



USAID
FROM THE AMERICAN PEOPLE

RELPA
REGIONAL ENHANCED LIVELIHOODS
IN PASTORAL AREAS

ELMT
ENHANCED LIVELIHOODS IN
THE MANDERA TRIANGLE

ELSE
ENHANCED LIVELIHOODS IN
SOUTHERN ETHIOPIA



Save the Children

***Pastoral Milk Production and Market Chain Analysis in
Dollo Ado and Dollo Bay, Somali Region of Ethiopia
for Save the Children/US – Version 1***



Photos 1 and 2: Milk transportation in Dollo Ado

Lumadede, A.K, Owuor, G., Laqua, H., Gluecks, I.V.

February 2010



List of Tables

Table 1:	Breakdown of interviewees for survey
Table 2:	Name of markets visited in Dollo Ado and Dollo Bay
Table 3:	Human and livestock population estimates in Dollo Ado and Dollo Bay
Table 4:	Herdsizes (Range, Average) in Dollo Ado and in Dollo Bay Districts, based on 23 interviewed households (hh's)
Table 5:	Price of milk in dry and wet season for producers, traders and in selected markets in Dollo Ado and Dollo Bay
Table 6:	Percent increase of the price for different milk products during the dry season
Table 7:	Average total milk sale per Producer hh and day (l) according to the seasons
Table 8:	Daily income from milk sales per Producer hh (Birr) according to the seasons
Table 9:	Average daily milk sales (l) per Trader according to the seasons
Table 10:	Average daily expenses, sales and profit from milk sales per Trader hh (Birr) according to the seasons
Table 11:	Estimation of total number of traders involved in the visited markets
Table 12:	Average daily milk sale turn over (l) in six markets according to the seasons
Table 13:	Average daily milk market value (Birr) in six markets according to the seasons
Table 14:	Summary of proposed interventions

List of Figures

Figure 1:	Map of Dollo Ado and Dollo Bay
Figures 2-4:	Proportion of different Livestock species (%) in Dollo Ado and in Dollo Bay Districts, based on 23 interviewed households (hh's)
Figures 5-7:	Herd composition by Species in Dollo Ado and Dollo Bay
Figures 8-10:	Trends in average daily milk production, sale and consumption per household in different seasons in Dollo Ado and Dollo Bay
Figure 11:	Seasonal milk production per household in average
Figure 12:	Usage of milk equipment by Producers, Traders and Consumers in Dollo Ado and Dollo Bay
Figure 13:	Boiling practices by study group
Figure 14:	Milk preservation methods used
Figure 15:	Cleaning practices of milk equipment
Figure 16:	Major markets in Dollo Ado and their supply radius
Figure 17:	Actors and their role in the milk market chain
Figure 18:	Gender distribution among milk Producers in Dollo Ado and Dollo Bay
Figure 19:	Involvement of milk Producers in Dollo Ado and Dollo Bay
Figure 20:	Gender distribution among milk Traders
Figure 21:	Sources of milk for Traders
Figure 22:	Milk sale points for Traders
Figure 23:	Factors influencing Consumer in purchase of milk
Figure 24:	Average daily sale of milk products by Traders according to season
Figure 25:	Profit from milk sales per Trader HH per day during various seasons
Figure 26:	Challenges of Traders and Producers in milk marketing
Figure 27:	Estimated daily volume (l) and value (Birr) of the milk market in the study area according to season
Figure 28:	Comparison of milk analysis results between baseline and impact assessment

List of Photos

Photos 1 and 2:	Milk transportation in Dollo Ado
Photo 3:	Stainless steel/aluminium containers are available from street vendors in Dollo Ado
Photos 4 & 5:	Women in Dollo Ado market displaying and selling milk
Photo 6:	Big and small milk measuring containers used for milk sales
Photo 7:	Contaminated plastic jerry can used for milk transport (Kenya)
Photo 8:	Anolei women group camel milk bar, Isiolo, Kenya with shared cooling facility

List of Annexes

Annex 1:	Terms of Reference/MoU Save US and VSF Suisse
Annex 2:	List of persons / organizations consulted
Annex 3:	Training report
Annex 4:	Questionnaire used

Table of Contents

List of Tables.....	2
List of Figures	2
List of Photos	2
List of Annexes	3
Table of Contents.....	4
EXECUTIVE SUMMARY	5
ACKNOWLEDGEMENT	7
1. INTRODUCTION.....	8
1.1. Background.....	8
1.2. Objectives of the study.....	8
1.3. Expected outputs	8
2. METHODOLOGY.....	9
2.1. Literature review	9
2.2. Briefing meetings and consultation with Save the Children/US project staff	9
2.3. Interviews of key informants and stakeholder groups using checklists on key issues	9
2.4. Consultation with local authorities public service providers	9
2.5. Consultation with service providers	10
2.6. Market Visits to Dollo Ado and Dollo Bay	10
3. RESULTS.....	10
3.1. Study area covered.....	11
3.2. Socio-economic status and role of livestock among the of communities in Dollo	11
3.3. Pastoral Milk Production and Hygiene	12
3.3.1. Household herd size and herd composition trends.....	12
3.3.2. Seasonal variability of milk production, consumption and sale.....	14
3.3.3. Common milk handling practices of Producers, Traders and Consumers	16
3.4. Milk Marketing.....	19
3.4.1. Features of the current milk value chain	19
3.4.2. Milk prices along the market chain.....	24
3.4.3. Income from Sales of milk.....	25
3.4.4. Estimated Market turnover	29
3.5. Summary of challenges in milk and milk products marketing	30
4. DISCUSSION AND RECOMMENDATION	30

EXECUTIVE SUMMARY

Save the Children/US contracted VSF Suisse to undertake a study of the pastoral milk production and market chain analysis in Dollo Ado and Dollo Bay, Somali Region of Ethiopia in order to better understand the opportunities and challenges associated with milk marketing in the region. VSF staff carried out the study in the period 8th to 21st October 2009.

The main purpose of the study was for VSF Suisse to provide Save the Children/US with base-line information on milk hygiene and marketing and to train selected Save the Children/ US staff and a selected women with training in improved milk hygiene.

The study methodology included a review of relevant documents and interviews with relevant stakeholders. Markets were also visited in Dollo Ado - Suftu, Sablaley and Lolomoge – and in Dollo Bay - Boryale and Dhurey. In all a total of 14 producers, 23 traders and 9 consumers were interviewed.

Milk Production

Dollo Ado and Dollo Bay are found in the arid and semi arid areas of the Somali Region of Ethiopia. Predominant livelihoods are pastoralism and agro-pastoralism and in both extensive livestock rearing play a central role. Profound changes are now taking place – the result of increased vulnerability due to more frequent climatic hazards and reduced mobility, which represented one of their major coping strategies - one of which is that pastoralists are selling more milk in order to generate cash to purchase grain and feed families amongst other things. Livestock owners move in search of pasture according to seasons and although the value of milk in their eyes is more in household consumption than in commercial marketing, this study found that they are actually marketing about two thirds of their milk, hence contributing considerably to the household income.

Major milk production is in the rainy seasons of Guu and Deyr. Of the studied a household produces on average 11 ltrs goat milk and 18 ltrs camel and cow milk in the Guu season and 8 ltrs goat milk and 11 ltrs camel and cow milk in the Deyr season per day. Production reduces considerably during the dry season and is dominated by camel milk with 6 ltrs in Hagaa and 5 ltrs in Jilal season, while both goats and cows produce only 5 ltrs and 3 ltrs in Hagaa and Jilal, respectively.

Milk Marketing

Milk marketing is traditionally done by women. Key actors involved in the milk market chain are producer, trader and consumer and all sectors are dominated by women. Their organisation is along kinship lines.

Products found in the market include fresh camel, cow and goat milk and fermented camel milk (Susac). The only processed product found in the market is ghee made out of goat or cow milk. Camel milk is the dominant type sold in the market. It fetches the highest price, both for producer and trader and has the highest volume turn over irrespective of the season.

Underdeveloped infrastructure (roads, transport, market buildings) are a big impediment to milk marketing, especially in the absence of cooling systems. Underdeveloped marketing infrastructure leaves no option to the women in Dollo but to sell their milk as **seated** at the roadside on the ground in the dust.

Customer preference

Rural household consumption patterns include fresh and fermented (sour) milk and ghee on a seasonal basis. However, in general the local customers' preference is for fresh milk. Since it is very difficult to get fresh milk in the market, most restaurants offer reconstituted powdered milk

to their customers as fresh milk, which bears some public health risks because clean and safe water is not easily accessible in many areas.

Milk Hygiene

Poor hygiene practices, inefficiency in milk handling and absence of cooling facilities were observed especially in the catchment areas of Dollo Ado and Dollo Bay markets. Despite some awareness of the risks, unhygienic practices along the chain frequently lead to spoilage of milk, rejected by traders and consumers. The milk for sale at the markets is usually delivered in plastic jerricans (57%) or gourds (43%). The ordinary plastic jerrican is difficult to clean and contributes to the frequent spoilage of milk. Sour milk in general fetches a lower price than fresh milk leading to a loss of income. It appeared that sour (fermented) milk in Dollo is more commonly sold than fresh milk for the above mentioned reasons.

Boiling of milk was mainly practiced at consumer and trader level while producers only boil the milk for preservation, hence marketing but not for own household consumption posing a health risk to the family members.

Household income from milk sales

Milk sales constitute a regular income for pastoralist communities in the ASAL. From the study group at pastoralist producer level the average daily income during the dry season from milk sales is Birr 23.5, while it almost triples during the rainy season to Birr 65.88. At trader level the average daily income does not vary much between the seasons and is with Birr 46.2 slightly higher during the dry season as compared to Birr 44.75 during the rainy season.

The average daily volume sold during Jilal, Guu, Hagaa and Deyr season is 8ltrs, 33ltrs, 12ltrs and 24ltrs at producer level and 16.9ltrs, 44.5ltrs, 23.7ltrs and 36.6ltrs at trader level respectively.

The estimated total volume of the milk sold in the mentioned markets on a daily basis varies from 1,740 ltrs in Jilal, 4,583 ltrs in Guu, 2,441 ltrs in Hagaa and 4,037 ltrs in Deyr season. This represents a market value of Birr 8,469, 14,364, 11,996 and 12,535, respectively.

Possible interventions

Recommended interventions to improve and strengthen the milk market include

- Training of all actors on improved milk hygiene practices and simple milk testing (e.g. clot and boiling test, alcohol test, lactodensimeter) ;
- Introduction of hygienic milk equipment;
- Capacity building on business management skills;
- Improvement of local market infrastructure such as establishment of collection points, cooling facilities, market stands, sheds, milk bars;
- Strengthening linkages between market chain actors
- Lobbying with relevant line ministries for the development of the dairy sector in the arid lands of Ethiopia

ACKNOWLEDGEMENT

The authors of this document, Dr.Kennedy Agoi Lumadede and Mrs. Genevieve Owuor, would like to thank the staff of Save the Children/US who funded and supported the implementation of this study under the RELPA ELMT/ELSE program.

