Analysis of the dairy value chain in Lemu-Bilbilo District in the Arsi Highlands of Ethiopia

M. Yami, B. Begna, T. Teklewold, E. Lemma, T. Etana, G. Legese and A.J. Duncan

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Executive summary

This study was initiated to assess the dairy value chain and identify major constraints and opportunities that could be used as points of entry for research, policy and development interventions to revitalize the dairy sector of the study area. For this study, Lemu-Bilbilo district were selected based on dairy potentiality as well as the district's inclusion on Agricultural Growth Program (AGP). This study made use of both qualitative and quantitative data collected from primary and secondary sources. Different Participatory Rural Appraisal (PRA) techniques such as review of literature, Focus Group Discussions (FGD), Key Informant Interviews (KII) and Personal observation were utilized to collect primary data. The secondary data was collected using a wall-to-wall fieldwork, i.e., collection of secondary data in offices, libraries and websites.

The dairy value chain in Lemu-Bilbilo district involves six distinct value-adding activities from the inception of milk production to the final consumer. These activities include input supply, production, gathering (bulking), processing, transportation and retail trading. In the study area, crop residues were mainly used as source of livestock feeds together with natural pastures. Due to its relative palatability, most farmers prefer barley straw to feed their dairy animals. During the rainy seasons, farmers rely mainly on natural pasture. Farmers provide supplementary concentrate feed only to oxen and lactating cows because of the high price, which made them costly to feed to other animals. Most farmers did not have access to training on ration formulation and improved feeding techniques. They feed their animals based on their own experience and by copying other farmers.

Currently, there are two categories of AI service providers. These are government and community service providers. There was only one government technician who provides the AI services in the study area. This AI technician was based at the district health clinic at Bekoji. Those who live in close proximity to the service center get AI service from this source. The service charge was 6 ETB per conception. A farmer can repeat up to 3 times if conception fails to happen. However, there were cases where the conception fails to happen after 6 times repeated inseminations. The most prevalent animal diseases mentioned by key informants and farmers were mastitis, Foot and Mouth Disease (FMD), black leg and parasites. Even if farmers have access to formal credit sources like Oromia Credit and Saving Institution (OCSI), they tend not to use this service due to short loan repayment periods. The other important gap observed with regard to micro-finance credits was lack of awareness of farmers about its terms and conditions that led to its avoidance by the community. Farmers abstain from using this credit mainly due to lack of understanding of its terms.

Most smallholder farmers on average held three local breeds and two improved breed cows. In some cases, an exceptional progressive farmer owned as many as 37 heads of improved breeds, mainly Holstein-Friesian and Jersey breeds. The feeding regime of the study area was dominated by communal grazing. However, very few farmers practice paddocking, indoor feeding (zero grazing), or cut and carry feeding systems. The average milk yield per dairy cow for local breeds was 2 liters per day and for improved breeds it was 10 liters per day (morning and evening milk). According to some

key informants, there were farmers who get up to 17 liters per day per cross breed dairy cow. This suggests that there is room for improvement of milk yield per improved dairy cow from the current average of 10 liter/day/cow to 17 liter, which is equivalent to about 70% increases. The immediate problem of low milk yield was attributed to poor feeding, low genetic makeup of the existing breeds and general animal husbandry.

The dominant market channels for raw milk produced in the district were:

- Channel 1 – Milk products supplied to individual consumers and hotels/cafeterias in Bekoji and Assasa town
- Channel 2 – Milk supplied to hotels and cafeterias in Bekoji town
- Channel 3 – Milk consumed by individual consumers in Bekoji town
- Channel 4 – Milk supplied to individual consumers in Adama area
- Channel 5 – Milk supplied to hotels and restaurants in Adama area

The main actors in dairy and its product markets include a network of collectors, private processors, cooperatives, hotels/cafeterias, individual consumers and farmers. Smallholder dairy farmers were the major players in the dairy value chain in the district. The proportion of milk marketed (milk off-take rate) by farmers was low. From FGD, the proportion of milk marketed by dairy producers was only 15%. The remaining 85% of the produced milk remains within the households either for household consumption or for processing (butter and cheese). The main reason given for not selling milk was the low level of milk production which was not sufficiently larger than home consumption.

Relative to all other fresh milk channels, a higher proportion of the final price of fresh milk reaches producers when milk was sold along the channel to individual consumers in Bekoji town. Hence, this channel was relatively more efficient as compared to other fresh milk channels.

Profitability analysis for dairy production indicates that on average a dairy producer obtains a gross margin of 50 ETB per improved cow per day, which shows that dairy production was a profitable venture for smallholder dairy producers in the study area.

Some of the challenges for dairy production at input and production stages include low quality and poor timeliness of AI and animal health service provision, where farmers complain about the inefficiency of the AI services, which results in increased rate of repetition per conception averaging about 5 to 6 times. Regarding credit services, the majority of farmers do not know how to get credit services or the amount of credit and loan repayment periods for dairy farming activities. Insufficient availability of government and private ranches and multiplication centers for the supply of improved dairy animals, unavailability of demonstration sites on improved forage production in Farmers Training Centers (FTC), feed shortage, very high prices of industrial-by products, low milk yield, lack of awareness and knowledge regarding improved feed formulation were the prominent constraints identified at the input supply and production stages of dairy value chain of the study area.

Technical constraints at processing and marketing stages includes inefficient processing machines of the cooperatives, absence of quality based payments, weak vertical linkage between cooperatives with potential buyers, non-market oriented milk production, inadequate waste disposal for cooperatives and a capacity gap among extension agents and agricultural experts in provision of training for feed formulation techniques.

To create knowledge based commercial dairy development in the area, there is an urgent need to encourage the introduction and development of herbaceous forage legumes and fodder trees species and organize recurrent training for dairy producers on improved forages, feed conservation, formulation and feed preservation techniques. These interventions needs to be coupled with scaling up/out of the achievements of progressive farmers in terms of high milk yields through the adoption of improved feeds and feeding techniques.

The availability and effectiveness of AI services also need to be improved. This can be achieved through in-service training of local service providers, training of farmers on AI services (especially heat detections and reporting) and on community bull selection. Furthermore, improvement in the current AI system's effectiveness and efficiency can be made through the introduction of innovative knowledge and technology options including the use of sexed semen or sex fixer to increase the probability of female calves born in the dairy system and expanding different organizational and institutional models on AI and animal health farmers training model. Moreover, micro-finance institutions need to create a platform to organize training in credit service terms and conditions for dairy producers. Strengthening the capacity of dairy cooperatives in terms of their processing capacities and linking them to better markets is suggested to enhance the development of the dairy sector in the study area.

Background

Livestock plays an important role in the Ethiopian agriculture. The 10 years policy and investment road map (2010/11 to 2019/20) shows that Ethiopia's agriculture is dominated by cereals (32% of AGDP) and livestock (32%) while export crops and other agriculture account for 17% and 18%, respectively (MoA, 2010).

Ethiopia is endowed with large and diverse livestock resources. The country is using its rich endowment to little advantage. For many years, livestock production in Ethiopia and indeed agriculture more generally was seen as a poor investment for development. Nevertheless, in few recent years, livestock issues are beginning to be put back on Ethiopia's development agenda. As reflected in the Growth and Transformation Plan (GTP), the Ethiopian government has huge interest to develop the livestock sector. The livestock sector is expected to be promoted through expansion of fattening and milk production via breed improvement as well as pasture development and animal health (MOFED, 2010).

The estimate of cattle for the rural sedentary areas at country level is about 53.4 million in 2010/11 (CSA, 2011 c). About 64% or 34 million of these are aged 3 years or above and play a number of economic roles in the livelihood of smallholder farmers. Livestock is primarily kept on smallholdings where it provides draught power for crop production, manure for soil fertility and fuel, and serves as a source of family diet and source of cash income (from sale of livestock and livestock products) particularly when markets for crops are not favorable.

Ethiopia holds large potential for dairy development due to its large livestock population and the favorable climate for improved, high-yielding animal breeds (Mohammed et al, 2004). Milk represents an important livestock product and makes a significant contribution to the nutrition as well as income of the livestock owner.

A key intervention for dairy value chains in Ethiopia is the use of genetically improved cows (Tegegne and Hoekstra, 2011). According to the Ministry of Agriculture, there are about 30,000 crossbred dairy cows in Ethiopia. In contrast, Kenya has around 3 million crossbred dairy cows.

In Ethiopia, milk production has improved over the past three years. Central Statistical Agency (CSA) estimates indicates that the country produced 2,765, 2,940 and 4,058, million liters of cow milk, respectively in 2008/09, 2009/10 and 2010/11 (CSA, 2011). In terms of per capita, these production figures can be translated in to 48, 36 and 34 liters per person for the respective three years[1], this figures show that per capita milk production has grown by about 41% over the past three years.

CSA data also indicates a high progress in milk yield. In 2008/09, it was reported that a milking cow produces on average about 1.3 liters per day over its estimated six-month lactation length. In 2010/11, this yield rose to 1.9 liter, indicating a growth of 46%. In other words, milk production has increased from 234 liters per cow per annum in 2008/09 to 342 liters per cow per annum in 2010/11.

Despite this high growth, milk production per cow per year is low in Ethiopia as compared to the neighboring countries (EEA report, 2012). For instance, Ngigi (2004) reported that, the average milk production per cow per annum was 507 in Kenya in 1998 while it was about 350 liters in Uganda and 209 in Ethiopia in the same year. This difference is due to poor livestock management (including

[1] Population number used for estimating per capita production for 2010/11, 2009/10 and 2008/09 are 84.8 million, 82.8 million and 80.7 million, respectively.

poor veterinary services and lack of feed) and low productivity. Therefore, interventions targeting improvement of the traditional dairy sector are crucial for the development of the livestock sub-sector. This in turn needs identification of root causes for the slow development of the dairy sector and specification of leverage points that could be used as entry points to bring about the desired developments in the sector. This study is initiated with the purpose to assess the dairy value chain and identify major constraints and opportunities that could be used as points of entry for research, policy and development interventions to revitalize the dairy sector of the study area.

Objectives of the study

The main objective of the study was to characterize dairy value chain in Lemu-Bilbilo district and identify intervention areas for the development of the sector in the area. Specific objectives are:

- To conduct dairy value chain analysis focusing mainly on key functions of the value chain, actors involved, the marketing channels, costs and margins of the different actors along the main channels and major marketing routes of the dairy products.

