (2019) and Abdi (2010) findings. Concerning the marital status of the Household head the majority of the respondents 115(76.7%) of them were married, while 18(12%) and 17(11.3%) of the respondent household heads were divorced and widowed respectively. In the other way, the result of the survey indicated that about, 126(84%) of the sample respondents were categorized as illiterates, while 21(14%) of respondent were fall under those who can able to read and write, and 3(2%) were grouped as those who completed primary school education. Therefore, the result survey showed that large proportion of the respondents did not attended formal education. This indicates that more risks are likely to occur at the herd level where the herdsman are involved of camel milking and handling of milk. The present finding in line with the result reported in many pastoral areas of Ethiopia (Beruk and Tafesse, 2000).

Table 4.2: Average household size with age of the household head

Variables	Minimum	Maximum	Mea ± SD
Total Family size in number	2.00	15.00	7.45 ± 2.64
Number of male family members	1.00	8.00	3.95± 1.56
Number of female family members	1.00	8.00	3.49 ± 1.60
Age of the household head	25.00	70.00	47.10 ± 11.65

Source: survey result, 2022 SD=Standard Deviation

The age of the respondents interviewed in the study ranged from 25 to 70 years. The mean age of the respondents was 47.10 years with the standard deviation of 11.65. This shows most of respondents fall under working force category of age 25-61 which are economically active range in the camel milk production and marketing. Because camel milk production and marketing management are labour intensive, it needs to be capable of both physical and mentally.

The mean family size of respondents was 7.45 with the standard deviation of 2.64. The average family size of the surveyed households in the present study was lately approaches the average family size of Somali region, which was about 6.7 person per household (CSA, 2007).

The larger family size is assumed to increase the consumption of camel milk which has a negative impact on sale volume of milk supply and marketing, particularly; if household members are small children but the larger family size has a positive influence on livestock production and market participation because they contribute more labour on production, management and marketing camel milk.

4.2 Socio-economic and Livelihood characteristics

Table 4.3: Socio-economic and Livelihood characteristics

Variables	n=150	Frequency	%
Occupation of the household head	Pure Pastoralist	122	81.3
	Semi pastoralist (mixed	28	18.7
	Crop and animal production)		
Other sources of earning income for household (excluding camel milk)	Shoat selling	95	63.3
	Charcoal production	32	21.3
	Small Business	23	15.3
How did you acquire starting Camel rearing	Inherited from family	104	69.3
	Purchased	34	22.7
	Received as bride price	12	8.0
main purpose of camel rearing (Keeping)	For milk production	103	68.7
	Social and cultural role	32	21.3
	Transport purposes	14	9.3
	Meat and milk purposes	1	0.7

Source: Survey result, 2022 %= Percentage n=Number of household interviewed

The livelihoods of majority of the respondents were pure pastoralist that accounts 122(81.3%), while Semi-pastoralist (mixed Crop and animal production) were 28(18.7%), this show that, most of the respondents were pure pastoralist than semi-pastoralist, this means in study kebeles of Ararso districts are pure pastoralist than semi-pastoralist. On the other hand, all the respondents in the studied area indicated that, generating income from selling of camel milk and also there are other sources of earning income for household (excluding camel milk). About 95(63.3%) of the respondents were generating income from Shoaat selling, while 32(21.3%) and 23(15.3%) of the respondents households earn income from Charcoal production and Small business respectively. This study shows that the main reason for selling shoats was family need cash to purchase their basic needs. This result of study agreed with the findings of Kedija et.al (2008).

The livelihood of the pastoral households was dependent on livestock herding as the sole source of employment and income as well as consumption. The following is a quotation taken from an interview with a community elder in Dinta'ab kebele which better illustrate the case;

“Our livelihood is dependent on the livestock and livestock products. And we could have the option to engage in some agricultural activities though settlement within rain-fed method. However according to our tradition we are a people that marry up to four wives and have the responsibility to fulfill the need of all these wives with their children. With engagement in agricultural production which we are less familiar with, we don't believe we could feed and manage these type of extended family of ours. However through herding we can manage them properly. Pastoralism is our way of life in which we have lived for years since our forefathers” (Interview with a community elder in Dinta'ab kebele, 2021)

The majority 104(69.3%) of the respondents households indicated that, camel acquired inherited from family, whereas 34(22.7%) and 12(8%) of the respondents were Purchased and Received as bride price for camel respectively and main purpose of camel rearing (keeping) in the study area was for milk production 103(86.7%), Social and cultural role 32(21.3%), Transport purposes 14(9.3%) and Meat and milk purposes 1(0.7%).

4.3 Livestock owned and herd composition

The livestock ownership is an indicator of household's wealth and social status in the study pastoral community. Besides, it is the main source of food, income, draft power, live asset, social security and means of livelihood diversification (coping mechanism during drought and hardship seasons) for pastoralist community. Based on the aforementioned premise, livestock ownership was hypothesized to have positive and significant relationship with camel milk market supply.

During the focus group discussion the participants stated that, livestock production and rearing is major source characterizes the livelihood of the district and livestock types kept by the pastoralist in the study area owned include: goat, sheep, cattle and camel are the most dominant species.