In particular the authors would like to thank Mr(s) Naasir and Sheriff of Save the Children/US who did a very good job in translating the questions into the local language (Somali and Amharic) and interpreting the questions of the consultants in addition to playing the role of guide. In addition the authors would like to thank the officials from the Ministry of Livestock, Crop and Rural Development Bureau, the County Council, the Administration in Dollo Ado and Dollo Bay as well as officials from Kalmese Savings and Credit Ltd Cooperative Society of Dollo Ado. Furthermore our gratitude goes towards all Save the Children/US staff in Ethiopia who provided support in terms of information, logistics and language in the course of the study and for providing the opportunity to learn about pastoral milk production, hygiene and marketing in a regional context.

Finally the authors would like to thank all the people from the study area, who were willing to spend their time to share their information and knowledge.

1. INTRODUCTION

1.1. Background

Both Save the Children/US and VSF Suisse are partners in the USAID funded Enhanced Livelihoods in Southern Ethiopia/Enhanced Livelihood in the Mendera Triangle (ELSE/ELMT) program and implement activities on all sides of the Kenya/Ethiopia and Somali border. The objective of the program is to increase the self-reliance and resiliency of the targeted population through improved livelihoods in drought prone pastoral areas of the Mendera Triangle (Ethiopia, Kenya and Somalia).

One of the activities falling under the Intermediate Result 4 “Livelihoods enhanced by strengthened alternative, complementary and enhanced income sources” is the improvement of the milk market ... what role does milk marketing play ... is it complementary to pastoralism – because it helps poorer pastoralists exchange milk for cereals/ cash which they need; is it an alternative livelihood – ie those involved are no longer pastoralists they are dairy farmers so to speak ... it would be useful to know more about what role milk marketing is seen to play and to be able to play by the VSF Suisse team .. . As VSF Suisse is already implementing a project to improve milk markets on the Kenya side, the organisation was asked by Save the Children US to carry out a study on “Pastoral milk production and market chain analysis in Dollo Ado and Dollo Bay, Somali Region of Ethiopia”.

1.2. Objectives of the study

The objectives of the study were to:

1. establish a simple base-line of milk hygiene and marketing in Dollo Ado and Dollo Bay as a first step in establishing a pastoral milk marketing initiative within Save the Children.
2. identify all sectors within the milk market chain (producers, collectors, bulkers, transporter, traders) their roles and responsibilities and collect and analyse milk value chain related information.
3. provide Save the Children staff and a selected group of women engaged in milk supply with training in improved milk hygiene.

For more details refer to the TOR in the Annex1.

1.3. Expected outputs

- Roles, responsibilities and interaction of all key actors within the milk market chain laid out
- Current and potential turn over of major milk markets, preferences and products available analyzed
- Major constraints and possible recommendations from all key actors involved
- Legality of the markets and involvement of local, regional and national authorities analyzed
- Trained staff and a group of women on milk hygiene and value addition
- Cost/benefit analysis for key milk value chain operators

2. METHODOLOGY

The VSF Suisse team used the following methodologies:

2.1. Literature review

The consultant reviewed documents relevant to the assessment, existing project documents and other background information. A systematic analysis and synthesis of the information formed the basis for the conclusions and recommendations.

2.2. Briefing meetings and consultation with Save the Children/US project staff

The consultants held a briefing meeting with Save the Children/US staff to discuss and get a clearer understanding of the assignment and relevant documents for desk review. Field work in Dollo started with an initial consultation with the Save the Children/US staff based at Dollo Ado. This consultation oriented the consultants regarding the local context in which implementation is taking place.

2.3. Interviews of key informants and stakeholder groups using checklists on key issues

The table below shows the key informants by location and occupation. A checklist/questionnaire was used during the fieldwork in Dollo, Ethiopia in interviews of milk producers, consumers and other stakeholders (see Annex 4&5). The selection of the informants was with focus on people involved in milk marketing (either as producer or trader) and their availability and willingness to participate in the study.

Table 1: Breakdown of interviewees for survey

Market Chain Actor	SAMPLE OF SURVEY		TOTALS
	Dollo Ado	Dollo Bay	
Producers*	10	4	14
Traders/Transporters	20	3	23
Consumers**	9	0	9
TOTALS	39	7	46

Notes:

* Milk producers 90km outside Dollo Ado and along the road were visited to understand the milk production system (size of herds, volume of production), seasonality, constraints and opportunities. Seasonal migration of producers and poor condition of the roads resulted in few interviews conducted¹

** Managers of hotels/ restaurants and a few individual consumers were interviewed to identify potential new consumers.

*** Assessment of potential for milk value addition was done in consultations with key informants in the table.

2.4. Consultation with local authorities public service providers

The consultant undertook consultation with the Dollo Ado town council and the Ministry of Livestock, Crop and Rural Development Bureau.

2.5. Consultation with service providers

Consultation with service providers (extension, capacity building, and animal health) was undertaken to obtain their perspectives on the milk marketing chain.

2.6. Market Visits to Dollo Ado and Dollo Bay

The consultants made several visits to markets where milk is sold to observe and consult with milk sellers on:

1. Catchment areas for milk production and distances to the market;
2. Alternative sources of milk (if applicable);
3. Types of milk products offered in the market and pricing;
4. Consumer tastes and preferences and demand for milk products;
5. Difficulties encountered in production and transportation of milk to the market;
6. Regulatory environment regarding public health and hygiene;
7. Infrastructure in place for milk marketing;

Table 2: Name of markets visited in Dollo Ado and Dollo Bay *Woredas*

Dollo Ado	Dollo Bay
Dollo Ado Town	Dollo Bay Town
Suftu	Boryale
Sablaley	Dhurey
Holomoge	

3. RESULTS

The study was carried out Dollo Ado and Dollo Bay of Afder and Liban Zone of the Somali Region in Ethiopia. The area is mainly arid to semi- arid with a rainfall pattern of 200 mm to 400 mm per year².

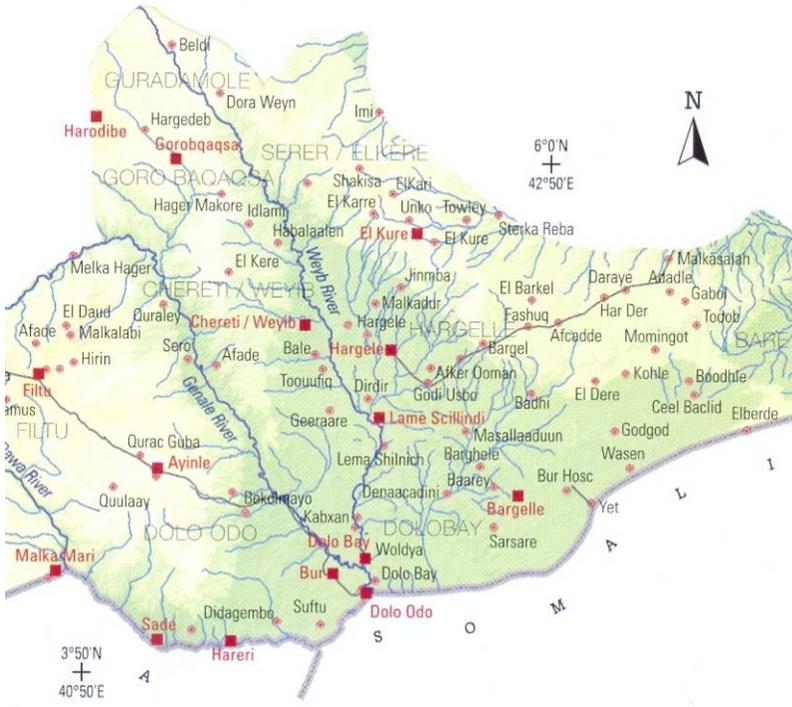
Somalis are the largest ethnic group in and their traditional lifestyle is dependent on their livestock. Major challenges faced by the communities include animal diseases, severe drought, high prices for staple foods, insecurity, decline in markets for livestock, gums/resins, and salt, border closure among others³.

² "Pastoral Atlas", March 2010, LVIA Ethiopia

³ "Livelihoods and Vulnerabilities – An Understanding of Livelihoods in Somali Regional State, Ethiopia", Save the Children UK and Disaster Prevention and Preparedness Agency, June 2008

3.1. Study area covered

Figure 1: Map of Dollo Ado and Dollo Bay



3.2. Socio-economic status and role of livestock among the of communities in Dollo

The subsistence economy and rich social life of the Dollo community have been determined in great measure by geography with their pastoral lifestyle being adapted to the periodic flooding and dryness of the land they live in. During the “dry season”, they live closer to the rivers in temporary structures. Over many years, pastoralists throughout the Horn of Africa region have adapted their herding patterns to maximize the use of available pasture and browse resources. In the area around Dollo, the adaptation process necessarily involves the riverine area which plays an important role in providing herds and flocks with dry season/ drought grazing. In the ‘wet season’ the livestock disperse into the rangelands away from the river.

Livestock play a central role in the economy, livelihood, and symbolic framework of the people and represent far more than a simple means of subsistence. Livestock are the main form in which wealth is kept, and are a means of survival.

Social obligations are paid through livestock (mediation of marriage, payment of dowry, settlement of disputes, feuds and kinship support). Livestock are a real time investment and source of disposable income through trade to meet non-food household needs. Livestock also matter in the symbolic order of value, tradition, and belief and are a part of Somali identity.

Approximately 70% of people in Dollo are dependent on livestock for their economic and social well being. Livestock is the major source of daily food (milk and meat) and for income for

households in the two regions. 30 - 40% of the population is referred to as very poor and poor, while 35-50% are classified as middle wealth and 10-15% as better-off⁴...

Population data for humans and livestock are shown in the table below.

Table 3: Human and livestock population estimates in Dollo Ado and Dollo Bay *Woredas*

	Dollo Ado	Dollo Bay
Human population	111,199*	84,127*
Number of cattle	159,944	n/a
Number of camel	201,322	n/a
Number of goats	436,099	n/a
Number of sheep	380,030	n/a
Number of donkeys	16,000	n/a

Source: **Pastoral Atlas**, March 2010, LVIA Ethiopia;

Adapted from district livestock office, figures for Dollo Bay not available

3.3. Pastoral Milk Production and Hygiene

3.3.1. Household herd size and herd composition trends

Fourteen producer households, ten from Dollo Ado and four from Dollo Bay as well as nine Consumer households from Dollo Ado only, were interviewed to establish herd size and production details. Herd size varied as did species distribution in the two districts (refer to the table below).