- Identify and prioritize opportunities and constraints along the dairy value chain and associated viable value chain upgrading strategies (recommendations to address the identified constraints and opportunities specific to the study area).

Organization of the report

The paper is organized in nine sections. Section two provides the methodology employed for this study. The findings of the study are presented and discussed in section four to eight. Section 4 and 5 elucidates the core functions of the dairy value chain, mainly discussing the dairy marketing channels, the flow of dairy and its products from their production areas to their final end-users. Section 6 discusses the profitability of involvement in milk production with the analysis of the efficiency of the fresh milk marketing channels. Whereas, section 7 and 8 demonstrated, the prospects and challenges of the dairy value chain systems of the study area. Finally, section nine concludes and recommends organizational, institutional and policy options for enhancing the smallholder dairy value chain.

Methodology

The study area

The study was conducted in Lemu-Bilibilo district, located in Arsi zone, Oromia Regional State of Ethiopia. This area is part of the former Bekoji district and located about 235 km southeast of Addis Ababa. The area is characterized as bimodal rainfall pattern with mean average rainfall of 940 mm.

The district is characterized by crop-livestock mixed farming system where livestock in general and dairy production in particular contribute significantly to farmer livelihoods. Local cattle are the predominant breeds reared in the area. Market oriented dairy production based on crossbred dairy cows is also practiced. This area is part of the highland area delineated as a dairy shed district due to its comparative potential for improved dairy production.

In the past, the study area benefited from a sustained developmental effort by the Chilalo Agricultural Development Unit (CADU) and Arsi Rural Development Unit (ARDU) in the late 1970s financed by Ethio-Swedish integrated rural development project. As livestock and cattle in particular, play an important role in the smallholder economy in Arsi, efforts to improve livestock production formed a natural and important part of the project. Activities included crossing local and exotic cattle and sheep breeds; conducting feeding and management experiments; investigating new fodder crops to level out seasonal fluctuations in pasture production; carrying out vaccination campaigns; and implementing milk collection and marketing programs. Research was also performed at the Asella livestock farm near the project center, and the production of crossbred heifers for sale to the farmers at the Gobe Farm in the southwestern part of the district was conducted.

The major crops grown in the area are malt and food barley, faba bean, field pea and wheat. Most land is allocated to food crop production and hence the major share of livestock feed is obtained from crop residues. The administrative center of the district is Bekoji located on the asphalt road to Goba, 56 kilometers south of Asella, and 50 kilometers east of Lake Langano.

Bokoji Negesso Peasant Association

Bokoji Negeso Peasant Association (PA) is located in Lemu-Bilbilo district at an altitude of 2876 masl with latitude and longitude of 07°32.529'N and 039°15.769'E. It is a typical Ethiopian highland mixed farming system where crop cultivations and livestock production are undertaken side-by-side. Bada (highland) and Bada-dare (mid- altitude) are the major agro-ecologies of Bokoji-Negesso PA, which accounts for 80% and 20% respectively. Cereals (barley and wheat), pulses (faba bean and field pea), oil crops (rapeseed and linseed) and vegetables (potato, garlic, carrot and beet root) are the dominant crops in the area. Similarly, cattle, draught animals, small ruminants and poultry are the dominant livestock species (table 1).

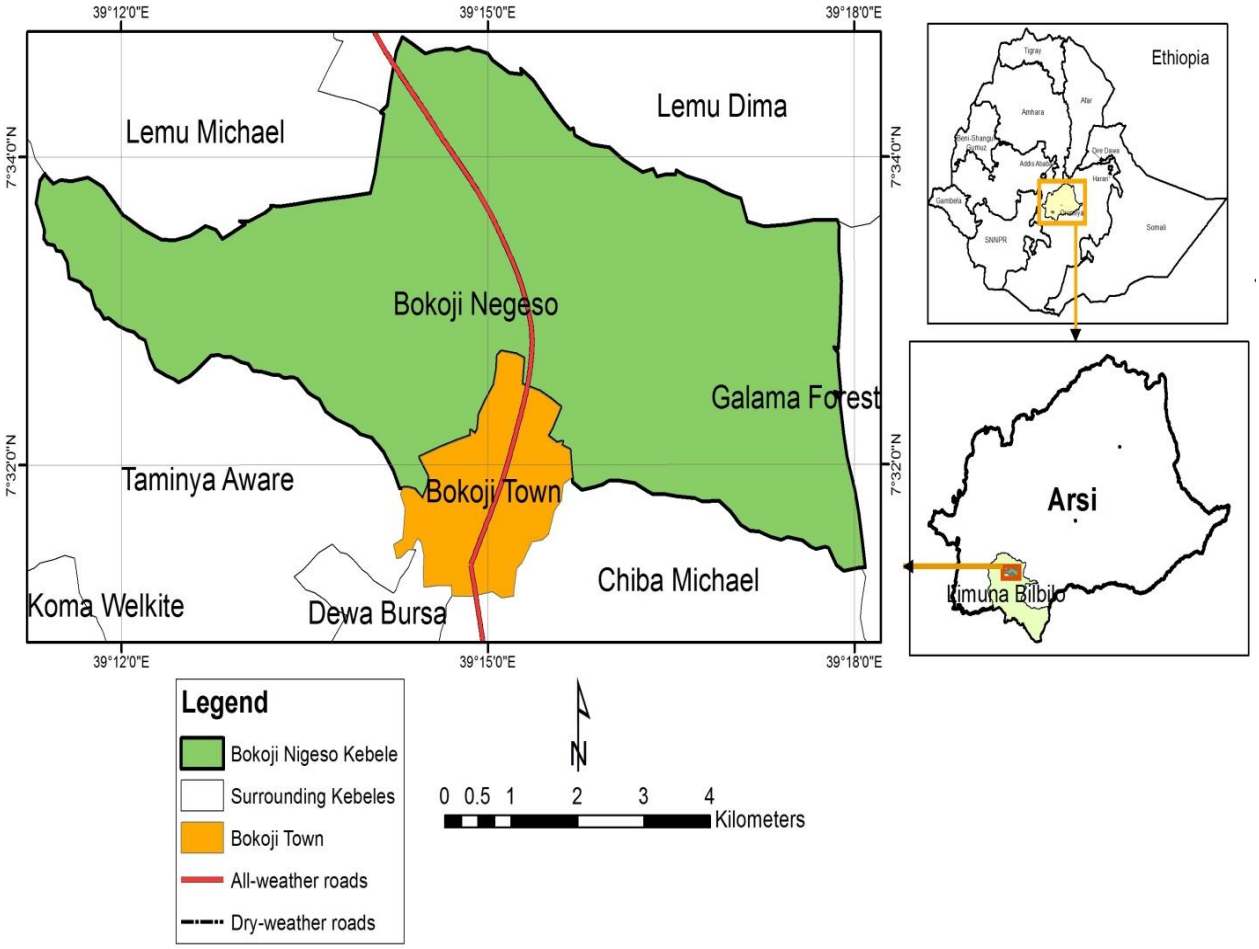

Figure 1: Map of the study area
Source: GIS unit of Ethiopian Institute of Agricultural Research (EIAR)

Table 1: Type of livestock available in Bokoji Negesso PA

	2010		2011	
Livestock	**Local**	**Improved**	**Local**	**Improved**
Cattle				
• Cows	3372	445	3450	480
• Oxen	2529	350	2590	390
• Bulls	4685	315	1730	385
• Heifers	4215	288	4110	325
• Calves	3215	158	3355	135
Equines				
• Horses	2681	-	1730	-
• Mules	11	-	15	-
• Donkeys	915	-	855	-
Shoats				
• Sheep	8845	-	3900	-
• Goats	1450	-	1495	-
Poultry	2490	176	2600	120
Bee hives	110	20	135	20

Source: District agricultural office

There are 802 households in this PA, out of which 703 of them were male headed and the remaining 99 were female headed. The total land size of the PA is 2678 ha, out of which 92% is allocated for crop production (Figure, 1).

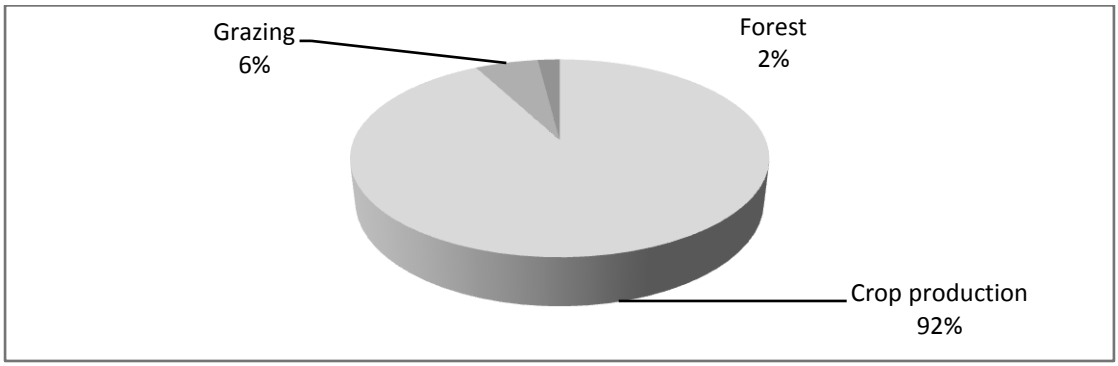

Figure 2: Land use pattern in Bekoji Negesso PA
Source: District agricultural office

Data collection and data sources

This study used qualitative and quantitative data collected from primary and secondary sources. Different Participatory Rural Appraisal (PRA) techniques such as Focus Group Discussions (FGD), Key Informant Interviews (KII) and Personal observation were utilized to collect primary data. Secondary data was collected using a wall-to-wall fieldwork, i.e., collection of secondary data in offices, libraries and websites and review of literature (http://quickfeeds.wikispaces.com).

***Secondary Data Collection and Desk Reviews**:* Before primary data collection, reviews were made on different published and unpublished documents/literatures that are relevant for the study. Such reviews were made to know previous works in dairy value chain studies in Ethiopia and elsewhere as well as to know the existing information gap. Moreover, secondary data were collected from reports of CSA, different organizations including government institutions such as agricultural offices (regional, zonal and district), primary cooperatives and unions.

***Focus Group Discussions (FGD)*:** These discussions with dairy farmers are the cost effective means of sharing experiences and ideas among different livelihood groups of smallholder farmers operating within the same dairy value chain systems. They can serve as a reality check, expose linkage possibilities, and foster ownership of the eventual interventions that are proposed (Frank and Lusby, 2007). Focused group discussions were held with two farmers group for two days on 26 and 27th of July 2012. Each FGD has a minimum of 15 to a maximum of 21 farmers. Checklists were used in order to guide the FGD with farmers.