The total livestock unit of household in the study area is summarized in Table 4.4, using Tropical Livestock Units (TLU) as standardized animal unit obtained by multiplying total number of animals with conversion factors that takes into account “equivalent” for animals as stated in Storck et al.(1991). 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.

Table 4 4: Average livestock kept by HH in the Study Area

Livestock Species	Minimum	Maximum	Mean \pm SD	Number of livestock owned by household in Tropical Livestock Unit (TLU)
Camel	6.25	50.00	19.88 \pm 8.59	
Cattle	.00	17.00	4.18 \pm 2.83	
Goats	1.30	13.00	5.72 \pm 2.32	
Sheep	.00	7.80	3.29 \pm 1.53	
Poultry	.00	.08	0.01 \pm 0.02	
Donkey	.00	3.50	1.83 \pm 0.65	

Source: Survey result, 2022 SD=Standard Deviation

As indicated in the Table 4.4, the average livestock holding per household in the study area was 19.88 \pm 8.59 camel, 5.72 \pm 2.32 goats, 4.18 \pm 2.83 cattle, 3.29 \pm 1.53 sheep, and 1.83 \pm 0.65 donkey respectively possessed. The survey results showed that number of small ruminants along with camel head per household were smaller than other large ruminants and this result contrary with findings of Igge (2019). The herd structure is diversified to drought tolerant species, especially goat and camel as an adaptation mechanism to drought and climate change. This study result also agreed with Amaha (2006) and Kediji (2007) findings.

4.4 Camel Milk Production Performance

Livestock production especially camel production plays important roles in cultural, economic, food security and social development of Somali pastoral communities. Camel herding for Somali communities indicated as a basic way of life, insurance against natural disaster, wealth status, prestige, and highly valued cultural heritage. The camel is an important livestock species uniquely adapted to hot and arid environments therefore; Somali pastoralists are a camel community mainly because of the dry and harsh environment they live in;

Maktal Awil Samatar is one of the Haljidi kebele elders, he was one of KII participating in camel milk related questions and during the key informant interview he said:

.....Camel milk is the most important camel product and it is a valuable human food source and income generating activities in our kebele, during wet season when the condition of pasture is good and green forage is available, freshly lactating camels are usually kept near the temporary family settlement to produce milk for households and it is common practice to share out the milk between families. Camel milk may account for half of the pastoralist's nutrient intake during the growing seasons and daily milk yield of camels per day depends on feed availability, season and water access.....

Table 4.5: Camel milk production performance and lactation length

Variables	N=150	Frequency	%
Frequency of milking camel	Morning and evening	148	98.7
	Morning, midday and evening	2	1.3
Does the camel milk consumption increase at home in last years	No	95	63.3
	Yes	55	36.7
Litter of milk produced per camel per day in herd on the average presently	1-5 liters	144	96.0
	6-10 liters	6	4.0
Months of camel lactation	12 months	144	96.0
	13 months	6	4.0
Type of camel milk household members used mostly	As Fresh	61	40.7
	As soured	5	3.3
	Bothe fresh and soured	84	56.0

Source: Survey result, 2022 % = Percentage n = Number of household interviewed

As indicated in the above table 4.5, majority 148(98.3) of the respondents informed that they milk their camels two times (morning and evening), 2(1.3%) said they milk three times (morning, midday and evening) per day. This result indicates that, majority of respondent's milk their camel more than one times. In fact current finding is in line with Farah et al (2004) and Wernery (2003) result findings. During the focus group discussion the participants stated that, frequency of camel milking by the pastoralists vary and it depends up on the following factors: amount of milk produced per camel, extent of demand for milking, season, number of milking camel present in the herd and availability of other food for the camel owners. This study result is in line with Simenew et al (2013) finding.

Out of the total sampled households, 95(63.3%) of the respondents reported camel milk consumption at home is not increasing for the last five years, rather decreasing for the sake of different factors like low productivity of camel caused by shortage of feed, decreasing of grazing land and marketing of more camel milk rather than consuming at home in the study area.

According to the response of the producers, about 84(56%) of the respondents mainly consumed camel milk in its Bothe fresh and soured, while 61(40.7%) and 5(3.3%) consumed as fresh and soured milk respectively. This indicates that most of the respondents consume both fresh and fragmented milk compared to fresh milk in the study area. This current result study is contrary with finding of Igge (2019).

The survey result revealed that majority of the respondents, 144(96%) camel can produce per camel in herd during conducting the study was 1-5 liters of milk per day, while 6(4%) of the respondents households their camel produce 6-10 liters per camel per day. This present study is in line with previous finding of Mebrahtu et al (2017).

Majority of the respondents 144(96%) in the studied area indicated that, camel lactation length is 12 months in the most of the cases, while 6(4%) of the respondents said camel lactation length is 13 months but there are factors affecting lactation length include season of the year and demand for milk for more prolonged

time and camel lactation length can be prolonged when there is good feed availability and if demand for milk by the owners is increasing and not pregnant. The current study agrees with the previous findings of Simenew et al (2013) and Eyasu (2009).