Table 4: Herd size (Range, Average) in Dollo Ado and in Dollo Bay Districts, based on 23 interviewed households (hh's)

Animal Species	Dollo Ado			Dollo Bay		
	Producer 10 hh's	Average	Consumer 9 hh's	Average	Producer 4 hh's	Average
Camel	15-60	26	0-4	0.4	20-60	45
Cattle	0-20	14	0-20	9	0-70	36
Sheep	12-50	26	0-30	12	30-45	39
Goats	25-150	61	0-40	18	20-40	28

Comparing the data of herd sizes between producer and consumer households it clearly reflects that producer households that still follow a more traditional lifestyle, own more livestock than consumer households that are mainly urbanised.

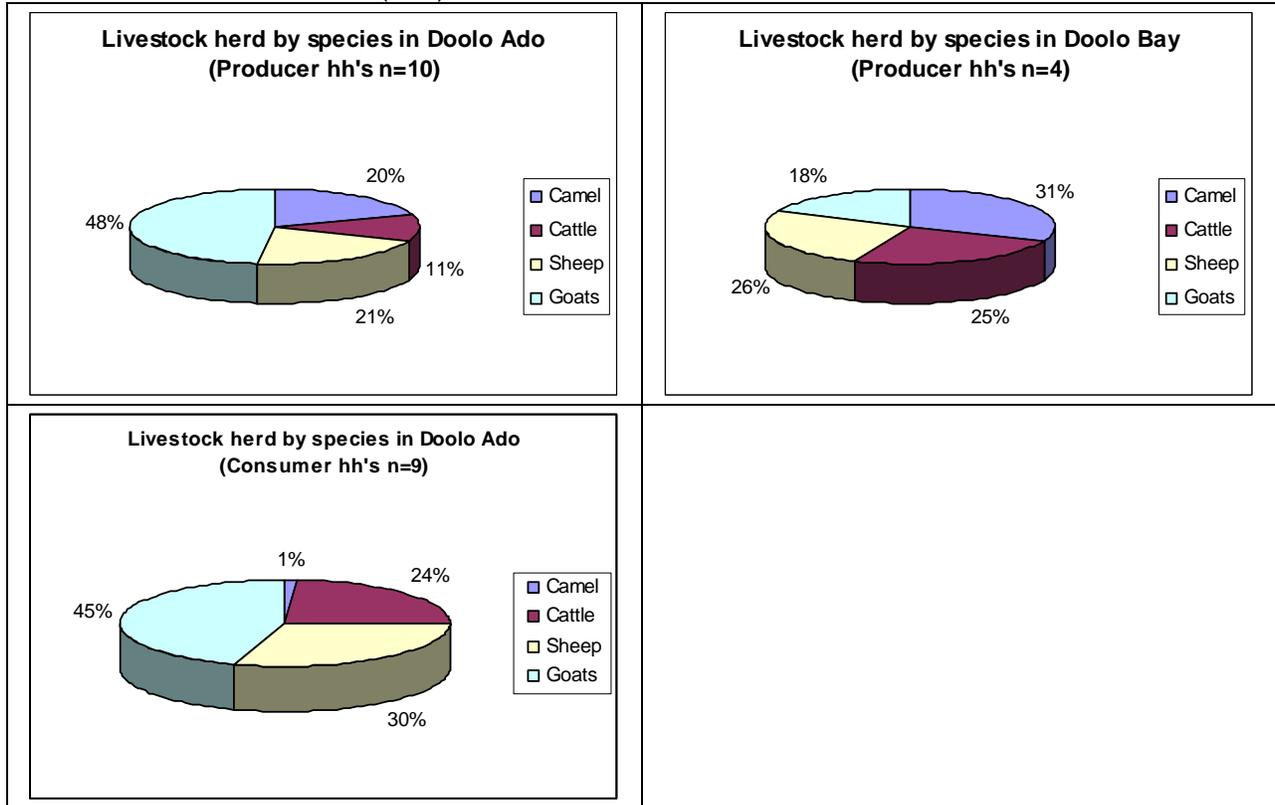
According to the average numbers of animals owned per household and the classification of wealth groups based on Save the Children/UK study on "Livelihoods and Vulnerabilities"⁵ the interviewed informants belonged to the middle and better-off wealth category. Considering that the consultants were focusing on people involved in milk marketing, this is understandable as very poor and poor households have no milk for sale. Poor pastoralist households often only keep goats and sheep and do not produce any surplus milk for sale. The little they produce is mostly used for their own consumption.

⁴ "Livelihoods and Vulnerabilities – An Understanding of Livelihoods in Somali Regional State, Ethiopia", Save the Children UK and Disaster Prevention and Preparedness Agency, June 2008

⁵ "Livelihoods and Vulnerabilities – An Understanding of Livelihoods in Somali Regional State, Ethiopia", Save the Children UK and Disaster Prevention and Preparedness Agency, June 200

The composition of the livestock herd in the two Districts by species is shown in the figure below.

Figures 2-4: Proportion of different Livestock species (%) in Dollo Ado and in Dollo Bay Districts, based on 23 interviewed households (hh's)

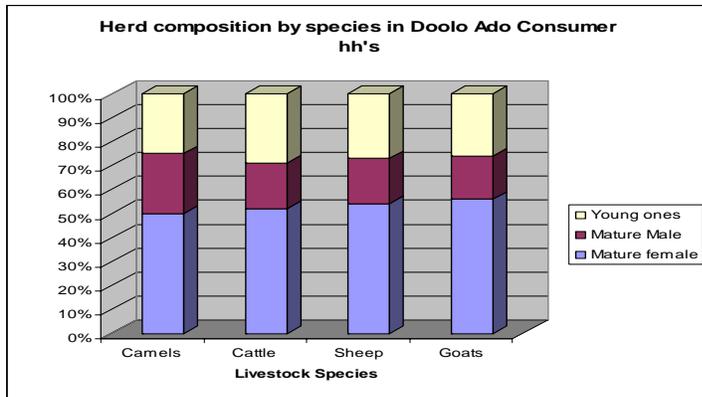
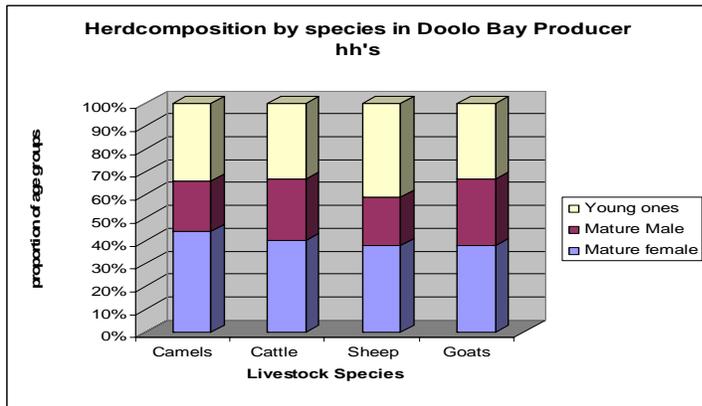
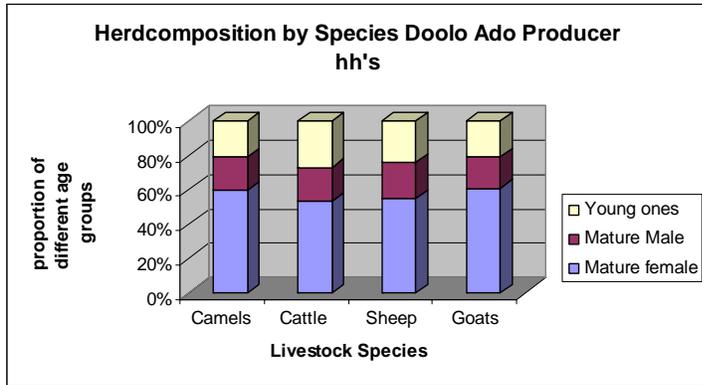


Based on the information from the informants, goats have the highest population in Dollo Ado District, followed by sheep, then camels and last cattle. Interviewees in Dollo Bay stated that the majority of livestock species kept are camel (31%) followed by sheep (26%), cattle (25%) and goats (18%). This information varies from the usual references whereby mostly small ruminants are kept followed by camel and cattle. However the study was conducted in the middle of the dry spell and with focus on people involved in the milk market. During the dry spell mainly camel milk is available and therefore a bias possible towards people who keep more camel.

Consumer households kept mainly small ruminants (75%), followed by cattle (24%) but hardly any camels (1%), which may be explained by their peri-urban or urban environments.

The herd composition was calculated for each District as shown below

Figures 5-7: Herd composition by Species in Dollo Ado and Dollo Bay



Mature female animals are dominant in the herd composition ranging between 38 to 61% followed by young animals between 21-41%. Mature male animals only represent between 18-29%. This represents the classical herd composition for livestock kept by pastoralist with focus on milk production.

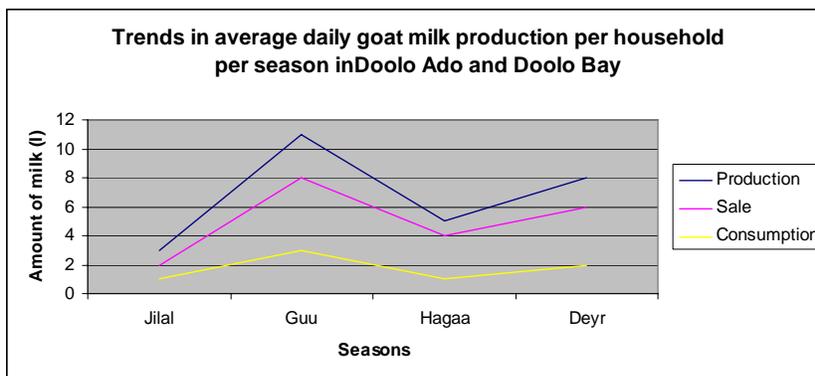
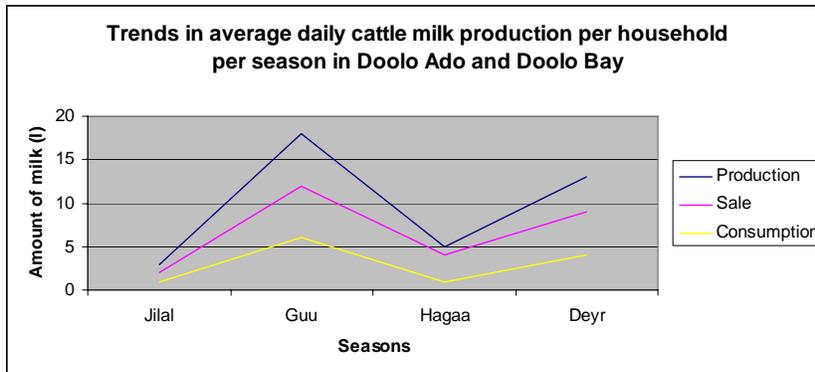
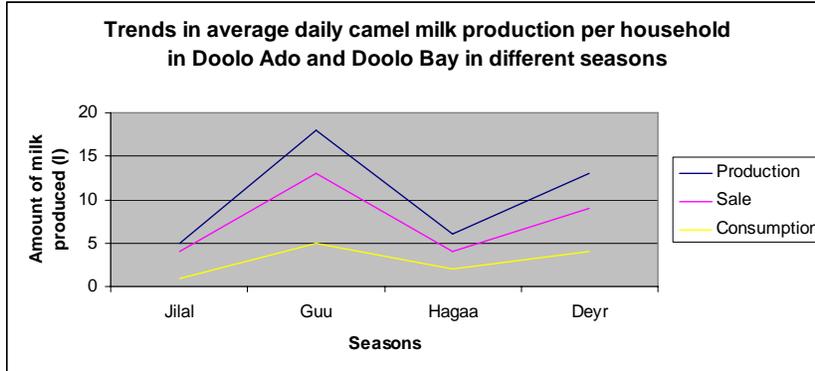
3.3.2. Seasonal variability of milk production, consumption and sale

The Somali Region of Ethiopia is characterised by a biannual rainfall pattern, which influences the milk production in line with availability of feed for livestock.