***Key Informant Interviews**:* Information gathered from FGD with farmers was cross-checked/validated and complemented with the existing secondary sources documentation and through key informants' interviews. A wide range of stakeholders including cooperative managers, input suppliers, processors, private traders and collectors, staff from the different offices (office of district livestock development, cooperative promotion office, partner NGOs) and union managers were used as key informants.

Observation: To grasp the business practices and transactions in dairy value chain of the study area, the major milk products (butter and cheese) market at Bekoji town was visited on the major market day (Saturday). During the field observations, discussions were made with butter and cheese

collectors and traders, private veterinary drug venders, grain milling factories that supply wheat brans and oil extractors that supply linseed and nouge cake to the surrounding dairy producers.

Figure 3(a); Butter and cheese market in Bekoji

Figure 3(b) Discussion with private vet drug venders

Literature review

The global production, trade and consumption of livestock products in developing countries have increased rapidly in the last two decades and are expected to continue to rise (Delgado et al. 1999; Delgado 2003; Hall et al. 2004). This trend has been termed the 'livestock revolution' (Delgado et al. 1999).

The livestock revolution has also increased the risks and challenges facing smallholders. At the same time, there have been rising consumer demands for food safety and quality, enhanced environmental protection and other quality attributes (Hall *et al*., 2004). Consumers are demanding food products with certain characteristics, such as products perceived to be safe, healthy, and convenient or produced in ways that are beneficial to the environment and take animal welfare and equitable labor concerns into consideration.

Furthermore, producers are also required to meet an increasing need for supply assurance in terms of required quantity, quality, space, and time need to have the flexibility and ability to respond to the changing consumers' needs and demographics, increasing product innovation and differentiation, and increasing competitive pressure to lower systemic costs. Thus, in this global food market, the challenge facing the producers and processors is how to respond to these dynamic changes in consumer demands. In general, traditional ways of production and marketing are challenged (Asfaw, 2009).

The livestock producers must adapt if they want to capitalize on the opportunities that are available by meeting these consumer demands or else the producers will be out of the game in the global food markets. There is a need to bridge the information gap between the producers and consumers in order to build confidence in the markets. Producers are required to learn new management expertise, new skills in contract evaluation and negotiation, understand specific quality traits required by buyer, contractual obligations of both parties and risks involved. This, in turn, is requiring tighter vertical coordination and concentration of production and marketing activities among the actors both vertically and horizontally within the chain.

According to Asfaw (2009), small dairy farmers are also facing threats of losing traditional domestic market outlets. This is because an increasing number of urban consumers might depend on supermarkets rather than traditional markets as their main food sources thus reducing market outlets for small farmers. There is need to design policies and strategies on how to incorporate small-scale farmers in vertically coordinated commercial livestock production and marketing systems. There is also a need to encourage the development of local market access and improve opportunities for small-scale farmers. Farmers need access to resources and training to be able to actively participate in the rapidly transforming domestic and global livestock and livestock product markets. All these issues point the need for understanding the value-chain approach (VCA).

According to DFID (2008), VCA consist of four major elements. The first component is value chain mapping, which systematically links different actors involved in the ladder of value chains: production, processing, marketing, distribution and consumption of a given product. The second element is analysis of distribution of benefits among actors of VCA, which mainly deals with identification of major beneficiaries of the VCA by examining profit margins at each level. The third is inspecting the importance of upgrading in the VCA that can involve improvements in quality and product design that enable producers to gain higher-value or through diversification in the product lines served. Lastly, identifying governance within the VCA where governance refers to the structure of relationships and coordination mechanisms that exist among actors in the VCA. Governance is important from a policy perspective by identifying the institutional arrangements that may need to

be targeted to improve capabilities in the VCA, remedy distributional distortions, and increase value added in the sector under consideration.

Figure 4: Agricultural Value chain Functions

• Traders • Cooperatives • Farmers • Credit & saving institutions • Development organizations (NGOs) • Livestock health and extension agency • Kulumsa Research Centre	• Farmers (both members and non-members of dairy coops)	• Cooperatives • Small holder farmers • Private processor • (traders)	• Cooperatives • Traders • Individual farmers	Cooperatives Traders	• Hotels • Cafeteria • Individual consumers
• Inputs like concentrate feeds, seeds of improved forage crops, AI services, provision of credit, • Training on handling, processing & feeds, • Veterinary services	• Rearing livestock • Feeding • Breeding • Milking and milk handling • Animal health care	• Buying • Bulking • Transporting • Selling	• Quality testing • Bulking • Processing	• Buying • Selling	Consumption (whole milk, skimmed milk, sour milk/Irgo, ayib/cheese and butter)

Figure 5: The core functions, actors and activities in the dairy value chain Source: Adapted from Getachew and Mohammed, (2012)

Results of dairy value chain analysis

The dairy value chain in Lemu-Bilbilo district involves six distinct value-adding activities from the inception of milk production to final consumption. These activities include input supply, production, gathering (bulking), processing, transportation and retail trading.

Input supply and services

The major inputs required for dairy production include purchased feeds like concentrate feeds (industrial by-products) and green fodder, Artificial Insemination (AI), veterinary and credit services/finance, land and labour.

Feed supply

The study area is characterized as mixed crop-livestock farming system, in which both livestock rearing and crop production are practiced simultaneously as a means of the farmers' livelihoods. In mixed farming system, crop residues are mainly used as source of livestock feeds together with natural pastures. The dominant crop residues available and used as feeding options for dairy production includes straws of wheat, barley, linseed, faba bean and field pea. Due to its relative palatability of the straw, most of the farmers prefer barley straw to feed their dairy animals. The main source of crop residues is from own harvest, but in some cases, farmers also buy from the market or other farmers. Preferences for crop residues differ for different crops. Farmers usually prefer barley, linseed and wheat straw in their order of importance to feed their dairy cows and oxen. Meanwhile, straw of faba bean is usually provided to horses and donkeys.

Purchased feeds

During the rainy seasons, farmers rely mainly on natural pasture to feed their dairy animals. As a result, demand for concentrate feeds and their associated prices decrease during such seasons. However, farmers start seeking concentrate feeds as their natural pasture dwindles. They get these concentrates from flour and oil mills in Bekoji town. Since, the factories are close to the study area, farmers directly purchase wheat bran and oil seed cakes from the factory outlets. In the year 2011, the cooperative union succeeded in distributing 50 barrel of molasses to smallholder farmers of the study area with the average selling price of 2 ETB[2]/kg.

According to the response of farmers, the price of the concentrate feeds increases from year to year. For instance, the price of oil seed cakes increased from 600ETB /100kg in 2010 to 900 ETB/100 kg in 2012 and for wheat bran it increased from 140 ETB /100kg in 2010 to 360 ETB /100 kg in 2012. This is becoming unaffordable for farmers and it has a negative bearing on the milk supplied by smallholder farmers. Farmers tend to reduce the amount of concentrate feeding to livestock as its price increases. Moreover, most farmers provide supplementary concentrate feed only to oxen and lactating cows because of the high price, which made them costly to feed to other animals.

Most farmers did not have access to training on ration formulation and improved feeding techniques. They feed their animals based on their own experience and by copying what other farmers in the area are doing. However, few progressive farmers were trained by ACDI/VOCA in ration formulation and improved feeding practices. They are serving as role models for other farmers in improving their feeding practices.

[2] Ethiopian Birr (ETB), during the survey time 1$=17.25 ETB

Artificial insemination

Artificial Insemination (AI) and animal health services are important inputs to the dairy sub-sector. Currently, there are two categories of AI service providers. These are government and community service providers. There is only one government technician who provides the AI services in the study area. This AI technician is based at the district health clinic at Bekoji. Those who live in close proximity to the service center get AI service from this source. The service charge is 6 ETB per conception. A farmer can repeat up to 3 times if conception fails to happen. However, there are cases where the conception fails to happen after 6 times repeated insemination.

To expand AI services in the remote areas of the study areas, Oriomia Livestock Agency, with the financial support of FAO has trained nine secondary school graduate farmers as Community Artificial Insemination Technicians (CAIT) from major dairy production areas of Lemu-Bilbilo district. Four out of the nine CAITs were provided with the necessary AI equipment including Liquid Nitrogen container, glove, semen container and inseminating gun. These CAI technicians are also regularly provided with semen and liquid nitrogen. The CAIT service providers will charge 12 ETB per conception of one animal. Since they do not have permanent salary from the government, they will take 10 ETB for themselves as service charge and pass over the remaining to the government.

The overwhelming number of farmers uses AI service for cross breeds but in some cases in consultation with the district experts, they also bring local breed cows with good body size for AI services. In the remote areas of the study areas, farmers travel more than 4 kilometers to get the AI services. This perpetuates use of bull services of cross breeds (Holstein-Friesian) for which on average farmers pay 18 ETB.

Animal health

The most prevalent animal diseases mentioned by key informants and farmers were mastitis, Foot and Mouth Disease (FMD), black leg and parasites. Currently, there are seven animal health posts serving the 27 PAs available in the district. There are also three private drug stores and one private clinic in Bekoji town. The Regional Government of Oromia has allocated 40,000 ETB as a revolving fund for veterinary drugs for the district. However, there is still shortage of drugs to treat important diseases such as mastitis. Due to unavailability and high price of intra mammary infusion, veterinarians indicated that it is difficult to treat mastitis in the area. For instance, if a dairy cow is infected with mastitis, all the teats should be treated with intra-mammary infusions and this has to be done three times in order to cure the teats. One infusion costs 20 ETB and the treatment costs 240 ETB per animal. This makes the treatment un-affordable for most of the farmers though the drug is available. Thus, treatment for mastitis is always partial which leaves the animal with the problem and finally lead to the loss of all its teats and eventual culling.

Financial services

Surprisingly, dairy cooperatives and unions in the study area were not involved in the provision of any financial services in a way of credit in kind (inputs) to individual farmers. Dairy producers are appreciative for the efforts of FAO in the provision of in kind credit through distribution of heifers to selected milk producers. However, FAO was unable to continue delivering these services due to unavailability of heifers supplying institutions and had to revise alternative source of AI delivery system through use of Community Artificial Insemination (CAI) model. Even if farmers have access to formal credit sources like Oromia Credit and Saving Institution (OCSI), they tend not to use this service due to short loan repayment periods. Farmers explain that OCSI credit is too small to procure dairy animals and it should be repaid within one year starting from the date the loan is taken. However, dairy production needs at least three to five years to generate return on investment and cannot be done using such very short-term credits.