4.4.1 Camel milk yield and productivity

The estimated camel milk yield performances, household consumption during wet and dry season and number of lactating camels are indicated in Table 4.6, the milk yield obtained from this study indicates that camel milk is an important source of food and income generating for the pastoralists in the study area and the pastoralists rely mainly on camels for their livelihood.

The milk yield obtained from pastorally managed camels in the study area depends mainly on environmental factors such as availability and quality of feed, water availability, the climate and the level of management. The study tried to find out the camel milk production on wet season and dry season, number of lactating camel owned by the household and camel milk consumption at household level used by the camel milk producers.

Table 4.6: Milk yield performance, household consumption during wet and dry season and number of lactating camel in the study area

Variables	Minimum	Maximum	Mean \pm SD
Average milk produced / camel /per day in wet season	2.00	5.00	3.25 \pm 0.639
Average milk produced/ came/ per day in dry season	1.00	2.50	1.61 \pm 0.39
Number of lactating camel	2.00	13.00	5.89 \pm 2.64
Average of camel milk used for household consumption per day in wet season	2.00	6.00	3.80 \pm 1.01
Average of camel milk used for household consumption per day in dry season	1.00	3.00	1.73 \pm 0.55

Source: Survey result, 2022 SD=Standard Deviation

Based on availability of feed and water sources the daily milk yield per camel per day ranges from season to season. Among the 150 study households, each produces an overall daily average (plus Standard Deviation) of milk yield per camel per day in wet and dry seasons of the study area was (3.25 \pm 0.639) liters and (1.61 \pm 0.39) liters respectively. This illustrated the yield decreases during the season when it compared with the wet season. The average milk yield of camel in dry and wet season in the current study is lower than average daily milk yield reported by Eyasu (2009) and Igge (2019) who stated that, average milk yield of camel was (5.2 \pm 2.2) , and in wet season (5.01 \pm 1.151) and dry season(2.68 \pm 0.674) respectively.

The total lactating camels of the respondent households were 883 that accounts on the average of every household had 5.89 \pm 2.64 lactating camels. Jointly, the study wants to know how many litters of camel milk consumed by sampled households in the wet and dry season. This result shows that the average of camel

milk used for household consumption per day in wet and dry season was 3.80 ± 1.01 liters and 1.73 ± 0.55 liters respectively.

4.4.2 Major constraints influencing camel milk productivity

The most constraints that influencing the productivity of the camel milk in the study area are indicated in Table 4.7. The major constraints that hinder camel milk production in the study area were feed shortage, shortage of grazing land with low productivity, disease and parasites, and high medicament costs. In this area is characterized by high ambient temperature, low and erratic rainfall with less precipitations per annum in most times. The vegetation in the area is dominated by sparsely distributed perennial shrubs and trees species the majority of which are less palatable. The result is displayed in the table below.

Table 4.7: Rank the most important constraints influencing camel milk production

Major Constraints	Rank based on their severity
Feed shortage	1
Shortage of land for grazing with low productivity	2
Diseases and parasites	3
High medicament costs	4

Source: Survey result, 2022

According to the respondents, there were different constraints in the camel milk production in the study area. Among these constraints, feed shortage was the first most problem identified. Most of the respondents reported that since there is feed shortage in the area the only main feed which camels feed during dry season was cactus which caused ulcerative lesions then mortality and poor production of the camels and also respondents mentioned that there will be no camels in the area after fifteen years due to cactus intervention if measures are not implemented. Besides, the majority of the rangelands in the area are being invaded by poisonous and unpalatable plant species.

Shortage of grazing land with low productivity was the second most important problem that limits the productivity of camel milk production the study area. Lack of grazing land and bush encroachments on the pastoral rangeland further compound the problem of feed shortages in the area. Increasing trend of sedenterization and introduction of crop farming in the area has been causing shrinkage of grazing lands of the pastoralist herds.

Diseases and parasites are the third most constraints that restrict the productivity of camels in the study area. In the area, camels are affected by outbreaks of various contagious and parasitic diseases and this situation is worsened due to lack of sufficient and appropriate veterinary services. In addition to the above main problems for the respondent pastoralists, lack of veterinary services, lack of governmental or private drug stores and lack of professional support towards improvements of production and productivity of their camels were also reported. The current study agrees with the previous findings of Simenew et al (2013) and Eyasu (2009).

4.5 Characterizing Camel Milk marketing in the study area

Market refers to a set of buyers and sellers who interact and influence price. However, the existence of the market by itself does not ensure an exchange to take place. Camel milk marketing is an income generating activity to the producers as most of them depend on it as their source of daily bread.

4.5.1 Transportation means used for camel milk marketing

As presented in figure 3 below, it reveals that the main means of transport methods used in transporting camel milk for sale was human back which was account 55%, while 17%, 11% and 17% were used car, animal pack, and both human and animal back respectively. Based on this survey result indicates the limitation of transportation exist in the study area, the closer the market less milk spoilage would be incurred and less time it take to travel.