Jilal is the dry period from December to March with a reduced volume of milk production. **Guu** is the main rain period from April to July when high milk yields are expected. **Hagaa** is the cold and dry period from July to October – again with lower milk production and **Deyr** is the second

main rainy season from October to December with high milk production. This is also reflected in the results of this study (refer to figures 8-10 below).

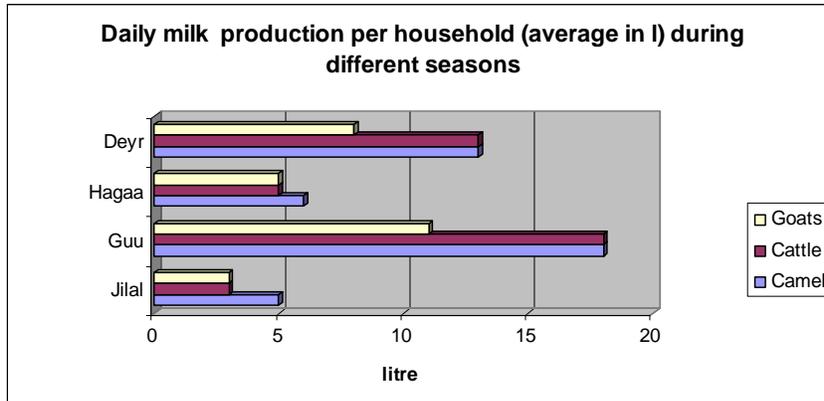
Figures 8-10: Trends in average daily milk production, sale and consumption per household in different seasons in Doolo Ado and Doolo Bay



Major milk production is in the rainy seasons of Guu and Deyr. A household produces an average of 11 ltrs goat milk and 18 ltrs camel and cow milk in the Guu season and 8 ltrs goat milk and 11 ltrs camel and cow milk in the Deyr season per day. Production reduces considerably during the dry season and is dominated by camel milk with 6 ltrs in Haggaa and 5 ltrs in Jilal season, while both goats and cows produce only 5 ltrs and 3 ltrs in Haggaa and Jilal, respectively (for more details see Figure below)

Despite the limited data, the trend for camels, cattle and goats is the same and shows, that the highest proportion of milk produced (67-80%) by the three species is sold, while 20-33% are consumed at household level.

Figures 11: Seasonal milk production per household in average



The fact that over two thirds of total milk production is sold, irrespective of season and species, clearly shows milk production and sale is a major source of income. The consultants noted that due to the higher volume of milk in the market during the wet season, the price reduces and consumers are able to pay for the fresh milk. In the dry season prices increase and most of the consumers are only able to purchase the cheaper reconstituted milk from milk powder. Only wealthier households are then able to purchase fresh milk from the market.

3.3.3. Common milk handling practices of Producers, Traders and Consumers

The hygiene standard in production as well as in marketing of milk is poor. At the production level, milking and handling of milk are of concern because personal as well as milking equipment hygiene is insufficient among the milk handlers.

It is assumed that contamination of milk during milking and handling is high based on the following observations:

- Use of dirty equipment and water
- Personnel not washing hands with soap and clean water
- Cleaning of udder usually not done, neither dry not wet
- Test for abnormalities of milk using strip cut not done
- Mastitis milk is not discarded
- Withholding period after use of veterinary drugs not observed
- No filtration of milk done before transport to market
- Fresh milk is stored in l or plastic jerry cans which are smoked for preservation and taste enhancement but very difficult to clean and to keep clean
- No cooling facilities available
- Boiling of milk is still not widely practiced
- Pooling of milk from different households without quality check
- Time period for milk to get from the producer to the market is long
- No transport services available or available transport is expensive
- Milk producers who are far from these routes may not easily access transport

Milk equipment:

Elaborate milking equipment such as large aluminium/stainless steel jars and pails are not available in the market because there is no demand. However smaller containers are available that would be suitable for small milk producers because there is a demand

Photo 3: Stainless steel/aluminium containers are available from street vendors in Dollo Ado

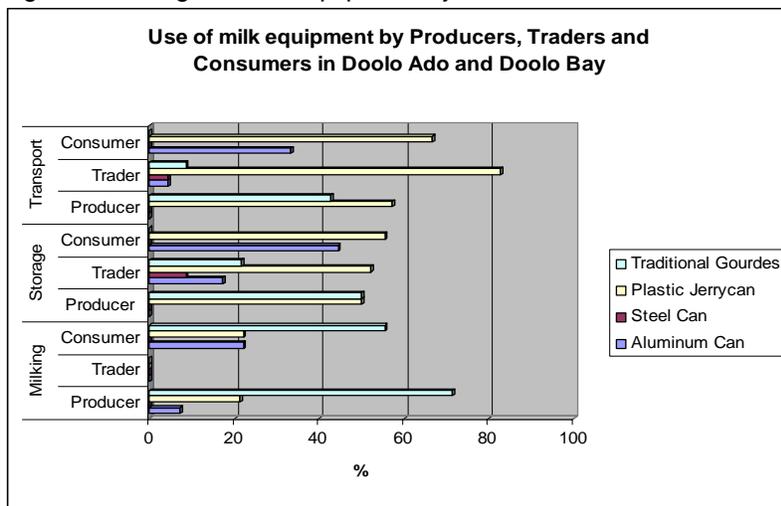


The figure below shows that Producers mainly use plastic jerry cans and traditional gourdes as milk handling equipment. Traditional gourdes are used by Producers mainly for milking (71%) and are equally used as plastic jerry cans for milk storage. For transport purposes plastic jerry cans are dominantly used (53%) followed by traditional gourdes (43%).

Traders and Consumers handle their milk using plastic jerry cans with 52% and 52% for storage and 82% and 67% for transport purposes, respectively. The use of aluminum cans was mainly found by consumers with 44% for milk storage and 33% for transport while traders used the aluminum cans for milk storage with 17%.

In general the use of plastic jerry cans still dominates the market especially for transport and storage purposes, while traditional gourdes are mainly used for milking. 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.

Figure 12: Usage of milk equipment by Producers, Traders and Consumers in Dollo Ado and Dollo Bay

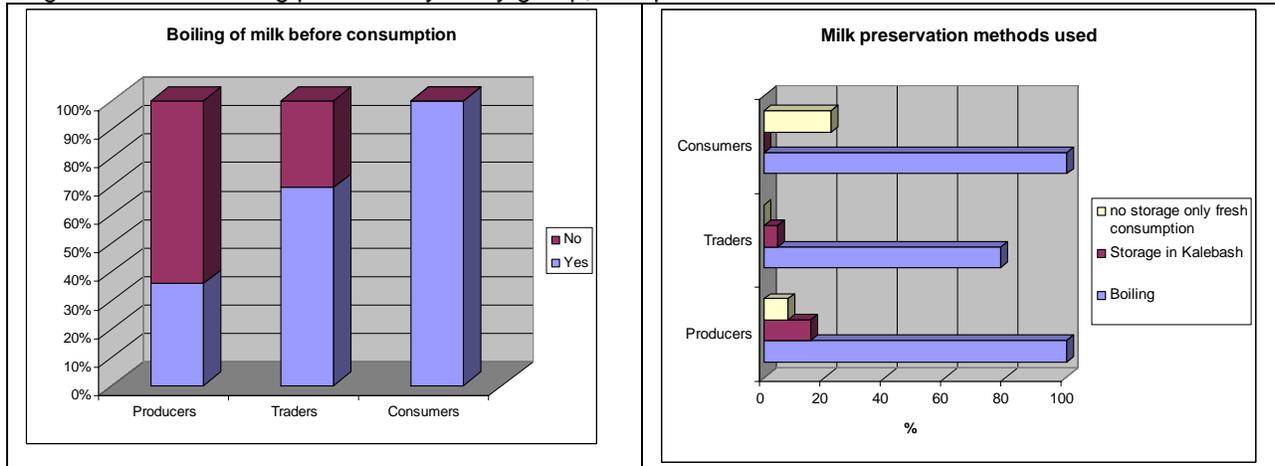


Boiling practices:

Boiling of milk before consumption is important as a preventative measure not to contract diseases such as Brucellosis (with a reported prevalence of 4.2% in cattle⁶, 2.8% in camel⁷ and 1.7% in small ruminants⁸) and is increasingly practiced along the market chain. As shown in Figure 13 below:

- Only 36% of the milk producer indicated that they boil their milk before drinking,
- 70% of the Traders said that they boil their milk before drinking,
- 100% of the Consumers implemented this practice.

Figure 13 & 14: Boiling practices by study group; Milk preservation methods used



Preservation methods used:

The majority of the interviewees used boiling as the preservation method for milk with 78% for Traders and 100% for Producers and Consumers each. 15% of the Producers and 4% of the Traders also mentioned the use of Kalebash containers as a method of preservation.