Milk production

The dairy industry in the study area mainly comprises smallholder farmers. However, according to the FGD results, the average herd size per household for local breeds is decreasing while that of improved breeds is increasing. This is presumably affected by reducing grazing lands and the increase of cultivated lands arising from high population pressure. There is also a lack of a push factor to relieve pressure on land due to the unavailability of jobs in the urban centers for the young educated farmers. As a result, there is a change in the commercial orientation of farmers towards milk production. In general, smallholder farmers engaged in dairy farming in the study area are characterized as follows:

- Most smallholder farmers on average held three local breeds and two improved breed cows. In some cases, exceptional progressive farmer owned as high as 37 heads of improved breeds, mainly Holstein-Friesian and Jersey breeds.
- The number of non-lactating cows for local breeds per household was relatively high as compared to the improved ones, which is four and one, respectively. Likewise, the number of lactating cows per household was two for local breeds and one for improved ones. The high number of local dairy breeds is partly attributed to the subsistence nature of the farming systems especially in crop dominated farming systems of Tulu Negesso and mixed farming systems of Merti-Leman villages. Farmers of this area do not perceive dairy production as a business mainly because they lack awareness on the potential viability of dairy farming, the high price of concentrate feeds and the tradition of using local bulls (partly due to the inefficiency and inaccessibility of AI services).
- The feeding regime of the study area is dominated by communal grazing. Very few farmers practice paddocking, indoor feeding (zero grazing) and cut and carry feeding systems for improved breeds. Most farmers use free grazingm especially in the village of Chefa-Woligala, where there is a big communal grazing land locally named *Lekuche* grazing lands.

Figure 6: 'Lekuche' communal grazing fields

- Average daily milk yield per local breed dairy cow is 2 liters; for improved breeds it is 10 liters (morning and evening milk). According to some key informants, some farmers get up to 17 liters per day per cross breed dairy cow. This suggests a potential to raise yield per improved dairy cow from the current average of 10 liter/day/cow to 17 liter, which is equivalent to about 70% increases. The immediate problem of low milk yield is attributed to poor feeding, low genetic makeup of existing breeds and general animal husbandry.

Milk bulking, processing and marketing

Bulking and processing are fundamental processes in the milk business. In the study areas, two types of actors undertake milk business in terms of collection, bulking, transportation, processing and marketing:

- The Dembela private milk processor undertakes collection, transportation, bulking, processing and marketing.
- Small dairy farmers' cooperatives focus only on collection, processing and marketing (wholesale and retail).

The **Dembela milk processing plant** is one of the most important players in the milk value chain in the study area. Although, it is more active in Lemu-Bilbilo district, it also has other milk collection centers in other areas of Arsi zone including Sagure and Assela.

According to the information obtained from FGD and key informants, the processing plant commands about 15% of the fresh milk market of the study area. The firm collects about 600 liters of fresh milk per day from the individual milk producers of Bekoji (250 liters), Sagure (200 liters) and Lemu (150 liters) areas. The firm collects the raw milk early in the morning from these areas and transports it using public transportation to the processing unit located in Assela town. This processing unit has a capacity to process up to 1000 liters of milk/day.

The Dembela private processor provides some incentives to its suppliers in order to attract more milk producers. It collects milk from regular and non-regular milk suppliers without any price discrimination. Unlike the cooperatives, it also assembles any quantity of milk supplied from farmers with a constant price throughout the year. Moreover, as long as the milk supplied by the farmer passes the quality test, the firm allows milk producers to mix morning and evening milk, which is not accepted by dairy cooperatives. According to the management of the processor, the major constraints to dairy marketing in the study areas are the seasonality of milk supplies, transportation and milk quality problems.

There are two small primary dairy farmers' cooperatives involved in milk collection, processing and marketing: Bekoji Zuria and Lemu Aria dairy cooperatives.

According to information obtained from its management, the **Bekoji Zurea Dairy Cooperative** collects and processes about 7% of the total fresh milk produced in the district. It processes and sells milk products like butter and cheese. During the dry season, it also sells skimmed milk to traders in the adjoining Assasa town. In the dry season, the cooperative buys a liter of fresh milk at 6.60 ETB and sell the skimmed milk for up to 3.50 ETB/lt. As a result of increases in supply of fresh milk, the demand and price for skimmed milk decreases in the rainy seasons. During this time, the cooperative returns skimmed milk to member suppliers at about 0.25 ETB/lt and members process it into traditional cheese (*ayib*) and use the milk for household consumption or feed it to animals.

While the cooperative has 400 registered members, only some 40 actively supply milk throughout the year. The rest sell milk to a private processor in search of constant price (6.60ETB/liter) as compared to the seasonally fluctuating prices of cooperatives.

During the dry season, the cooperative collects milk from members and non–members at its collection and processing center located in Bekoji town. During the wet seasons, only it collects from members. Their volume of operation is as high as 500 liters per day in rainy seasons; this decreases to 300 liters per day in dry seasons.

The major customers of the butter produced by the Bekoji Zuria cooperative are passengers passing through Bekoji town and traders of Assasa town. The demand for butter and skimmed milk increases as we go towards the dry season. This is mainly because of two important reasons. The first is because of better purchasing power of consumers in and surrounding Assasa mainly after harvesting seasons. The second reason is feed shortage during dry season that causes shortages of milk. During this time, whatever is produced is taken up either by individual consumers or traders.

The **Lemu Ariya Dairy cooperative** is located in Lemu village under Bekoji-Negesso PA within the radius of 5-10 Kms from the Bekoji zurea cooperative. Currently, the cooperative has 85 active members that supply only morning milk to its collection center. Although the area has a big potential where almost all residents have at least one dairy cow, only 20% of the total morning milk reaches the cooperative. The cooperative collects milk from both members and non-members. However, there is a price difference of up to 0.50 ETB/liter between members and non-members.

According to the management of this cooperative, the supply of milk increases during September, October, November and May whereas the supply significantly reduces during March. Unlike the Bekoji Zuria, this dairy cooperative produces local cheese throughout the year. It has permanent customers that collect cheese in bulk. Since it is located in the rural village, it does not have a good outlet for its skimmed milk. Thus, the whole of its skimmed milk is converted to *ayib*; butter is sold mainly to travelers that pass through its collection center.

The cooperative detects the quality of milk using a lactometer, visual observation and a lacto scan (obtained via the financial support of Land O'lakes). However, due to the high rate of rejections of the lacto scan taste, they mainly use lactometer and acido meter tests. On the other hand, payment for raw milk is not quality based. The current daily intake of Lemu Ariya cooperative averages 300 liters of milk during the dry season and 700 liters per day during the wet seasons, implying high dependence of the milk delivery on the availability of pasture which needs to improve in relation to feeds production and feeding systems.

Marketing

The analysis of dairy marketing is expected to provide a systematic knowledge of the flow of dairy and its products (butter and cheese) from production areas in Lemu-Bilbilo district to final consumers (end users) in different parts of the country. Marketing also describes the actors who play roles and how they function in the market.

Raw milk and milk products marketing routes

As explained in Figure 7, there are several marketing routes for raw and skimmed milk produced in the study area. From the FGD, the proportion of milk marketed by dairy producers was only 15%. The rest 85% of the produced milk will remain within the households either for household consumptions or for processing purposes (butter and cheese). The dominant market rout for raw milk is the local market of Bekoji (Bekoji zurea cooperative, hotels, cafeteria and individual urban and pre-urban consumers of the town). The evening milk will be used for home processing into butter and cheese and for household consumption. The remaining milk will be supplied to private traders (Dembela dairy processing) where they have major collection centers in Bekoji, Sagure and Lemu areas and transport the collected milk to Assela.

The marketing route for skimmed milk is quite different from what we observed for raw milk. The main route for skimmed milk was the Assasa market where traders purchase the skimmed milk from Bekoji zurea cooperative and sell to the consumers of Assasa town. In some cases, milk collected by Dembella factory is exposed to high temperature and become too sour for processing. In such occasions, the fermented milk will be sold as sour milk (*Irgo*) in Adama town.

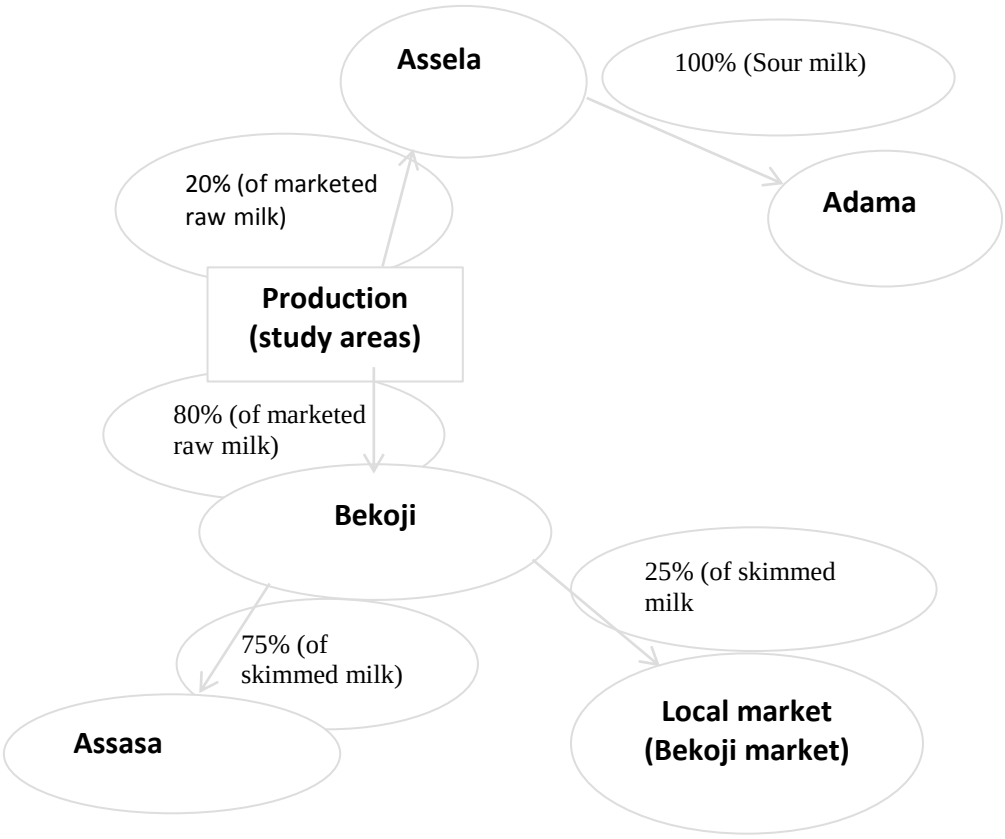

Figure 7:Raw and skimmed milk marketing routes
Source: own estimation through interview of key informants

Butter and cheese market routes

The main market routes for butter are consumers of Bekoji and Assela towns. Shashemene and Hawassa also serve as regional market outlets for retailers to the southern part but some of the wholesalers in the south also directly buy from the study sites. Traders are responsible for directly purchasing butter from the cooperatives and distribute to the wholesalers of Assasa, Assela, Adama and Addis Ababa markets. In some instances, wholesalers directly purchase the butter and sell to Assasa and Addis Ababa markets.