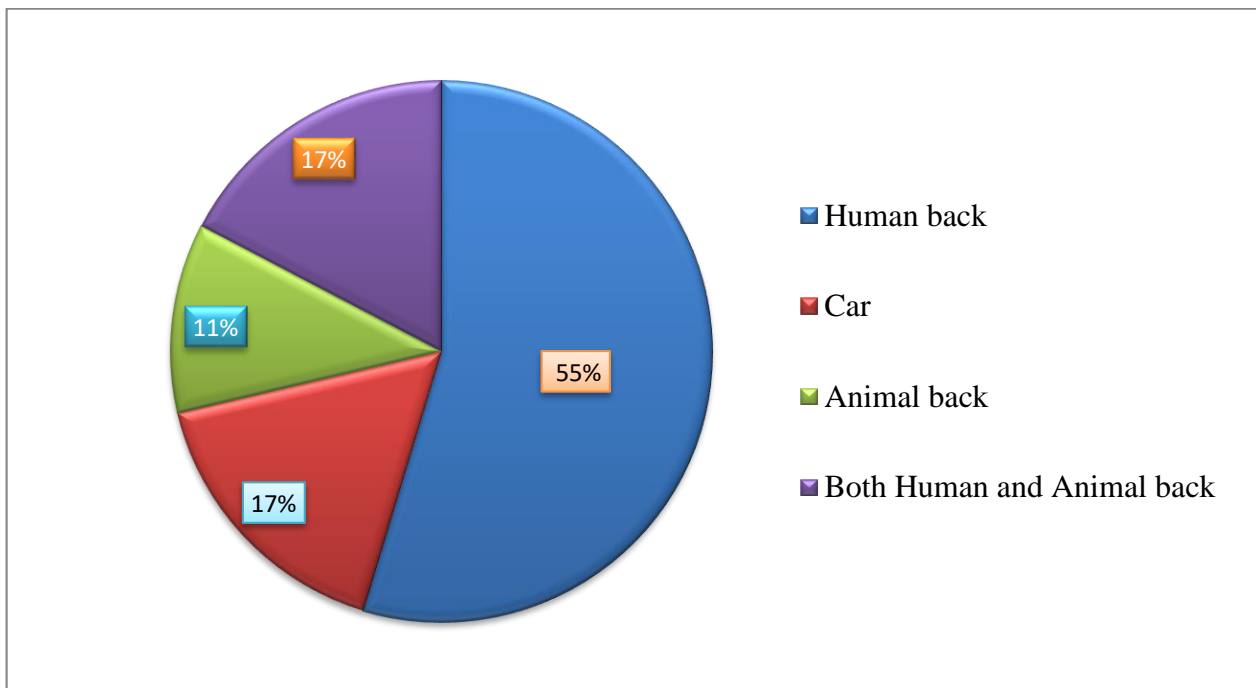


Figure 3: Transport means used to transport camel milk during marketing

Source: Survey result, 2022

4.5.2 Seasonal price variability of camel milk marketing and average income

The Somali regional state is characterized by a biannual rainfall pattern that influences camel milk production and marketing in accordance with animal feed and water availability. The fact that over two-thirds of total milk production is sold, irrespective of season and price, clearly shows that camel milk production and sale is a major source of income. The researcher noted that due to the higher volume of camel milk in the market during the wet season, the price is reduced and consumers are able to pay for the fresh camel milk. In the dry season, when there is less volume of camel milk in the market and prices increase, most of the consumers are not able to afford it and most of them purchase the cheaper reconstituted milk made from milk powder. Only wealthier households are able to purchase fresh camel milk from the market.

Table 4.8: Seasonally marketing price of camel milk and average income gained

Variables	Minimum	Maximum	Mean±SD
Volume of camel milk marketed or soled measured in liter	3.00	12.00	6.06±2.69
Camel milk/liter selling price in the market during dry season	15.00	30.00	21.50±4.91
Camel milk/liter selling price in the market during wet season	10.00	25.00	15.17±4.15
The average income gets from selling camel milk during wet season	30.00	300.00	181.73±67.49
The average income gets from selling camel milk during dry season	45.00	450.00	278.13±96.85
The average costs incur for transporting camel milk supply	0.00	10.00	4.20±4.74

Source: Survey result, 2022 SD=Standard Deviation

As indicated in Table 4.8, the average sale volume of camel milk of the households was 6.06±2.69 during the wet and dry season. The amount of camel milk sold increases during the wet season due to high excess production, but falls during the dry season due to low surplus production, according to participants in the focus group discussion.

The survey found that the average sell volume of camel in the study area was 6.06±2.69. Dairy camel producers also noted that the sell volume of camel milk is dependent on the seasons and availability of fodder and water during a focus group discussion.

The survey result shows that camel milk price ranged from 10-25 ETB in the wet season to 15-30 ETB in the dry season. This reveals that in the rainy season, the mean average price per liter was 15.17±4.15, while in dry season, it was 21.50±4.91. This means that the lowest price is in the wet season, when there is more supply of camel milk in the market, and the highest price is in the dry season, when there is less supply of camel milk in the market. The supply of camel milk is limited during the dry season, and the demand for it is high.