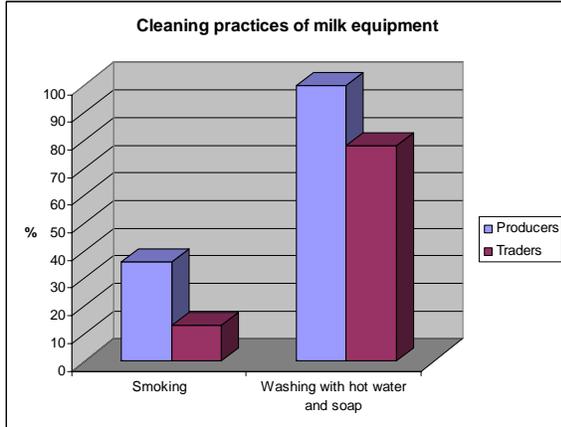
⁶ Mangen, M.-J. et al. (2002), „Bovine brucellosis in Sub-Saharan Africa: Estimation of sero-prevalence and impact on meat and milk offtake potential“, Livestock Policy Discussion Paper No.8, Food and Agriculture Organization, Livestock Information and Policy Branch, AGAL, Livestock Policy Discussion Paper No.8

⁷ Teshome, H. et al. (2003), “A Seroprevalence Study of Camel Brucellosis in Three Camel-rearing Regions of Ethiopia”, Tropical Animal Health and Production, 25 (2003), pp. 381-390

⁸ Teshale, S. et al. (2006), “Seroprevalence of small ruminant brucellosis in selected districts of Afar and Somali pastoral areas of Eastern Ethiopia: the impact of husbandry practice”, Revue de Médecine Vétérinaire, 2006, 157(11), pp.557-563

Cleaning practices

Figure 15: Cleaning practices of milk equipment



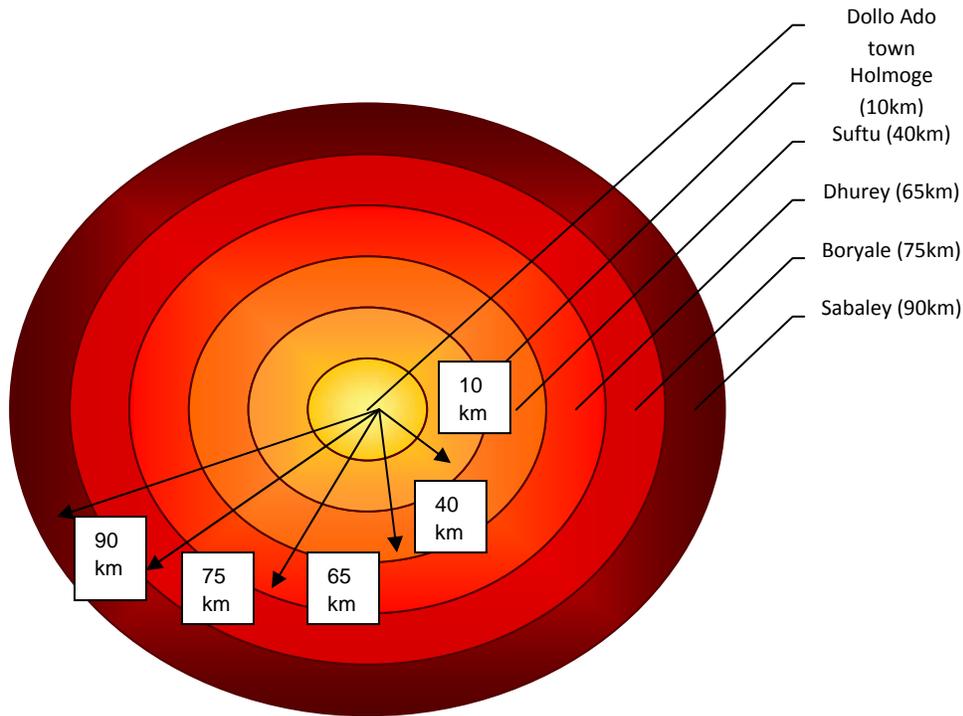
100% of the Producers and 78% of the Traders wash their milk equipment with hot water and soap while 36% of the Producers and 13% of the Traders would also use the more traditional smoking practice for cleaning their equipment. No data was collected from Consumer hh's.

3.4. Milk Marketing

3.4.1. Features of the current milk value chain

Milk and milk product marketing in Dollo Ado and Dollo Bay pastoral area is an essential livelihood requirement to meet basic needs for food and other household essentials.

Figure 16: Major markets in Dollo Ado and their supply radius



Within a radius of 90km five markets could be identified around Dollo Ado town, namely Holmoge (small local milk market, 10km distance), Suftu (bulking of milk and sale in Mandera town of Kenya, 40km distance), Dhurey (small local milk market, 65km distance), Boryale (small local milk market, 75km distance and Sabaley (local milk market 90km distance). All visited markets operated on a daily basis. The following observations were made:

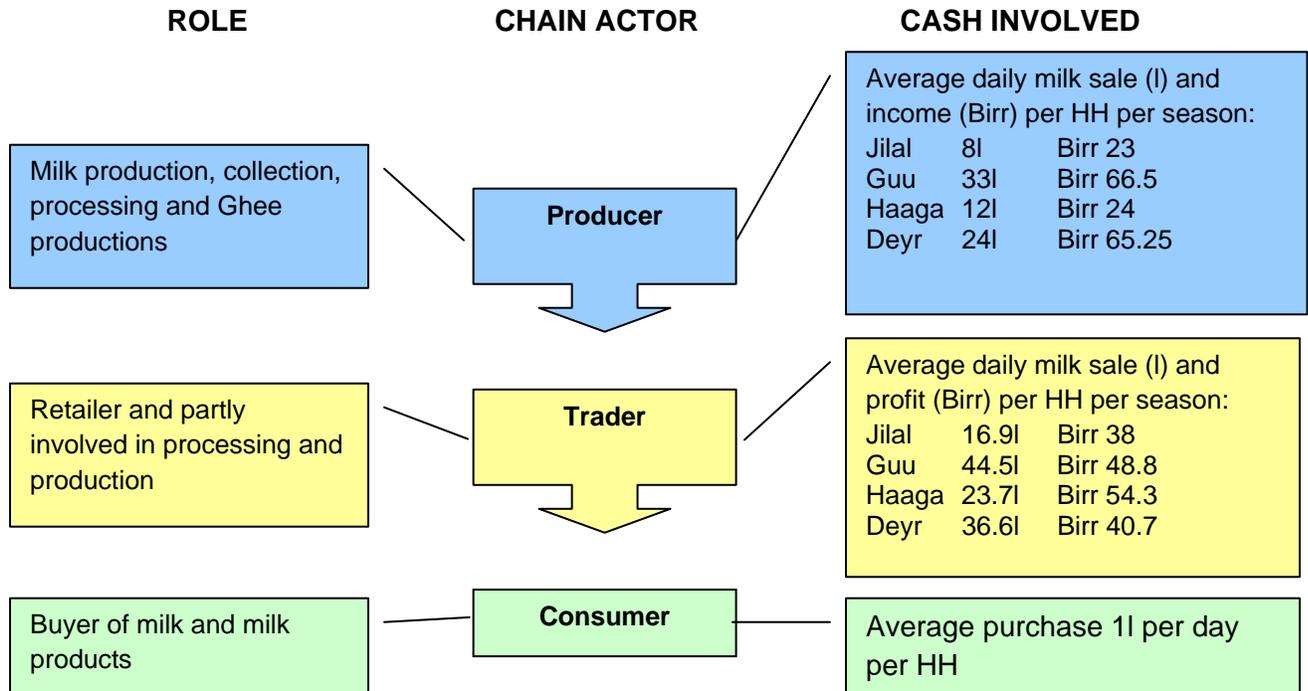
General observation:

- All fresh milk arrived late in town (afternoon) and was brought by pick up or on foot. This “night milk”, mixed with traditional herbs, was sold as fresh milk early next morning.
- Some consumers asked to be given a sample to taste and in all the instances witnessed, the container used was not washed before the next person tasted
- Average buyers bought 3 cups
- The jerricans and gourds used to dispense the milk were not very clean.
- Consumers usually go to the sellers and it is not common that sellers hawk their milk. The sellers are stationed next to the road side and display their milk for passers-by to buy.
- Milk sellers indicated that they had to walk for long distances to bring milk to the market and in the process, the milk turned sour.

Milk market chain actors:

Along the market chain Producers, Traders and Consumers are involved. The Figure below describes their role along the market chain and the cash involved.

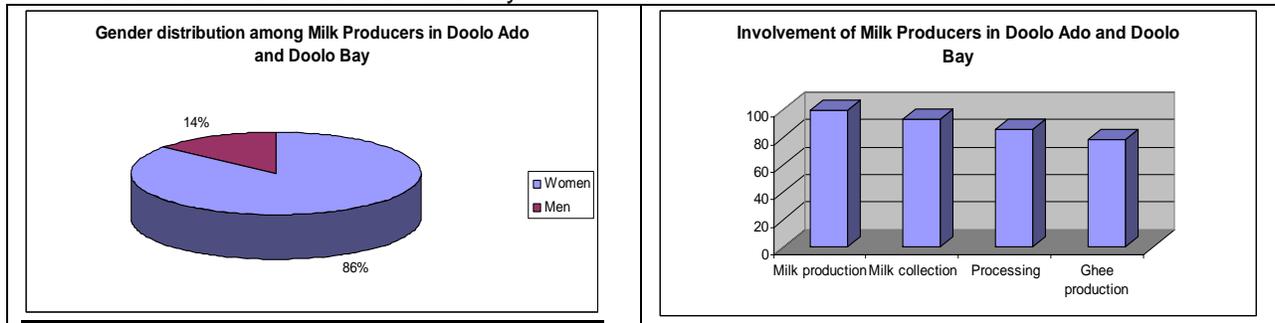
Figure 17: Actors and their role in the milk market chain



Profile Producer:

A total of 14 Milk Producers (10 from Dollo Ado and 4 from Dollo Bay) were interviewed. Women were dominating with 86%. According to the interviewees all of them were involved in milk production while 93%, 86% and 79% were also involved in milk collection, processing and ghee production respectively. It is important to note that most of the Producers also act as collectors and transport the milk to the markets, either by food or with vehicles.