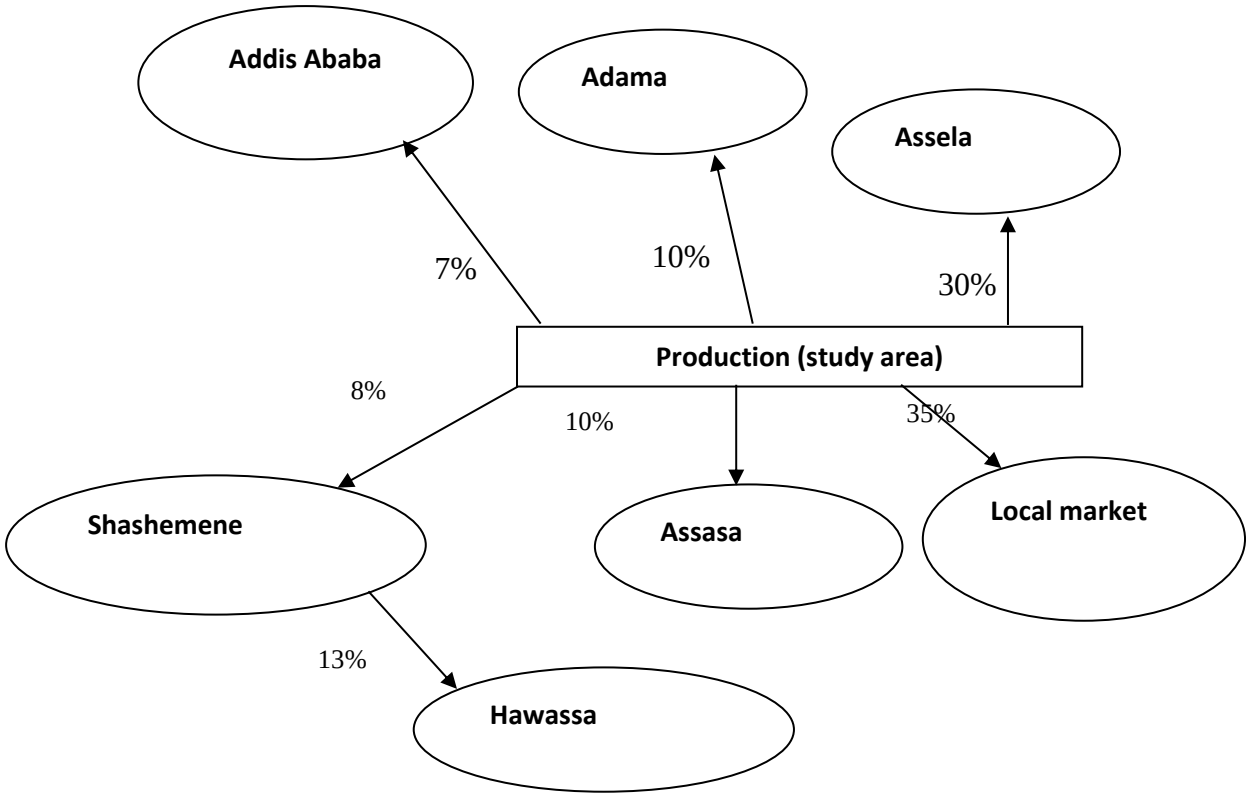

Figure 8: Major butter marketing routes

The primary regional market outlet for cheese is the Shashemene market. Large traders collect cheese using their own collectors on major market days and transport it to the Shashemene market. Likewise, traders from Mojo purchase cheese from the producers in Bekoji market and sell it to wholesalers of Addis Ababa and Meki. According to key informants, the southern route is the main market outlet of cheese where products transported to Shashemene are sold to Alaba retailers; a negligible amount of white cheese from the cooperatives is transported to Hawassa.

Figure 9: When cheese collectors sell to traders of Shashemene at Bekoji market

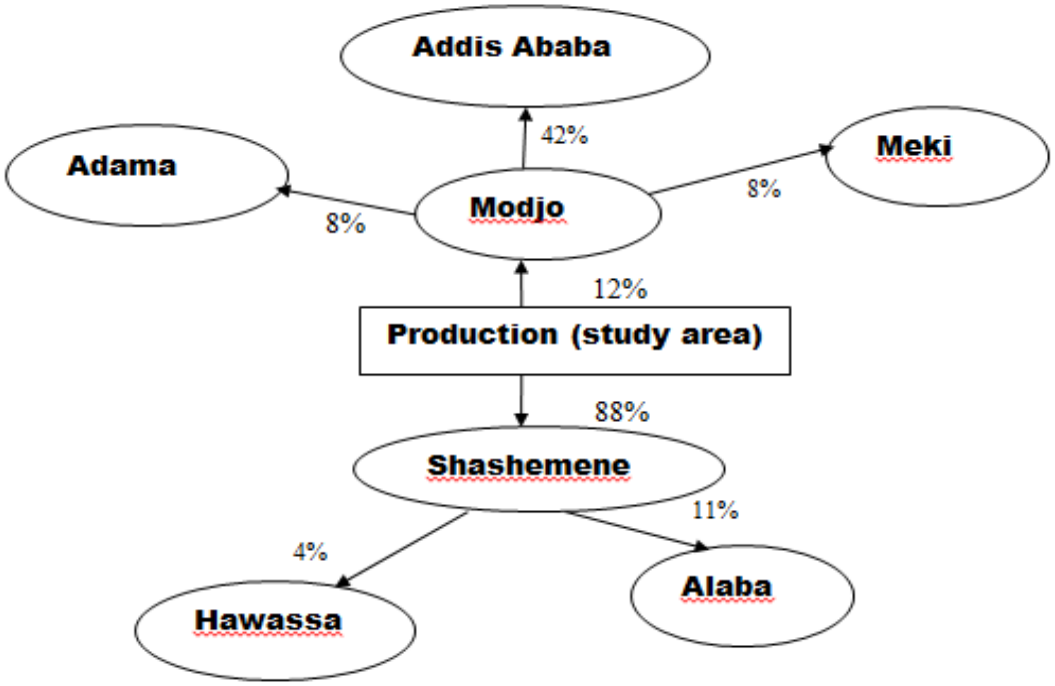

Figure 10: Major market routes of cheese (ayib) produced in Lemu-Bilbilo district

Marketing channels

The analysis of dairy marketing channels is assumed to provide a systematic knowledge of the flow of dairy and its products from their production areas to their final end-users. In due course, it allows simplifying the complex nature of the subsector, helps to identify all key actors and the main leverage points for the sub-sector where targeted interventions could affect the entire value chain.

Analysis of information obtained from different sources during the study depicts that there are five main market channels for fresh milk produced in Limu-Bilbilo district with which it reaches to final consumers (Figure 11). The final consumers of dairy products in the study area are individual consumers and hotels/cafeterias of Assasa, Bekoji and Adama towns.

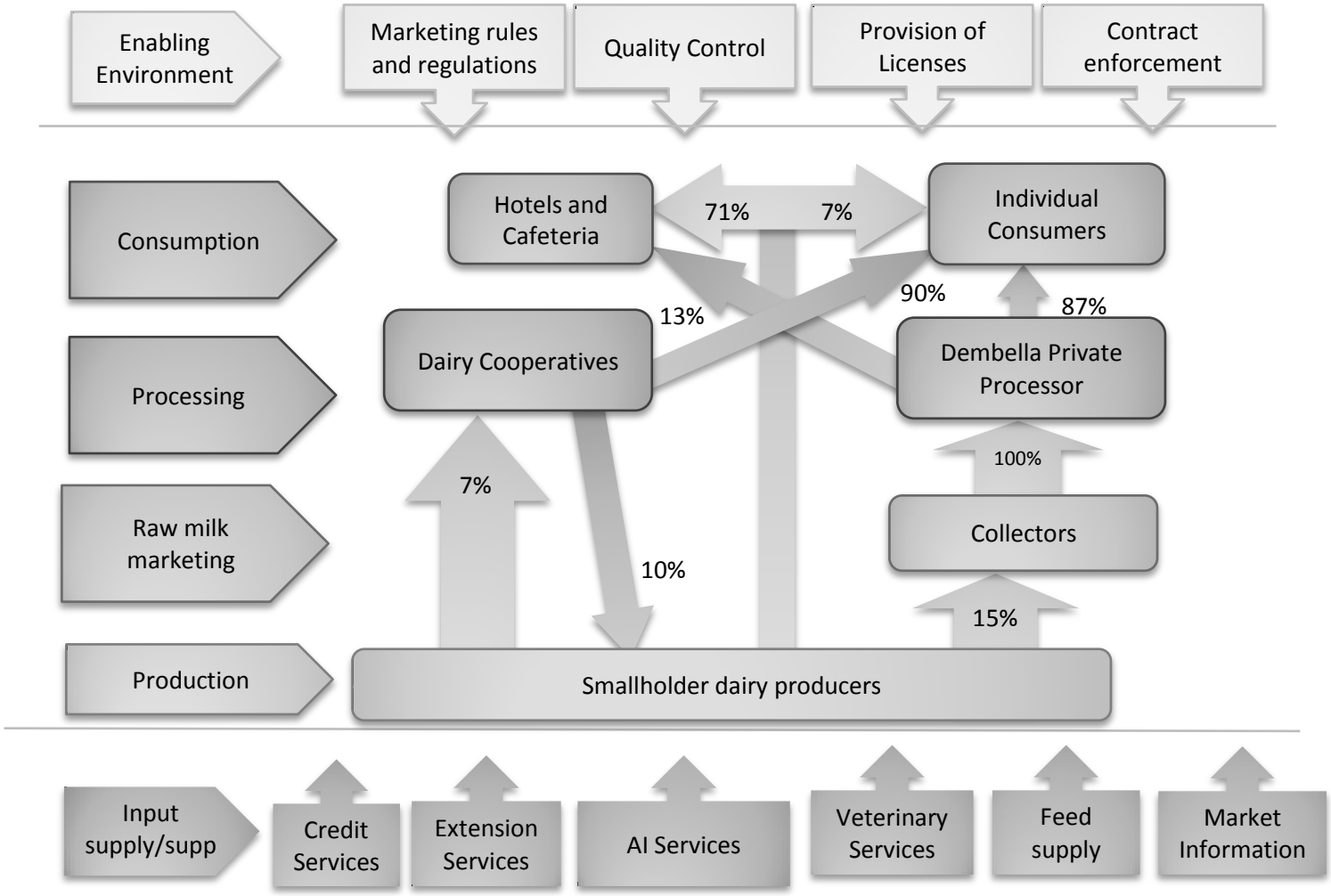

Figure 11: Fresh milk and milk products marketing channels

The main market channels for raw milk produced in Lemu-Bilbilo to reach final consumers include:

- Channel 1 –Milk products supplied to individual consumers and hotels/cafeterias in Bekoji and Assasa towns
- Channel 2 – Milk supplied to hotels and cafeterias in Bekoji town
- Channel 3–Milk consumed by individual consumers in Bekoji town
- Channel 4 – Milk supplied to individual consumers in Adama area
- Channel 5 – Milk supplied to hotels and restaurants in Adama area

Channel 1 – Milk products supplied to individual consumers and hotels/cafeterias in Bekoji and Assasa towns

This is the first channel through which farmers sell fresh (morning) milk directly to the Bekoji Zurea and Lemu-Ariya dairy cooperatives. The cooperatives process and sell the milk products (butter, cheese and skimmed milk) mainly for the individual consumers and traders of Bekoji and Assasa towns.

According to the information obtained from FGD, it was learnt that about 7% of the fresh milk produced by farmers goes through this channel via cooperatives. The suppliers of these cooperatives are mainly commercial farmers that continuously produce and supply milk throughout the year. The cooperatives process the raw milk in to butter and skimmed milk and sell mainly for the individual consumers and traders of Bekoji and Assasa towns. In this channel, some amount of butter and traditional chees (*ayib*) is also purchased by passengers passing through Bekoji town.

This is also the dominant market channel for skimmed milk produced by Bekoji Zurea dairy cooperative. The sale of skimmed milk virtually made during the dry season. In dry seasons the supply of fresh milk decreases significantly due to feed shortage which is exacerbated due to lack of grazing pasture and high price of concentrate feed. During such season the cooperative process the assembled milk into butter and sells the skimmed milk to traders from Assasa district and to their members at price of 3.50 ETB/liter. On the basis of the information from cooperative chairman, about 10% and 90% of the produced skimmed milk was sold for member farmers and traders of Assasa, respectively. Assassa traders sell the skimmed milk to individual consumers and hotels/cafeterias in Assasa district.

Channel 2 – Milk supplied to hotels and cafeterias in Bekoji town

On the basis of the information obtained from FGD, this is the biggest fresh milk marketing channel in which about 70% of the milk produced in the study district is supplied to the hotels and cafeterias of the study district. Bekoji is the major source of the long distance runners of Ethiopia. Nowadays there are growing number of investments on hotel and cafeterias in the study district mainly built with the remittance income obtained from athletics. Smallholder farmers who have little supply mainly opt for this channel due to the flexibility of payments. Payments will be made on the basis of the agreement between the supplier and owner of hotels and cafeterias. In most cases payment will be made on weekly and bi-monthly basis which gives farmers the choice to invest the income on concentrate feed especially during the dry season.

Channel 3 – Milk consumed by individual consumers in Bekoji town

Due to the change of life style, the per capita milk consumption in Ethiopia is increasing over the past few years. Individual households tend to include milk consumption as their daily dietary food intake although the volume and frequency is not enough. According to the CSA (2011) estimates indicate that the country per capita milk consumption has reached 48 liter, which shows 25% and 29% enhancements compared to 2008/09 and 2009/10 seasons.

In this channel individual consumers buy raw milk on the contractual basis or their household. Most of the households consume the whole milk (fresh, pasteurized milk or fermented sour milk).Some households churn the crème that is accumulated over a week to get butter and cheese (*ayib*) for household consumption. As per the information obtained from FGD and key informants, about 7% of the fresh milk produced by farmers is directly sold to individual consumers on contractual basis through this channel. Payment will be effected in advance on monthly basis.

Channel 4 – Milk supplied to individual consumers in Adama area

Non-cooperative affiliated and relatively small milk producers usually follow this channel. According to the information obtained from FGD, this is the second biggest fresh milk market channel whereby a relatively large proportion of fresh milk is marketed. Nearly 15% of the morning milk produced by farmers reaches to private processor (Dembella private processor) through milk collectors.

In this channel, the milk assembled by Dembella private processor is distributed to individual consumers in Adama town at Dembella selling shop in the form of fluid milk, sour milk (*Ergo*), cheese and butter. Almost 87% of the milk collected from Dembella private processor (i.e., 13% of the morning milk produced in the area) goes to individual consumers in Adama town. During transportation of the assembled milk from his collection centers at Sagure, Limu and Bekoji towns, some of the collected milk will be exposed to sun and became too sour for processing and is sold as sour milk (*Ergo*) to individual consumers in Adama.

Channel 5 – Milk supplied to hotels and cafeterias in Adama area

In this channel, 13% of the fluid milk assembled by Dembella private processor (i.e., 2% of the morning milk produced in the area) is distributed to hotels/cafeterias in Adama town on monthly contractual basis. In general, this channel is relatively better organized in terms of sustainability and trust. In this channel, collectors of Dembella processor and its raw milk suppliers have developed long-standing relationships and trust with each other. This is due to the fact that the collectors have formal addresses and most of them are residents of the same district with that of the producer. Farmers are supplying milk on credit basis even without signing any contractual agreement whereby payments are effected every month.

In this market channel, the milk rejection rates are relatively fewer as compared to the first channel. In this case, producers are allowed to mix the evening and morning milk to supply to the collectors which otherwise is the bases for rejection, if they supply to cooperatives. The main reason mentioned by the collectors was to attract the milk supply from farmers.

Despite the fact that this channel is relatively organized and developed, it still they use public transportation and Isuzu private trucks for transporting the milk from their major collection areas to milk processing plant in Assela which is 56 km far away from the collection centers. Moreover, the collected milk is transported using plastic can that can handle up to 20 liters and difficult for maintaining and checking the cleanness of the can using visual observation. Therefore, the greatest challenge in this route is maintaining clean and hygienic milk for delivery to the processor. The most noticeable advantage of this channel is the constant price paid to supplier farmers during the dry and wet season. This has made most farmers to rely on this channel.

Market actors

In marketing chains the product passes through different market stages in the value chain before it reach to final consumers. The main actors in dairy and its products markets include a network of private processor, cooperatives, hotels/cafeteria, individual consumers and farmers.

Dairy producers

The general features of dairy farmers of the study sites are discussed in section 4.2. Smallholder dairy farmers are the major players in the dairy value chain in Lemu-Bilbilo district. The proportion of milk marketed (milk off-take rate) by farmers is lower. According to the information from FGD, the proportion of milk marketed by dairy producers is only 15% of the total production. The rest 85% of the produced milk will remain within the household either for household consumption or for processing purposes (butter and cheese). The main reason given for not selling milk was low-level of milk production, which was not sufficiently larger than home consumption.

Dairy cooperatives

It is argued that in many developing countries, milk production remains small-scale, scattered and poorly integrated to the market chain (Bennet *et al*., 2006). The implication of this observation is that smallholder dairy producers face higher transaction costs as compared to large farms in accessing and competing in the input and output markets due to their small-scale operations. It has been observed that high transaction costs for production and marketing limit market participation by asset and information poor households (Staal *et al*., 1997). In this regard, the milk marketing cooperatives through milk collection centers provide external economies of scale in the collection, bulking, transporting, processing and marketing of dairy products and provide regular income and sale guarantee to their members.

In Arsi Zone, there were 24 primary dairy cooperatives and one zonal -level cooperative union was established with the support of FAO project at the time of this study. Dairy farmers in the study area supply milk to two dairy cooperatives. Farmers in Bekoji Negesso area supply to Bekoji Zuria dairy cooperative while farmers in Lemu area supply to Lemu Ariya dairy cooperative.

Both dairy cooperatives are engaged mainly in bulking raw milk from members and non-members, processing and marketing of processed dairy products. The milk deliveries are received at the collection center only in the morning (60%) and the evening milk (estimated to be 40% of the total production) is not collected. The capacity of the cooperatives was limited in terms of the quantities of milk collected and processed, geographic coverage and number of dairy producers involved. The dairy cooperative's product offerings were limited mainly to butter, skimmed milk[3] and cheese. The direct sale of fresh fluid milk is not common.

Collectors

Collectors are one of the important actors in the dairy value chain. Some of collectors undertake their regular duties for private processor by collecting milk in their rented collection shops in Bekoji, Sagure and Lemu towns. These collectors do have monthly salary of about 900 ETB and in some cases, they do have some commissions. They collect about 600 liters of fresh milk per day from the individual milk producers of Bekoji, Sagure and Lemu areas. They usually use plastic can to transport the milk to Assela. In order to detect the milk quality, they mainly use acido meter tests and visual observations for their regular customers.

[3] Skimmed milk is not pasteurized and it is usually sold after it get sour (become Ergo)

Private processors

As discussed in section 4.3, one private dairy milk-processing firm (Dembela private milk processing) was involved in milk marketing in the study area. Although it is active in Lemu-Bilbilo district, this private processor has other milk collection centers in other areas of Arsi zone including Sagure and Assela. According to the information obtained from FGD and key informants, Dembela private milk processing commands about 15% of the fresh milk market where the firm collects about 600 liters of fresh milk per day from the individual milk producers of Bekoji (250 liter), Sagure (200 liter) and Lemu (150 liter) towns. The main market outlet for this firm was the urban consumers of Adama town, where it has a mini shop that sell the milk products (cheese and butter) and sour milk to the consumers of this town.