As revealed in table 4.9, the survey result shows that the average income gained by the respondent from camel milk sale during wet season was 181.73±67.49 Birr, while in dry season, it was 278.13±96.85 birr. During the focus group discussion with dairy camel herds told that income gained from the camel milk depends on seasons, price per liter and market accessibility.

Ahmed Muhumed is one of the Ararso woreda local leaders, when he was participating seasonal variability of camel milk supply and price related questions in key informant interview he said:

.....“Seasonality plays a major role in milk marketing as its supply, quality and transport problems change drastically from the dry to the wet seasons, with consequent price fluctuations. The long dry season (*diraac*) represents the most difficult time: milk suppliers are lower, distances further and milk price higher. Pastoralists carefully consider economic tradeoffs before selling their milk in these periods, although are often limited in their choice by the need for cash to face household and herd needs (e.g. the purchase of water and food)”

4.5.3 Storage and safety materials used for camel milk marketing

As indicated figure 4, about 92.7% of the respondents said that the camel milk transport materials they use is plastic can/Jerri can, while 4.7% and 2.7% of the respondents use traditional can and metal can respectively. The main storage materials of camel milk during the marketing in the study area were jerikan/plastic can, traditional can and metal can respectively. This finding reveals that metal can is the most storage technology materials that pastoralist preferred to store their milk as it refrigerates at night easily.

In general the use of plastic jerry cans still dominates the market especially for transport and storage purposes, while traditional cans are mainly used for milk storage. This might be a contributing factor for the rapid spoilage of milk, as plastic jerry cans cannot be cleaned properly, due to its shape and the bacterial residues mainly in the handle. This current finding is in line with previous findings of Lumadede et al. (2010) and Gebremichael et al. (2019).

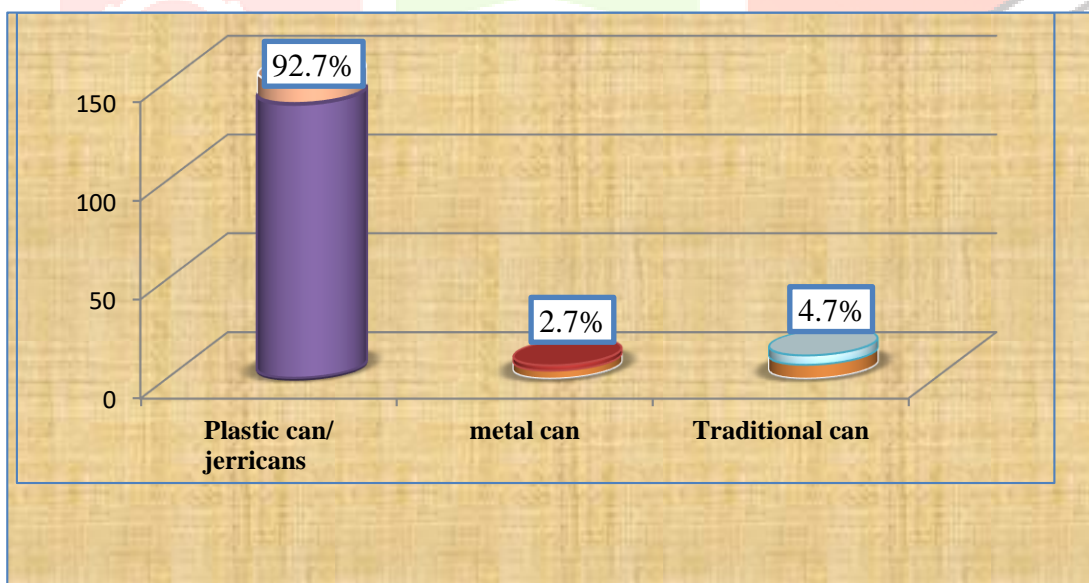


Figure 4: Storage material used for camel milk storage and safety in the study area

Source: Survey result, 2022

4.6 Access to market information

Access to marketing information is an essential element of any marketing activities. Exchange of information is traditionally part of Somali culture, if two persons coming from different direction are met along the road, they do not pass each other unless they exchange information relating peace, good pasture and rain, marketing situation of the nearby market and its information. There is one old saying of Somali

“there is no hunger than being eager to get information” which means hunger for information is more serious than hunger for food.

Access to marketing information is an intrinsic factor that allows the producer to get their products a fair price, market information is principal element of any marketing activities. The author consequently tried to see access of market information, sources of market information and where they sell their camel milk in the study area and the following results were obtained in table 4.9.

Table 4.9: Distribution of access to marketing information and other related issues

Variables	N0=150	Frequency	%
access of market information	Yes	118	78.7
	No	32	21.3
Main information source	Telephone	51	34.0
	Other milk traders	67	44.7
	No access of market information	32	21.3
Where do you sell your camel milk	At the village market	111	74.0
	At the local market	39	26.0

Source: Survey result, 2022 %= Percentage n=Number of household interviewed

As is stipulated in table 4.9, the finding against whether the respondents have access to market information was found that 118(78.7%) responded “yes” we have access to marketing information and rest of them which is 32(21.3%) of the total were demonstrated there is no access to marketing information to sell their camel milk confidently. With respect to sources of information, most 67(44.7%) of the respondents replied during interview and open discussions that they usually get through other milk traders, while 51(34%) and 32(21.3%) of the respondents were get market information through Telephone and no access of market information respectively. Those with no access to marketing information belonged to Haljid kebele which has physical barriers of access because of no communication access.