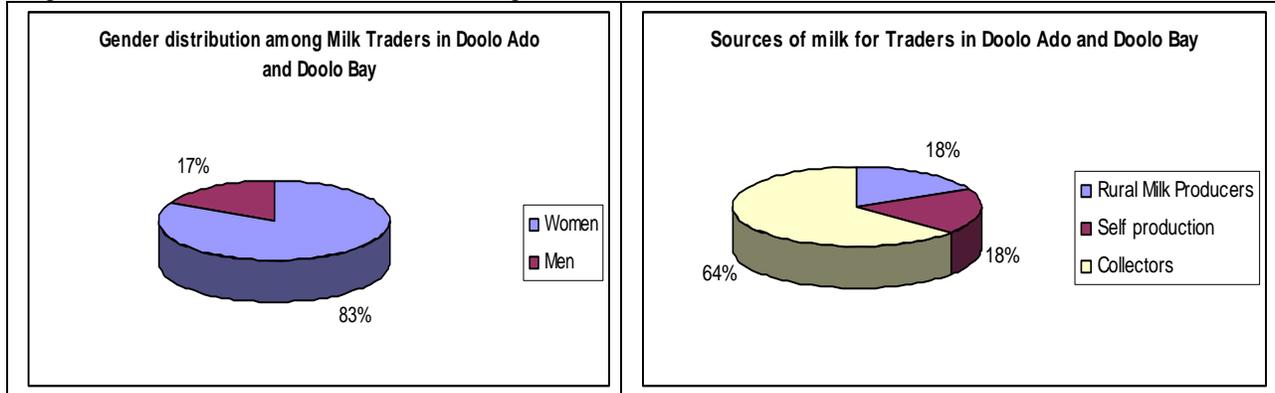
Figure 18 & 19: Gender distribution among milk Producers in Dollo Ado and Dollo Bay; Involvement of milk Producers in Dollo Ado and Dollo Bay



Profile Trader:

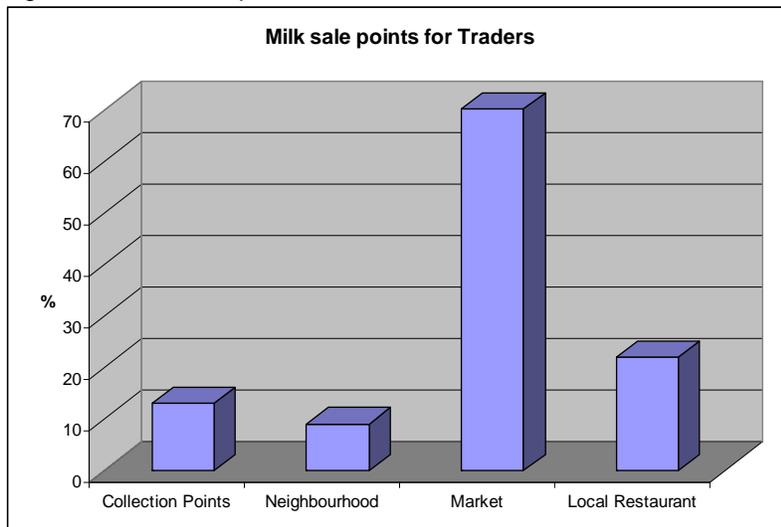
The milk trade is mainly in the hand of women with 83% representing the study group as compared to only 17% men out of 23 interviewees.

Figure 20 & 21: Gender distribution among milk Traders; Sources of milk for Traders



The majority (87%) of traders act as retailers only while 17% of the interviewees were also involved in milk processing. Collectors represent with 64% the major source for milk for the traders equally followed by self production (18%) and rural milk producers (18%). Relationships along the market chain are mainly Business relations (36%) followed by strong links with relatives (32%) or simple self enterprises (32%).

Figure 22: Milk sale points for Traders



70% of the milk is sold by Traders in the local market, followed by local restaurants (22%), at collection points (13%) and in the neighbourhood (9%). However there is no market structure available and Traders sit on the ground in the market in very unfavourable and unhygienic conditions (see photo below).

Photos 4 & 5: Women in Dollo Ado market displaying and selling milk



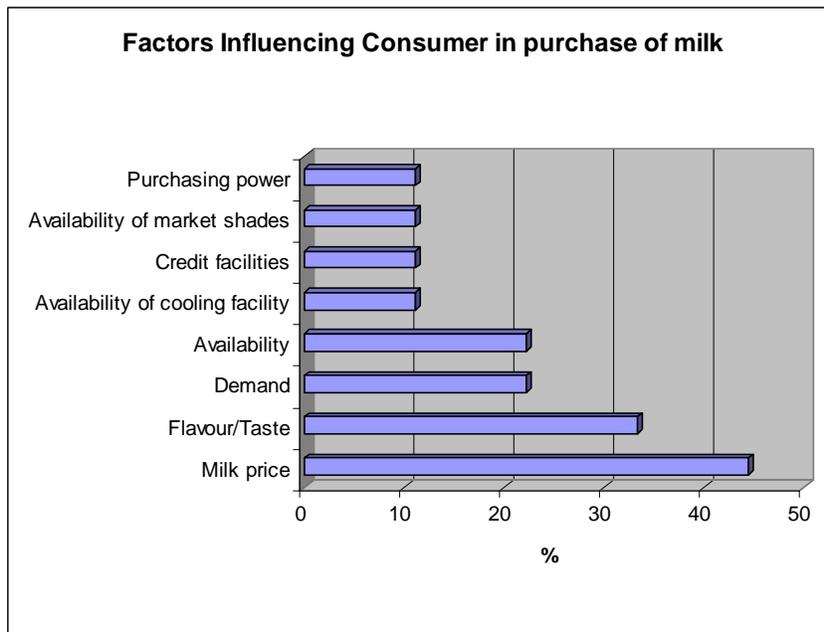
Profile Consumer:

A total of nine people were identified and interviewed as consumer represented by eight women and one man.

Consumers are market participants particularly urban residents. Other buyers include tea and coffee shop owners, restaurants and hotel owners

44% of the interviewed Consumers stated that the price is the most prominent factor influencing their decision on the purchase of milk in the market and it is followed by the taste (33%), current needs (22%) and availability (22%). Other factors such as availability of cooling facilities within the market, credit facilities, market sheds and purchasing power were mentioned by 11% of the consumers each.

Figure 23: Factors influencing Consumer in purchase of milk



Most rural households consume fresh milk but some also consume fermented (sour) milk and ghee on seasonal basis. Selling of fermented milk in Dollo appears more common than the selling of fresh milk. The fact that rural households make their own fermented milk and ghee for

their own consumption and for sale is an indication of the acceptance of other milk products in addition to fresh milk.

The primary demand for fresh milk in Dollo region is a function of the population of the towns which is estimated to be about 194,966.

Discussions with stakeholders in small hotels, the town council, government departments and ordinary householders indicated that many would wish to access fresh milk but are not able to do so because of concerns of hygiene and availability.

Although milk related businesses like tea shops are common in Dollo Ado and Dollo Bay towns, much of the tea is consumed strong (without milk). In the absence of fresh milk supplies, most of the tea vendors use powdered milk for their customers who demand tea with milk and also reconstitute it and sell as fresh milk.

Additional observation

As opposed to Dollo Ado, only small amounts of milk find their way into Dollo Bay town. Hotels in town offer milk reconstituted from milk powder. The reasons why only little fresh milk is sold in Dollo include among others:

- poor or expensive transport services;
- producers not well organized for marketing of milk;
- markets not well developed in terms of infrastructure
- producers' level of awareness on market opportunities for milk is low;
- seasonal fluctuations in milk production;
- low hygiene standards and lack of promotion;

3.4.2. Milk prices along the market chain

Seasons have a very important impact on the availability of locally produced milk. This is because of the effect the season has on the reproduction pattern of each individual species, movement of the livestock and the amount of milk produced per animal due to varying availability of pasture for grazing. Seasonality in milk supply would actually favour processing of milk as a means of preservation, enabling sales in times of scarcity, however this is not practised.

Milk prices vary according to seasons. In the wet season, production is higher and most households have some excess milk and prices tend to go down.

Table 5: Price of milk in dry and wet season for producers, traders and in selected markets in Dollo Ado and Dollo Bay

Milk product	Unit	Dollo Ado		Dollo Bay		Average	
		Producer sales price (Birr)	Trader sales price (Birr)	Producer sales price (Birr)	Trader sales price (Birr)	Producer sales price (Birr)	Trader sales price (Birr)
Rainy season							
Fresh cow milk	l	2.00	3.00	1.00	2.00	1.50	2.50
Fresh camel milk	l	3.00	4.00	2.00	2.50	2.50	3.25
Susac	l	2.00	3.50	2.00	3.50	2.00	3.50
Fresh goat milk	l	3.00	3.50	1.00	3.00	2.00	3.25

Milk product	Unit	Dollo Ado		Dollo Bay		Average	
		Producer sales price (Birr)	Trader sales price (Birr)	Producer sales price (Birr)	Trader sales price (Birr)	Producer sales price (Birr)	Trader sales price (Birr)
Dry Season							
Fresh cow milk	l	3.50	4.50	1.00	2.00	2.25	3.25
Fresh camel milk	l	4.00	7.50	3.00	5.00	3.50	6.25
Susac	l	2.50	5.00	2.00	4.50	2.25	4.75
Fresh goat milk	l	3.50	6.50	1.00	2.00	2.25	4.25

The table above reflects the prices of various milk products at Producer and Trader level in Dollo Ado and Dollo Bay compared between the rainy and dry season. The data also indicate that fresh milk products (fresh camel milk) fetch a higher price than fermented one (Susac).

An average price for the two locations has been calculated and added to the table. Based on these average prices the increment in % of the price between the rainy season and dry season is reflected in the table below. On average the prices increase by 29% at Producer level and 47% at Trader level in the dry season as compared to the rainy season.

Table 6: Percent increase of the price for different milk products during the dry season

Milk product	Percent increase of price at Producer level	Percent increase of price at Trader level
Fresh cow milk (l)	50%	30%
Fresh camel milk (l)	40%	92%
Susac (l)	13%	36%
Fresh goat milk (l)	13%	31%
Average increment	29%	47%

Photo 6: Big and small milk measuring containers used for milk sales



3.4.3. Income from Sales of milk

Most of the milk is sold as raw fresh or fermented/sour milk. Fresh milk fetches a higher market price, however due to lack of hygiene standards the milk often reaches the market as sour/fermented milk. The only processing that currently takes place is the production of ghee either from goat or cow milk.

Based on the data, milk sales contribute to the household income per day both at Producer and Trader level in the two districts.

Income at Producer level:

According to the interviews with the Producer a household sales on a daily average 8l, 33l, 12l and 24l of milk from all livestock species in Jilal, Guu, Hagaa and Deyr season, respectively.

Table 7: Average total milk sale per Producer hh and day (l) according to the seasons

Milk product	Average Milk sale per Producer hh and day (l)			
	Jilal	Guu	Hagaa	Deyr
Fresh cow milk	2	12	4	9
Fresh camel milk	4	13	4	9
Fresh goat milk	2	8	4	6
Total	8	33	12	24

Taking into consideration the average milk sold per household and day and the average prices of the various milk products according to the rainy and dry season, the average income per household per day from milk sales has been calculated and is reflected in the table below. Thus the average income during the dry season varies between Birr 23 during Jilal and Birr 24 during Hagaa, while it increases to an average of Birr 66.50 during Guu and Birr 65.25 during Deyr season. It should be pointed out that camel milk fetches the highest price in the market both during the rainy and the dry season and has the highest volume sold, hence mainly contributing to the household income from milk sales throughout the year, with Birr 14, 32.50, 10 and 31.20 in Jilal, Guu, Hagaa and Deyr season, respectively.