Hotels/cafeterias

Hotels and cafeterias directly purchase fluid milk (morning and evening milk) from the producers based on contractual agreements. They purchase butter from local butter traders at a price of 140 ETB/kg. The average daily intake for raw milk reaches up to 21 liters/day/hotel or cafeteria. According to the information obtained from FGD and key informants, hotels/cafeterias command about 70% of the fresh milk market of the study site. They consider quality parameters such as freshness, adulteration with water, taste, hygiene and price in their decision to buy liquid milk.

Individual consumers

There are three main dairy products consumed by individual consumers in the area: raw milk, edible butter, cosmetic butter and cheese. Smallholder dairy producers are still very important sources of milk for individual consumers of the study area. Smallholder dairy producers sell fresh milk to their neighbor and other individual consumers on monthly contractual basis. In this case, the consumer collects milk from the producer's gate. Either the children or women are usually collecting milk from the producer. Collection could be in the morning, afternoon or both depending on their agreement. In this case too, there is no formal written agreement. However, the payment is usually in advance.

Since the two parties meet every day, they easily communicate the quality problems so that producers can correct them as much as possible. If not, the consumer looks for better quality milk from other producers usually after finishing the contract.

On the other hand, for other dairy products like cheese, edible butter and cosmetic butter, the major points of purchase are town markets and cooperatives shops and the main sellers are traders, individual producers and cooperatives.

Profitability analysis

The cost of production used for estimation of gross margin analysis is calculated based on the information obtained through FGD and KII. This is because most of farmers in the study area practice subsistence dairy farming and records on costs and returns on investments are not available.

Profitability analysis for dairy production was made by considering the different selling price options in which the majority of producers were selling their fresh milk to cafeterias/restaurants, individual consumers of Assasa and Adama, private processor and dairy cooperatives. Price of milk received by producers decreases during Christian fasting and wet season and increases beyond the average level during dry season. Since, milk price set by private processor was constant throughout the year, we base our analysis on milk price of private processor during the study production year.

Based on gross margin analysis, the major production costs for dairy went for rent of grazing pastureland, which comprises about 18% of production costs. The reason for this is that it is customary that dairy producers in the investigated area rent land to produce pasture with average rental value of 1000 ETB/ha/year. Most of the rented land used for production of pasture is less fertile, water-logged and less commercially viable for crop production. On average a dairy producer obtain a gross margin of 50 ETB per improved cow per day (Table, 2), which shows involvement in dairy production was a profitable venture for smallholder dairy producers of the study area.

Table 2: Profitability analysis of an improved dairy cow per 6 months of lactation length

A. COSTS	Daily feed intake/day	ETB	Remarks on costs
1. Grazing pasture Per cow per day	3 Kg	4.6	Costs include rent of land; we assume 1 ha of pasture feeds 1 cow for 3 months.
1. Green fodder per cow per day	1 Kg	4	
2. Mineral Supplement (ETB) per cow per day	0.17 Kg	0.05	
3. Local Brewery Waste (*Atela*)[4] per cow per day (ETB)	0.3 (Can)	0.83	
4. Crop Residues (Barley and wheat straws) per cow per day	1.3 Kg	1.04	20 kg of wheat and barley straw sold at 16 ETB
5. Wheat Bran per cow per day	0.55 Kg	1.38	
6. Labour cost per cow per day	1(Man day)	3.6	1 person manages 6 cows including feeding, milking and transporting milk to sale point ; monthly salary of 648 ETB
7. Detergent costs per cow per day	5.5 gm	0.07	
Total Cost/Cow Per Day		**16**	
A. REVENUE			
1. Average Milk Production Per improved Cow Per Day (liters)	-	10	
2. Price per Liter	-	6.60	
Gross Revenue/Cow Per Day		**66**	**Excluding income from sale of manure**
Gross Margin/Cow Per Day		**50**	
Gross Margin/Cow Per/11Months of Lactation Length[5]		**16,500**	

Source: Own calculations

[4] Traditional home made local brewery

[5] According to Million and Tadelle (2003), lactation length for crossbreed of Holstein-Friesian in Ethiopia was 326 days which is about 11 months.

Margins and value addition

Based on the costs of dairy production as indicated above, this section describes the margins that different market actors obtain as a result of their participation in dairy value chain.

Net marketing margin of a particular marketing agent, as an indicator of the efficiency of the channel, is defined as the residual of the gross marketing margin after paying marketing costs. Hence, a net marketing margin is specified as:

Gross marketing margin = Selling price - Buying price
Net marketing margin = Gross Margin - Marketing Costs

The value added to a product at each stage of the value chain is also calculated as the selling price minus the total production and marketing costs. The total cost for traders and private processors is the sum of marketing cost and buying price of the product. The proportion of value addition at each stage relative to the value added along the value chain is also calculated for each actor in the different channels.

In the fresh milk and milk products marketing channel in which milk is sold to individual consumers and hotels/cafeterias in Bekoji and Assasa towns, the highest value addition was made by the dairy cooperatives. This is because cooperatives assemble fresh milk from producers and add values through changing its form in to butter, cheese and skimmed milk. Based on the data from FGD and key informants interview, this is the second fresh milk channel where higher proportion of final price of fresh milk and its products reaches to producers. This is associated mainly to the shortness of the channel and the objectives of dairy cooperatives in safeguarding the welfare of their members.

Table 3: Distribution of costs and margins along the channel in which raw milk and milk products are sold to individual consumers and hotels/cafeterias in Bekoji and Assasa towns

Values, costs & margin	Producers (1)	Cooperatives (2)
Selling price(A)	6.30	8.10
Total marketing costs (B)		0.37
Marketing margin(C) = (A2-A1)		1.80
Net margin (D) = (C – B)		1.77
Total cost (E)	5.2	6.67
Value added (F) = (A-E)	1.10	1.43
Share of value added (%)	43.5	56.5
Producers' share of final price (%)		78

Source: Own calculations

Along the channel in which fresh milk are sold to hotels/cafeterias in Bekoji town, the largest value was added by hotels/ cafeterias. Hotels and cafeterias usually sell fresh milk in the form of hot (boiled) milk to their customers. On the basis of the information obtained from mangers of hotels and cafeterias, one liter of fresh milk will produce 5 cups of hot milk. They usually sell one cup of milk at 3 ETB. As a result, hotels and cafeterias retained higher margin as compared to producers.

Table 4: Distribution of costs and margins of actors along the channel in which raw milk is sold to hotels/cafeterias in Bekoji town

Values, costs & margin	Producers	Hotels and cafeterias
Selling price	6.50	15
Total marketing costs		3
Marketing margin		8.50
Net margin		5.50
Total cost	5.2	9.50
Value added	1.30	5.50
Share of value added (%)	19	81
Producers' share of final price (%)		43

Source: Own calculations

Individual consumers in the study area consume fluid milk on the basis of monthly contractual agreement with the producer. On the basis of their agreement producers may supply the milk at the consumers' residence or the individual consumers might also get the milk at producer gate. In most cases children are responsible for delivering the milk to the individual consumers. On average individual consumers incur about 200 ETB/liter/month with the daily milk price of 6.70/liter. Due to the shortness of the channel, the margin earned by producers was the highest of all fresh milk and milk products channels. Therefore, we can deduce that this was the efficient market channel for fresh milk and milk products. However, the volume and number of individual consumers relying on this channel will not flourish as we tend to promote value chain approach through capacitating the dairy cooperatives in direct fresh milk marketing and value addition. In spite of the fact that this channel was efficient, most of the supplied milk to the individual consumer is the evening milk which has no market outlet due to the inefficiency of the cooperatives in handling the evening milk for longer period. Therefore, in the long run when the dairy cooperatives will be capacitated and linked with potential market niches through promoting value addition, reliance of farmers on this channel will eventually culminate.

Table 5: Distribution of costs and margins of producers when milk is sold to individual consumers in Bekoji town

Values, costs & margin	Producers
Selling price	6.70
Total marketing costs	
Marketing margin	
Net margin	
Total cost	5.2
Value added	1.5
Share of value added (%)	100
Producers' share of final price (%)	100

Source: Own calculations

The private processor obtains the highest net margin along the channel in which milk and milk products were sold to individual consumers in Adama area through private processor. The milk price was relatively higher in Adama due to the deficiency of milk supply and higher demands for milk and milk products from the consumer side. Private processor adds value and sells in the form of butter, cheese, *Ergo* (sour milk) and fresh milk. As compared to collectors, the private processor adds more value in this channel. This was because the collectors do not do any structural change to the product except transportation and changing its place.

Table 6: Distribution of costs and margins along the channel in which raw milk and milk products are sold to individual consumers in Adama area

Values, costs & margins	Producers	Collectors	Private processor
Selling price	6.60	8.90	12
Total marketing costs		1.30	1.10
Marketing margin		2.30	3.10
Net margin		1	2
Total cost	5.2	7.90	10
Value added	1.40	1	2
Share of value added (%)	32	23	45
Producers' share of final price (%)			55

Source: Own calculations

As depicted in Table 7, the largest margin obtained along the channel in which raw milk was sold to hotels and restaurants in Adama area via private processor was by hotels and restaurants. The main reason was that hotels and restaurants sold the product by adding values on fresh milk by selling in the form of boiled (hot milk). As compared to all other fresh milk and milk product channels, the producers' share of the final price was the lowest at 22%. This can be associated to the relatively longer value chain actors that participate in value addition along the different value chain stages.

Table 7: Distribution of costs and margins along the channel in which raw milk is sold to hotels and restaurants in Adama area via private processor

Values, costs & margins	Producers	Collectors	Private processor	Hotels and cafeterias
Selling price	6.60	8.90	12	30
Total marketing costs		1.30	1.10	10
Marketing margin		2.30	3.10	18
Net margin		1	2	8
Total cost	5.2	7.90	10	22
Value added	1.40	1	2	8
Share of value added (%)	11.3	8.1	16	64.5
Producers' share of final price (%)				22

Source: Own calculations

Challenges of dairy production and marketing

Technical constraints at input supply stage

- ***Low quality and untimeliness of AI and animal health service provision:*** Based on famers' response during FGD, the service rendered by the AI technicians was inadequate and offering low quality services. Due to this problem, nowadays farmers tend to use bull service for breeding, which is more attractive from the point of view of its timely accessibility when service is required.

- Furthermore, the situations become even worse for those farmers who live in far distance areas within the peasant association where provision of animal health and AI services were either unavailable or inadequate. It was learnt that those farmers in distant areas travel more than 4 hours to arrive at the service provider station. In some cases they reach the service station after the heat period is over. This leads to failure of conception which perpetuates farmers to lose their confidences on AI services and leads to the use of the alternative bull services.