4.7 Access to extension services

The livestock sector in Somali region plays vital roles in ensuring food security, provision of traction power, generation of pastoral income and employment at the household level as well as regional economic development through foreign exchange earnings and it's also culturally important. However, the contribution of this resource to the regional economic is not commensurate to the huge regional potential and this mismatch is mostly caused by the widespread prevalence of many infectious and parasitic diseases which drastically reduce the production and productivity of livestock through morbidity, mortality and market restrictions.

Access to extension service is a vital capital which enhances quality and quantity of livestock production, productivities and improves the skill of the producers.

Veterinary services deal with all activities concerning animal healthcare and disease control. This includes: disease outbreak control, disease prevention, disease investigation/diagnosis, drug and vaccine control and provision and therapeutic services.

The pastoral community has no stable life as it wanders from place to place following its animal in searching of feed and water. This condition makes animal health and veterinary services are presently not accessible to the vast majority livestock owners in pastoral areas of Somali region. Provision of livestock extension services become very difficult in the study area due to number of reasons including poor infrastructure, livestock population are highly mobile, limited qualified staff and inadequate animal health services. The researcher makes an effort to know the access and availability of animal health and veterinary services in the study area. The result displayed the table 4.10

Table 4.10: Distribution of respondents access to extension services (N=150)

Variables		Frequency	%
Access to Extension service	Yes	138	92.0
	No	12	8.0
Where do you get Extension service	Woreda Pastoral Development office	98	65.3
	Kebele animal health center	40	26.7
	No access of extension service	12	8.0
Availability of Animal health service	Yes	39	26.0
	No	111	74.0

Source: Survey result, 2022 %= Percentage n=Number of household interviewed

As indicated in table 4.10, about, 138(92%) of the respondents has an access of extension service, whereas, 12(8%) had no access to extension services to their livestock. Majority 98(65.3%) of respondents gets extension service from office of pastoral development which provided service by campaign vaccination, while 40(26.7%) and 12(8%) of the respondent household heads were kebele animal health center and no access of extension service respectively. Regarding the availability of animal health service of the respondents, 111(74%) of them were replied that there is no sufficient animal health services in our kebele, whereas, 39(26%) of them said that yes we had animal health service. In addition to these, during the survey pastoralists reported most of extension providers do not give attention for forage and grass land improvement except one project which is called drought resilience and sustainable livelihood project (DRSLP). Therefore, livestock move long distance to search feed and water, but what happens sometimes they came across new diseases when they move new places. This finding agrees with the previous report of Igge (2019).

4.9 Constraints and opportunities of camel milk marketing

4.9.1 Constraints of camel milk marketing

In the pastoral area, camel milk marketing facing numerous constraints which are hindering economic contribution of camel milk to pastoral households. The common milk marketing constraints in Somali region includes: lack of clear milk marketing system, inaccessibility of market and lack of transport, lack of effective extension service to use newer technology and practices, lack of market information and seasonality of milk production in pastoral production system is great and it is believed that some surplus camel milk is wasted during the rainy seasons when production is high.

Table 4.11: Constraints of camel milk marketing in study area

Variable	Rank based on their severity
Distance to market	1 st
Major constraints of camel milk marketing	Lack of transportation facility
	Shortage of Milk packaging materials
	Lack of demand
	Lack of market or collection center
	2 nd
	3 rd
	4 th
	5 th

Source: Survey result, 2022

As indicated table 4.11, according to respondents, there were different constraints in camel milk marketing. The challenges in the camel milk marketing were ranked from the most important to the least important and the major constraints of camel milk marketing in the study area were: most pastoralist households travel long distance to sell their milk in the market, lack of transportation facility, shortage of milk packaging materials, lack of demand and lack of market or collection center. On the other hand, during the focus group discussion the participants stated that, there are other problems which encountered during engaging in milk marketing like: lack of access to market, price fluctuation, and poor access of transportation, infrastructures, and milk handling materials and buyers related problem. This finding agrees with previous finding of Wolkaro et al. (2017).

Fadumo Ahmed is one of the Haljid kebele women who rear camel and markets camel milk, when she was participating market related question in the key informant interview she said that:

“Market is critical to our livelihood, and livestock and livestock productions. Because we sell our camel milk to exchange for food and other household necessities and it is extremely difficult for us to reach market during the rainy season, especially if it rains early in the morning and no one comes to buy or sell our milk due to poor infrastructure and transportation, which causes our surplus milk to go to waste. She also stated that we sell all of our milk to Ararso market which far from our kebele and we do not have alternative market. Buyers set price, particularly during the wet season when there is a surplus of camel milk. As a result, we respectfully beg that the government, NGOs, and investors provide us a hand and assist us in delivering our milk at a reasonable price at the farm gate.”