Table 8: Daily income from milk sales per Producer hh (Birr) according to the seasons

Milk product	Average income per Producer hh per day (Birr)			
	Jilal	Guu	Hagaa	Deyr
Fresh cow milk	4.50	18.00	6.00	20.25
Fresh camel milk	14.00	32.50	10.00	31.50
Fresh goat milk	4.50	16.00	8.00	13.50
Total	23.00	66.50	24.00	65.25

Income at Trader level:

Milk products sold in the market by Traders included fresh camel, cow and goat milk, Susac (fermented camel milk) and ghee made from goat or cow milk.

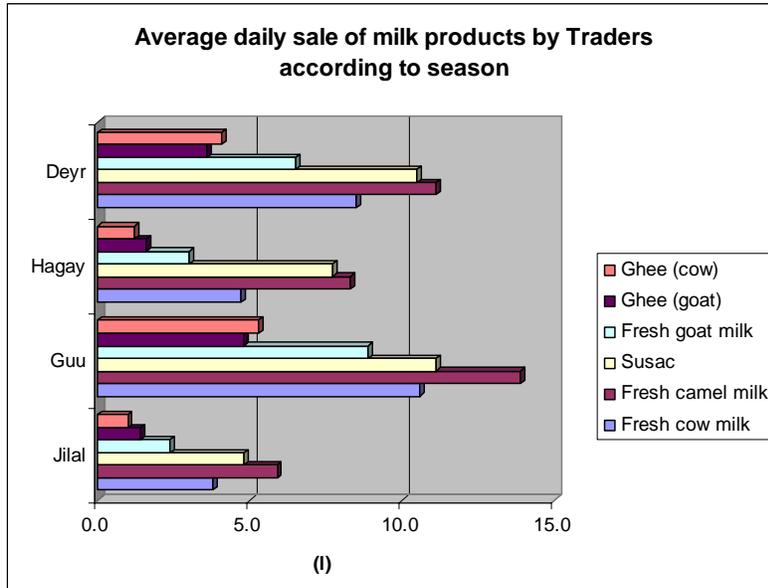
Table 9: Average daily milk sales (l) per Trader according to the seasons

Milk product	Average sales per Trader hh and day (l)			
	Jilal	Guu	Hagaa	Deyr
Fresh cow milk	3.8	10.6	4.7	11.1
Fresh camel milk	5.9	13.9	8.3	11.1
Susac	4.8	11.1	7.7	10.5
Fresh goat milk	2.4	8.9	3.0	6.5
Total	16.9	44.5	23.7	36.6

Comparing the average daily sales of milk in the market during the various seasons, fresh camel milk usually has the highest turn over, followed by Susac, fresh cow and fresh goat milk

independent of the season. Ghee both from goat or cow milk is mainly sold during the rainy seasons (Guu and Deyr), indicating that some of the “excess” milk produced during that period is processed.

Figure 24: Average daily sale of milk products by Traders according to season



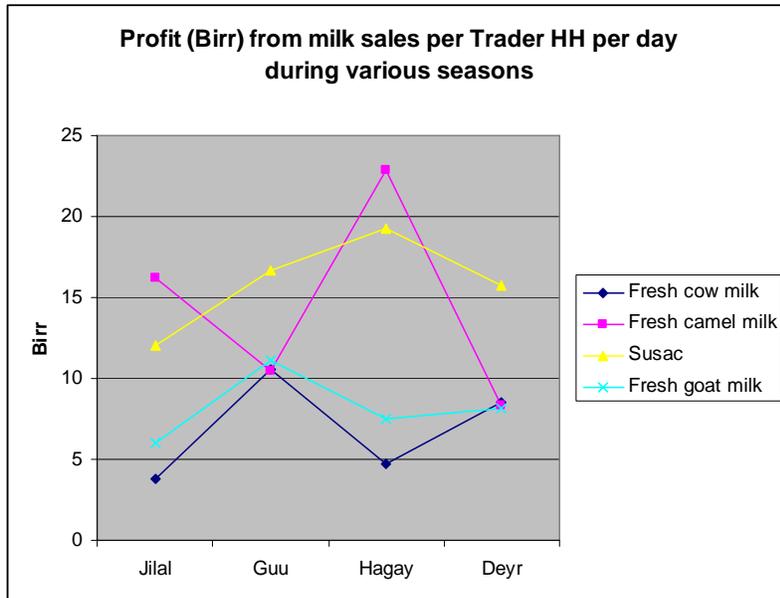
The table below reflects the average daily expenses for the procurement of milk, the sales of milk and the profit made per Trader hh compared between the different seasons. In average a Trader hh makes a total profit of Birr 38 in Jilal, Birr 48.8 in Guu, Birr 54.3 in Hagay and Birr 40.7 in Deyr season. Even though the prices of the different milk products are higher during the dry season (Jilal and Hagaa) the average daily profit is with Birr 46.15 only slightly higher than the average daily profit during the rainy seasons (Guu and Deyr) with Birr 44.75. However, the highest profit is made in Hagaa, followed by Guu, Deyr and Jilal.

Table 10: Average daily expenses, sales and profit from milk sales per Trader hh (Birr) according to the seasons

Average daily expenses, sales and profit (Birr) from milk marketing in Dollo Ado and Dollo Bay													
Season	Fresh cow milk			Fresh camel milk			Susac			Fresh goat milk			Total profit
	Out	In	Profit	Out	In	Profit	Out	In	Profit	Out	In	Profit	
Jilal	(8.55)	12.4	3.8	(20.7)	36.9	16.2	(10.8)	22.8	12.0	(5.4)	11.4	6.0	38.0
Guu	(15.9)	26.5	10.6	(34.8)	45.2	10.4	(22.2)	38.9	16.7	(17.8)	28.9	11.1	48.8
Hagaa	(10.6)	15.3	4.7	(29.1)	51.9	22.8	(17.3)	36.6	19.3	(6.8)	14.3	7.5	54.3
Deyr	(12.8)	21.3	8.5	(27.8)	36.1	8.3	(21.0)	36.8	15.8	(13.0)	21.1	8.1	40.7

The figure below shows that the average daily profit made from fresh camel milk is usually higher during the dry seasons (Jilal and Hagaa) as compared to the rainy season (Guu and Deyr). For fresh cow and goat milk the trend is the opposite and higher profits can be obtained during the rainy season.

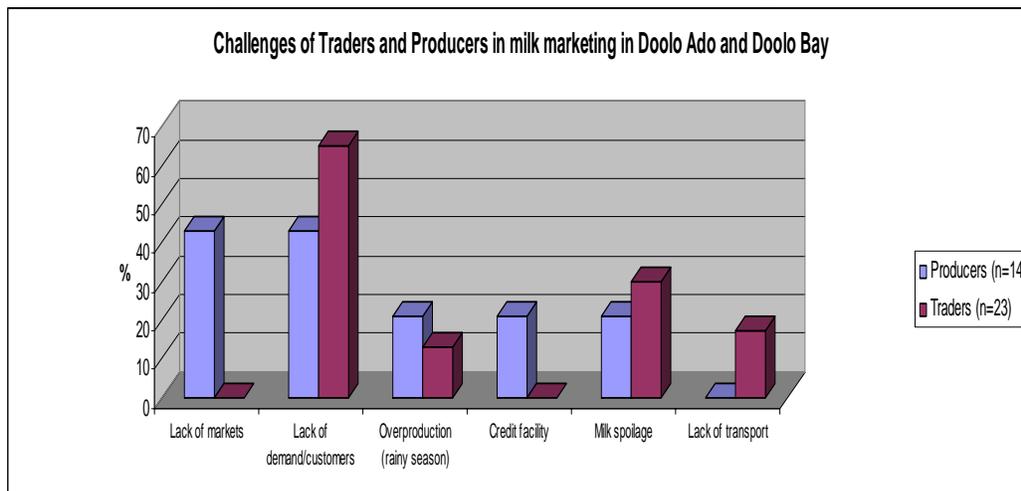
Figure 25: Profit from milk sales per Trader HH per day during various seasons



Challenges in milk marketing:

Challenges in the milk marketing were noted by all actors involved along the market chain. The lack of demand and customers was referred to one of the major challenges for Producers and Traders with 43% and 65%, respectively. A comparative challenge for the Producers was the lack of available markets (43%). Other challenges mentioned are detailed in figure below and included overproduction of milk during the rainy season, demand of credit facilities from the consumer, milk spoilage because it cannot be sold in time as a result of the low purchasing power of consumers.

Figure 26: Challenges of Traders and Producers in milk marketing



3.4.4. Estimated Market turnover

Table 11: Estimation of total number of traders involved in the visited markets

Market name	No of Trader per place	Place in market	Total number of Traders	estimated
Dollo Ado	15		3	45
Suftu	10		3	30
Sabaley	5		2	10
Dhurey	5		1	5
Boryale	5		1	5
Holmoge	3		1	3
Total				103

Based on the observation by the consultants there are an estimate of 103 Traders involved in the six above named milk markets. Considering the average daily milk sale volume (see Table 9 above) per Trader household according to season, an estimate of the daily milk turn over in the markets has been calculated and is reflected in the Table below.

Table 12: Average daily milk sale turn over (l) in six markets according to the seasons

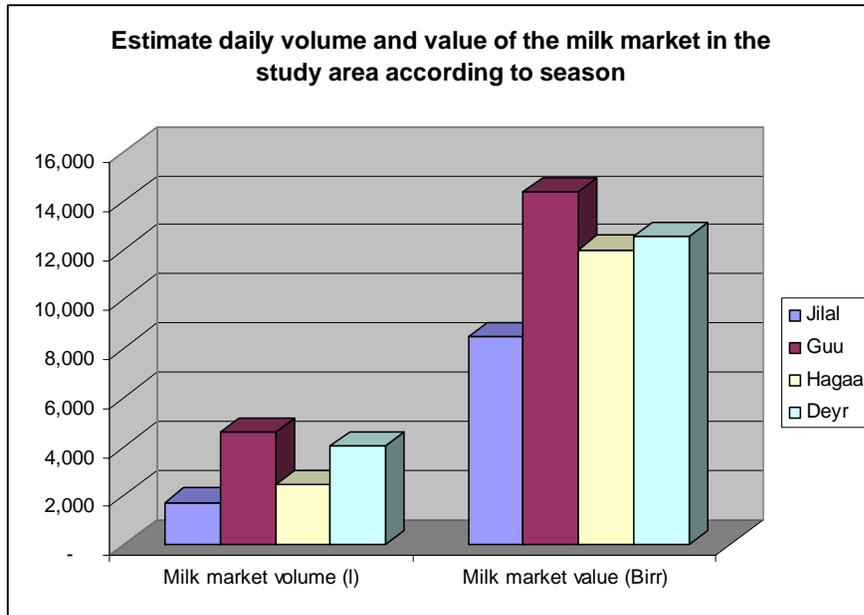
Milk product	Average daily milk sale turn over (l)			
	Jilal	Guu	Hagaa	Deyr
Fresh cow milk	391.4	1091.8	484.1	1,143.3
Fresh camel milk	607.7	1,431.7	854.9	1,143.3
Susac	494.4	1,143.3	793.1	1,081.5
Fresh goat milk	247.2	916.7	309	669.5
Total	1,740.7	4,583.5	2,441.1	4,037.6

Table 13: Average daily milk market value (Birr) in six markets according to the seasons

Milk product	Average daily milk sale value (Birr)			
	Jilal	Guu	Hagaa	Deyr
Fresh cow milk	1,272	2,730	1,573	2,858
Fresh camel milk	3,798	4,653	5,343	3,716
Susac	2,348	4,002	3,767	3,785
Fresh goat milk	1,051	2,979	1,313	2,176
Total	8,469	14,364	11,996	12,535

Tables 12 and 13 above reflect the estimated daily volume of milk sales in the mentioned markets and its market value. The volume of the milk sold in the market varies from 1,740 l in Jilila, 4,583 l in Guu, 2,441 l in Hagaa and 4,037 l in Deyr season. This represents a market value of Birr 8,469, 14,364, 11,996 and 12,535, respectively. The above data is also reflected in the figure below.

Figure 27: Estimated daily volume (l) and value (Birr) of the milk market in the study area according to season



3.5. Summary of challenges in milk and milk products marketing

- Low productivity (dry seasons), over production (rainy seasons)
- Low milk quality
- Poor hygienic standards (personal, equipment, market infrastructure)
- Low level of organization, coordination and cooperation of actors involved in the chain
- Low level of business orientation among producers
- No common vision, goals, objectives and strategy for increased growth and competitiveness of the sub-sector at policy level
- Lack of institutional support
- Inadequate infrastructure (road and transport, market development)
- Search for outside solution rather than inside

4. DISCUSSION AND RECOMMENDATION

Actors along the market chain include pastoralist producers, traders and consumers. However there is no clear line drawn in the roles of the actors, as producers also often act as collectors and sellers, and traders also own livestock and produce milk. Even the consumers who are mainly urbanized people keep livestock in a smaller scale and produce milk. However their milk production is not sufficient for the household needs; hence they do purchase milk from the local market. Other consumers include hotels and restaurants.

In general this study revealed that hygiene standards among the actors along the market chain are very poor starting with personal hygiene to equipment used for milking, storage and transport. Equipment used for milking, storage and transport include mainly traditional gourdes, plastic jerry cans and in few numbers aluminium cans. Traditional gourdes, that are usually smoked after usage, pass hygiene standards⁹, however the milk is often transferred to plastic jerry cans for transport and contribute to milk spoilage as they are difficult to clean.

Photo 7: Contaminated plastic jerry can used for milk transport¹⁰

⁹ Personal communication Mario Younan

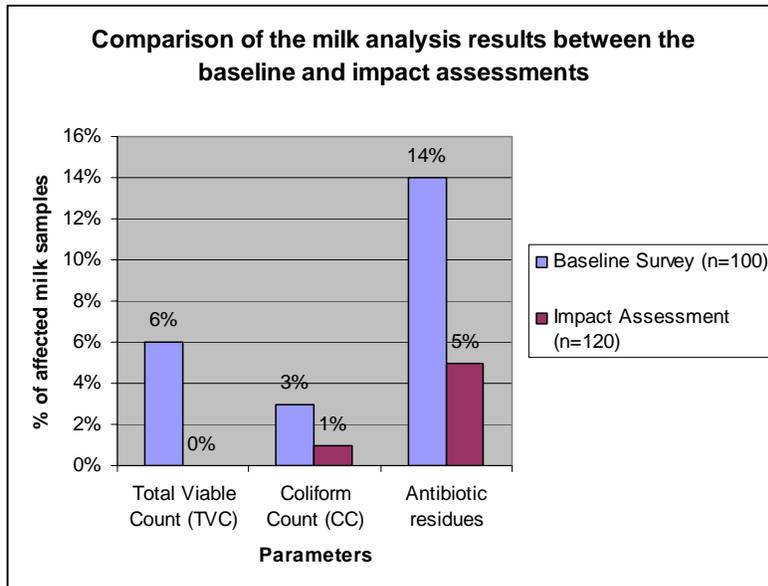
¹⁰ Picture taken in Kenya



Improvement of the equipment e.g. with either aluminium cans would improve the milk quality. A small amount of aluminium and steel cans can already be found in the local markets.

In addition previous intervention implemented by Save the Children UK in partnership with VSF Suisse in the greater Mandera District of Kenya showed the positive impact on the milk quality in the market through training of producer and traders on standard milk hygiene practices, including personal hygiene, hygienic milking and storage practices, milk testing, public health issues with focus on zoonotic diseases transmitted with milk, introduction of aluminium cans and processing. Comparing milk samples collected before and after the intervention a clear improvement of milk quality could be noticed. The Total Viable Count (TVC), Coliform Count (CC) and detection of antibiotic residues significantly reduced from 6% to 0% for TVC, from 3% to 1% for CC and from 14% to 5% on detection of antibiotic residues¹¹.

Figure 28: Comparison of milk analysis results between baseline and impact assessment



It is therefore recommended to promote proper hygiene practices among all actors along the milk market chain. Improved milk quality resulting in the increased sale of fresh milk would significantly contribute to an increase in household income.

¹¹ Owuor, G., et al., (2010), “Enhancing the Camel Milk Market Supply Chain in the Greater Mandera and Isiolo Districts”, VSF Suisse (not yet published)

Milk production varies with the season and is particularly high during the rainy season of Guu and Deyr and hence the volume of milk sold in the market also increases. At producer level two thirds of the milk produced is sold, indicating that milk sale contributes considerably to the household income. At producer level the average daily income during the dry season from milk sales is Birr 23.5, while it almost triples during the rainy season to Birr 65.88. At trader level the average daily income does not vary much between the seasons and is with Birr 46.2 slightly higher during the dry season as compared to Birr 44.75 during the rainy season. The reason for this might be the increase of the milk price by the traders during the dry season by 47% as compared to the rainy season while the producers increase their selling price only by 29%. Hence producers have less income from milk sales during the dry season, while traders can keep it levelled through higher prices in the dry season and more volume during the rainy season.

Milk is a highly perishable commodity and especially under the high temperatures found in Southern Ethiopia further compounded by long distances to the market, which poses a challenge to the market chain especially to the producers. A requirement for effective marketing of milk is improved organization of the producers and traders themselves. Currently, neither milk producers nor traders are organized adequately for milk marketing. Thus a jerry can of milk that a woman milk seller has in a market may contain milk from several households. This pooling of milk could, however, also lead to spoilage of milk, depending on the health of the milked animals since no rigorous tests are done to isolate bad milk. Improving hygiene standard at this level will have a positive impact on the overall milk quality in the market. This could include the joint procurement of cooling facilities such as freezers and running of milk bars.

Photo 8&9: Anolei women group camel milk bar, Isiolo, Kenya with shared cooling facility



In Isiolo town, Kenya as an example women milk traders joint to form a group and are currently sharing cooling facilities. Each woman still deals with her suppliers and costumers on an individual basis but she benefits from the group infrastructure and training workshops that are offered to the group. In El Wak, Mandera Central District in Kenya women milk traders have decided to form a group, pool their milk and sell it at a jointly run milk bar. Three women have been employed for the sale of milk, while the remaining members can attend to other business and still profit from the milk sale.

In addition the formation of producer and trader groups might help to find solutions for the expensive and difficult transport conditions, as they will have a stronger stand as a producing/selling group than as individuals and could possibly negotiate better transport conditions and/or prices.

Milk products found in the market include fresh camel, cow and goat milk, fermented camel milk (Susac) and ghee made out of goat or cow milk. Camel milk is the dominant type sold in the market. It fetches the highest price, both for producer and trader and has the highest volume turn over. The only processed milk product found in the market is ghee from goat or cow milk. This shows that part of excessive milk produced during the rainy season is processed; however alternatives to ghee such as condensed milk or cheese making could be produced to preserve some of the milk in the rainy season. The products however will have to be tried with the consumers first, as they are no traditional products readily available in the market.

Even though husbandry and health aspect of the livestock was not investigated, it is recommended to discuss current husbandry practices with producers both rural and peri-urban and introduce simple techniques that have a positive impact on the milk production such as the use of fodder to improve the diet, breeding practices and health management. In addition the strengthening of the veterinary services will overall contribute positively to livestock production..

Improving infrastructure is a key to the improvement of the milk market chain. As it might be difficult to have an influence on the improvement of roads, simple introduction of strategically placed collection points (e.g. using charcoal coolers or simple constructed facilities with water and cooling and the development of milk sheds and/or milk bars would contribute positively to the improvement of the milk quality in the market. Currently these structures are non existent and traders sell their milk sitting on the ground in the market place.

Awareness creation with line ministries and lobbying for the development of the dairy sector in the pastoralist areas is also recommended in order to create a friendly environment for this sector.

Table 14: Summary of proposed interventions

Proposed intervention	Targeted audience	Impact
Training workshops on improved hygiene practices	Pastoralist producers, Traders, Consumers	Improved milk quality resulting into an increase of sales of fresh milk and therefore an increase in hh income
Introduction of more hygienic milk equipment	Pastoralist Producers, Traders	Reduced spoilage of milk hence increase income per hh through fresh milk sales
Training workshop on milk testing and introduction of equipment	Traders, Pastoralist Producers	Rejection of milk will improve overall quality of sold product and reduce spoilage through pooling
Capacity building on business management and marketing	Traders, Pastoralist Producers	
Introduction of milk processing	Pastoralist Producers, Traders	Preservation of milk during the rainy season when milk production and availability is high
Improving local market infrastructure (collection points, cooling facilities, market stands/sheds, milk bars)	Pastoralist Producers, Traders, Consumers, local authorities	Reduced spoilage of milk increasing income through sale of higher quality milk.
Strengthening linkages between market chain actors (formation of	Pastoralist Producers, Traders, Consumers, Transporters	Improved supply of milk to local markets

Proposed intervention	Targeted audience	Impact
producer and trader groups) Lobbying with relevant line ministries for development of the dairy sector in the arid lands of Ethiopia	National and Regional Government, Dairy Board, local authorities,	Improved policy environment to develop the dairy sector in the pastoralist areas, formalization of the market