4.9.2 Opportunities for camel milk marketing

Camel milk marketing gives a lot of opportunities for pastoral households or producers to generate regular income. Even though many constraints that obstruct the increment of milk marketing were identified in the study area, the majority of milk producers in the study area were willing to continue and expand the sector in the future. There is rapid urbanization, extensive population growth, large unmet demand, huge potential for increased supply, emerging trends in commercialization and change in the living standard of the societies in the study area which are good opportunities for camel milk marketing in the future. As demand for camel milk grows, there is a need to access adequate animal health service, new technology transfer and training services to increase the camel milk production potential in the area.

4.10 Econometric Model Results and Discussion

4.10.1 Factors which mostly determining volume of camel milk market supply

The multiple linear regression model was used to determine the factors influencing the volume of camel milk market supply in the study area. The variables of regression model was formulated and tested where the dependent variable was volume of camel milk marketed or soled (Y_i) and independent variables included in the estimation were: The average income gains from selling camel milk during dry season, Number of lactating camel of the HH, Camel milk/liter selling price in the market during dry season, Household family size, Number of Livestock kept for HH in TLU, Age of the household head, Camel milk/liter selling price in the market during dry season, The average income gains from selling camel milk during wet season. The results are presented in Table 4.18 below.

Fundamentally, the regression analysis is used to test how the model fits and investigate the determinant variables from the given independent variable. Finally, the regression questions were got their suitable answer based on the proposed specific objectives and regression output results and it's explores whether all the above explanatory variables equally affect the volume of camel milk supplied in the market or not.

The R-square (coefficient of determination) in the model summary table can be interpreted as the proportion of variation in the dependent variable accounted for by the test of predictors. Multiplying by 100% allows me to interpret as percentage of variation accounted for.

We can see here, that the set of predictors accounted for approximately 74.3% of the variation in test of volume of camel sold; whereas, the rest 25.7% of the variation can cover by other unknown variable which not included in the study.

According to Cohen (1988), suggested the following standards for judging the size of the effect of the set of predictors and dependent variable using R-square: $R^2=0.02$ (small effect); $R^2=0.13$ (medium effect); $R^2=0.26$ (large effect). Using these standards the size of the effect of the predictors on the dependent variable can be described as large effect.

The study before giving more explanation about the determinant factors primarily has to test whether other misspecification problems those hindered the quality of the model, due to the formulated frame work, occur or not should be checked by using **AVOVA** test. As the result indicated in the table below, the F-test of the

p-value is 0.000 and the significant value is 0.05. Hence, the significance (sig), value is greater than that of the p-value; for that reason, accept the hypothesis which is stated that the model is fitted or good.

Table 4.12: The determinant volume of camel milk market supply

R=0.862	R²=0.743		Adjusted R²=0.728	SE=1.401	
Variables	Unstandardized Coefficients		Standardized Coefficients	t-value	Sig.
	B	SE	Beta		
Constant	3.430	1.403		2.446	.016
Sex of the Household head	-.455	.259	-.084	-1.756	.081
Education Status of the household head	.243	.337	.033	.722	.472
Household Family size	.191	.083	.188	2.306	.023**
Age of the household head	-.051	.018	-.223	-2.812	.006**
Number of Livestock kept for HH in TLU	.039	.020	.158	1.970	.051**
Number of lactating camel of the HH	.706	.069	.694	10.255	.000**
Average of income gains from selling camel milk during wet season	-.008	.004	-.193	-1.758	.081**
Average of income gain from selling camel milk during dry season	-.001	.003	-.020	-.185	.853**
Camel milk/liter selling price in the market during wet season	.126	.056	.195	2.256	.026**
Camel milk/liter selling price in the market during dry season	-.084	.061	-.153	-1.372	.172**
access of market information	.515	.587	.079	.877	.382
Distance to market for camel milk marketing	.245	.228	.078	1.076	.284
Access of Extension service	-.163	.461	-.017	-.353	.724
Access to credit service	-.791	.365	-.146	-2.170	.032

Source: survey result, 2022.

Not: **1% significance level * 5% significance level.

a. Dependent Variable: Volume of camel milk marketed or soled measured in liter (Y_i)

*Regression is significant at the 0.05 level (2-tailed)

Result of regression analysis presented in table above also provides more comprehensive and accurate examination of the research questions. For that reason, the regression analysis is used to test the developed questions based on the specific objectives and investigate the contributions of the independent variables over dependent once.

Mainly, the researcher wants to check whether above the independent variables (Household Family size, Age of the household head, Number of lactating camel of the HH, Price of camel milk in the wet season and Access to credit service), are statistically significant determinant of the volume of camel milk marketed or soled measured in liter (Y_i) or not.

Hence, the result indicated in table 4.19, all the variables are statistically significant associated with dependent variable volume of camel milk marketed/sold (Y_i) where (p-value=0.000 up to 0.032, <sig value=0.05). therefore, the assumed hypothesis which is stated that the Household Family size, Age of the household head, Number of lactating camel of the HH, Price of camel milk in the wet season and Access to credit service are significant important to determine the volume sale of camel milk, i.e., there is evidence that the these variables associated to each other.

As indicated in the previous sections, a number of independent explanatory factors (socio-economic, seasonal price of milk, institutional variables) were postulated to influence volume of camel milk supplied in the market. Out of fifteen explanatory variables hypothesized to volume of camel milk supplied in the market eight were found to be statistically significant when it run to model. These factors include: the Household Family size, Age of the household head, Number of lactating camel of the HH, Price of camel milk in the wet season and Access to credit service.

Household Family size: This variable was related positively and significantly with volume of camel milk supplied to market with a 0.05level of significance. So, after taking the remaining variables as a constant, for a one person increment of household family size the volume of camel milk supplied to market increases by 0.191 liter.

Age of the household head: This variable was related negatively and significantly with volume of camel milk supplied to market with a 0.05level of significance. So, after taking the remaining variables as a constant, for a unit increment of Age of the household head the volume of camel milk supplied to market decrease by 0.051 liter.

Number of lactating camels of the HH: This variable was related positively and significantly with volume of camel milk supplied to market with a 0.05level of significance. So, after taking the remaining variables as a constant, for one lactating camel increment of the household the volume of camel milk supplied to market increases by 0.706 liter.

Price of camel milk in wet season: This variable was related positively and significantly with volume of camel milk supplied to market with a 0.05level of significance. So, after taking the remaining variables as a constant, for unit increment of the price per liter in wet season the volume of camel milk supplied to market increase by 0.126 liter.

Access to credit services: This variable was related negatively and significantly with volume of camel milk supplied to market with a 0.05level of significance. So, after taking the remaining variables as a constant, for a unit increment of Access to credit services of the household the volume of camel milk supplied to market decrease by 0.791 liter. This implies that when household receive Access to credit services they prefer other small business trade rather than marketing camel milk which means credit does not promotes participation in milk marketing in the study area.

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REFERENCES

- [1] Abdi, M. A. (2010). Determinants of participation in milk marketing of smallholders in Jijiga Woreda, Ethiopia (Doctoral dissertation, Mekelle University).
- [2] Behnke, R. H. (1985). 'Measuring the benefits of subsistence versus commercial livestock production in Africa', *Agricultural Systems*, 16:109–135.
- [3] BoFED. (2014). Regional Development Gap Analysis in 2014. Jijiga, Ethiopia.
- [4] Ethiopian Red Cross Society (ERCS). (2013). Somali region Vulnerability and capacity Assessment (VCA) and Branch Capacity Assessment (BCA) reports.
- [5] FAO (Food and Agriculture Organization). (2019). The future of livestock in Ethiopia. Opportunities and challenges in the face of uncertainty. Rome. 48 pp. Licence: CC BY-NC-SA 3.0 IGO.
- [6] Faye, B. (2015). Role, distribution and perspective of camel breeding in the third millennium economies. *Emir. J. Food Agriculture* 27 (4): 318–327.
- [7] Gebremichael, B., Girmay, S., & Gebru, M. (2019). Camel milk production and marketing: Pastoral areas of Afar, Ethiopia. *Pastoralism*, 9(1), 0–10. <https://doi.org/10.1186/s13570-019-0147-7>
- [8] HATFIELD, R., & DAVIES, J. (2006). Global review of the economics of pastoralism. Prepared for the World Initiative for Sustainable Pastoralism, IUCN: Nairobi.
- [9] Igge, A. (2019). Assessment of Camel Milk Productivity, Marketing Channel and Its Effect on Pastoralist Livelihood: The Case of Degahbour Woreda, Jarar Zone, Somali Regional State (SRS) Ethiopia.
- [10] MacDonald, M. and Simon, J. (2011). Climate, foodsecurity, & growth Ethiopia's complex relationship with livestock Policy Brief 3. Brighter Green.
- [11] Mohamed Ali Hussein. (1993). Traditional Practices of Camel Husbandry and Management in Somalia pp.123-140.
- [12] MUKHERJI, G.B., RAO, J., CHATURVEDI, R., & PRIYADARSHINI, P. (2017).). Evolving a Policy on Pastoralism in the Semi-arid State of Rajasthan, and India. Annual World Bank Conference on Land and Poverty. Washington DC, March 20-24, 2017.
- [13] Seifu, Eyassu. (2009). Analysis on the contributions of and constraints to camel production in Shinile and Jijiga zones, eastern Ethiopia, *Journal of Agriculture and Environment for International Development*, 103 (3): 213-224.
- [14] Tadesse, Y., Urge, M., Abegaz, S., Kurtu, M. Y., Kebede, K., & Dessie, T. (2014). Husbandry and breeding practices of dromedary camels among pastoral communities of Afar and Somali regional states, Ethiopia. *J. Agriculture and Environment for International Development*, 108(2), 167-189.
- [15] TEFERA, M., & ABEBE, G. (eds. . (2013). *Camel in Ethiopia 2012*. Ethiopian Veterinary Association: Addis Ababa. ISBN 9789994498192.
- [16] Tezera, G. (1998). Characterization of camel husbandry practices and camel milk and meat utilization in Jijiga and Shnlie zone, Somali region. An MSc Thesis Presented to the School of Graduate Studies of Alemaya University 145p.