- Farmers in the study area complained that service per conception was 5-6 times and there were cases where they fail to succeed after 6 conceptions. Farmers identified three important reasons for this. The first reason was shortage of technicians. There was only one technician for five kebeles and he cannot be available when the animals were in heat. The second reason was poor semen quality. This could be the result of poor handling especially because of shortage of liquid nitrogen to maintain the cold chain and keep the semen alive. The third reason was low technical capacity of the technician. Farmers indicated that they do not have confidence on the capability of the technician. However, farmers understand the importance of AI services over natural mating in terms of its proven quality in improving the genetic make-up of the cattle population through access to genes from superior bulls, disease control and cost effectiveness as compared to rearing bulls. Despite this superior advantage, farmers were forced to rely on the natural mating due to the above stated inefficiency and inaccessibility of the AI services.

- Farmers usually use natural mating without selecting the bull. This aggravates problems of inbreeding and reproductive diseases transmission, which has been the major underlying factor towards the predominance of low yielding cross breed cattle herd in the area.

- ***Information gap on credit services:*** With regard to credit, farmers and dairy cooperatives have limited awareness about the terms and conditions of credit providers. Currently most farmers do not have good knowledge of how to get credit services, amount of credit and loan repayment periods for dairy farming activities. Farmers abstain from using this credit mainly due to lack of understanding of its terms.

- ***Unavailability of budget for demonstration sites on improved forage production in Farmers Training Centers (FTC):*** Utilization of FTC as training ground for demonstration of improved forage development was not observed in the study area. The major problem behind this was budget shortage. Due to lack of awareness and emphasis regarding the importance of improved forage deployment in enhancing dairy productivity, the allocated budget for the district went for development of major cash crops like malt barley, bread wheat and highland pulse crops. As a result, farmers were following the practice of producing only natural grazing pasture, fodder beet and oats using the knowledge obtained from their neighborhood.

- **Shortage of government and private ranches and multiplication centers for the supply of improved dairy heifers and bulls**: Farmers stated that there was shortage of ranches that multiply and distribute improved heifers and bulls in the area. The government ranches that used to serve this purpose were privatized and are no more multiplying and distributing breeding stock. Those ranches that are still multiplying breeding stock under the private ownership such as Gobe are too expensive to be accessible by farmers.

Technical constraints at production stage

- ***Feed shortage and undeveloped forage seed production and marketing*:** Feed shortage is one of critical factors affecting milk production and productivity in the area. This problem was caused by the shrinkage of grazing land due to high population pressure. The problem of feed shortage becomes persistent during the dry seasons.

- Recent trends indicate that there is a renewed interest to introduce improved forages for feed production and natural resources management in various parts of the country (Tegegne, *et al*., 2006). However, use of improved forage seed in the study area was negligible. In addition, the involvement of farmers in forage feed production and marketing has been limited, and as result, the market at farmers' level for these resources has not yet been developed. In general, the following were identified as problems in animal feeding:

    - Poor quality and quantity of feed in dry season;
    - Lack of initial seeds and recurrent training for improved forage development;
    - Poor delivery of support and extension services;

- ***High price of industrial by-products:*** Over the last three years, the price of industrial by-products has sky rocketed. For instance, the price of oil cake increased from 600 ETB /100kg in 2010 to 900 ETB /100 kg in 2012 and for wheat bran it increased from 140 ETB /100kg in 2010 year to 360 ETB /100 kg in 2012. This is becoming unaffordable and farmers tend to reduce the amount of concentrate feeding to livestock as its price increases.

- ***Low milk yields*:** This is due to the predominance of local dairy breed types, poor feeding and animal husbandry. In fact, one progressive farmer was noted to produce 17-20 liters per improved cow per day (which most people perceive as easily achievable with improved feeding and herd management) indicating the existence of even greater potential in improving the current average milk production of 5 liters a day.

- ***Lack of awareness and knowledge regarding improved feed formulation:*** Despite the efforts of ACDI/VOCA Ethiopia in provision of training for some progressive farmers on improved feed formulation methods by using the idea of proper cost-effective ration techniques, farmers still lack the basic skills and ideas of feed formulation techniques.

Technical constraints at processing and marketing stage

- ***Inefficiency of processing machines*:** The cooperatives were found to have problems with their processing machines. Their machines are too mechanical and have low efficiency in extracting the cream from the raw milk. According to the management of Bekoji zurea dairy cooperative, the current cream separator machines extract only 25% of the cream from the fresh milk, in other words they get 1 kg of butter from 27 liters of raw milk.

- ***Lack of refrigerated trucks:*** To resolve the fresh milk marketing problems of the cooperatives, FAO had purchased milk cooling machine for the dairy cooperatives union in the area. This was to enable primary cooperatives to supply morning and evening milk twice a day to the union in Assela. However, this facility would be useful only if the cold chain of milk stored in the cooler machine is maintained up on delivery to potential buyers. This needs the availability of trucks with refrigerated tankers. However, FAO did not consider this aspect and the cooling machine is left idle in the store. Thus, the union and the primary cooperatives have failed to accomplish their intended purposes.

- ***Absence of quality based payments*****:** Since there is no quality-based payments for milk producers, milk supplied by farmers were sometimes adulterated with hot water and mixed with evening milk, which was below the required quality set by the cooperative.

- ***Weak vertical linkage between cooperatives and potential buyers:*** The dairy cooperatives have weak vertical market linkages with supermarkets, institutional users and private processing plants. Cooperatives immediately process milk into butter and the opportunity of transporting fresh milk to other regional markets does not exist.

- ***Non-market oriented milk production:*** According to the FGD and key informants, some farmers consider selling milk outside their homes as a bad habit: *"Selling milk will worsen the body weight of our calves"*. This norm was more common in the sub-villages of Merti-Lemman and Tulu-Negesso where mixed crop-livestock production is dominant. Farmers in these villages do not keep livestock mainly for dairying. Because of this, they have less market orientation behavior in milk selling. However, this picture was completely different for Chefa-Weligala sub-villages which have favorable conditions for livestock production. Here, farmers heavily rely on income generated from dairy as compared to crop farming practices. As a result, they are more market-oriented in milk production and marketing.

- ***Inadequate waste disposal for cooperatives*****:** Bekoji zurea dairy cooperative runs their business in a private rented house which has no drainage systems and waste disposal pits that absorb the wastage of the processing machines. This has got a negative impact on the hygiene of its own products and the public health of the surrounding community.

Legal and institutional constraints

- ***Unlicensed traders*****:** This is the case for the butter market where most of the traders are informal while only few of them are licensed. This means the licensed traders pay taxes and compete with non-tax payers in the market, distorting the normal working environment of the business.

- ***Weak coordination between union, primary cooperatives and farmers*****:** As a result of the perishable nature of milk and the range of skills involved in its production, handling and marketing, dairying requires a number of services that can best be provided by cooperative action. Contrary to other areas, the milk collected by cooperatives of the study area was not delivered to the union. Instead, the primary dairy cooperatives limited their involvement only in processing fresh milk in to butter and cheese.

- The dairy cooperative union of the study area was established in the zonal headquarters of Assela town. The linkage of both Bekoji zuera and Lemu Ariya primary dairy cooperatives with the union was not as such strong. The immediate reason was the less involvement of the union in the marketing of fresh milk for which they were initially established.

- Moreover, the linkage between primary dairy cooperatives and farmers was not strong since farmers are not getting the benefits they are expecting from their cooperatives. The cooperatives do not provide any capacity building training to farmers on milk handling and processing. Furthermore, they did not supply any inputs such as concentrate feeds, veterinary drugs and improved forage seeds. In other parts of the country, the unions and the cooperatives became the major sources of heifers and linked farmers to the sources, provided credit services and identified market outlets. For instance, Ada'a dairy cooperative has been sharing dairy related knowledge and information by providing training and advisory services on dairy production and marketing for their member farmers. However, such kinds of correlation and service provision were non-existent in the study area.

Market infrastructure

- ***Sanitation problem of milk products*****:** Marketing of dairy products, mainly butter and cheese wholesaling and retailing in the study area is mainly carried out on major market days (Tuesday and Saturday). Compared to other areas, the district has relatively better market facilities for cheese and butter sales. The transaction of these products takes place under a market shade with cemented floor. The sanitation problem was observed in the way products were handled. Farmers take their cheese mainly using plastic bags and small buckets and transactions take place using food packing cans (especially 1 kg marmalade packing cans). Butter is taken to the market using similar materials but the measurement is usually a pile of the product over small coffee cups. The hygiene of materials used to take products to the market and measurement cans are points of concern from the public health perspective. The plastic bags and buckets used to carry cheese and butter to market are not visually attractive and clean. There is a need to inspect the appropriateness of the marmalade cans to measure cheese and replace it with other more appropriate units.

- The other important issue was access of scavenging dogs to the butter and cheese markets. Dogs are observed scavenging under the market shade. Since some zoonotic diseases such as rabies are very dangerous for public health, it is essential to pay due attention to avoid access of these animas to the marketing facility.

Capacity and capability of support service providers

- ***Capacity gap among extension agents and agricultural experts in provision of training for feed formulation techniques*****:** During FGD, farmers in the study area indicated that they were not getting any information regarding dairy husbandry practices like ration formulation techniques either from extension agents or from experts.

Opportunities

The major opportunities available to invigorate the transformation of the dairy sector of the study area include:

- The availability of some progressive farmers who have adopted the practice of keeping improved dairy cows provides clear evidence that there is an opportunity to bring about the positive changes.

- Good policy road map that aimed at bringing the desired change in the livestock sector. For instance, Oromia Livestock Agency prioritized improving the effectiveness and accessibility of AI services through use of oestrus synchronization and mass AI campaigns.

- Change of lifestyles in urban centers coupled with urbanization and rapid population growth.

- Good infrastructural facilities: For instance, the study area is connected with good asphalt roads to milk deficient urban towns of Shashemene, Hawassa, Assela and Adama.

- Favorable climate and weather conditions with relatively abundant pasture land.

Conclusions and future directions

This study was initiated to assess the dairy value chain and identify major constraints and opportunities that could be used as points of entry for research, policy and development interventions to revitalize the dairy sector of the study area.

The dairy value chain in Lemu-Bilbilo district involves six distinct value-adding activities (core functions) from the inception of the milk production through reaching to the final consumer. These activities include input supply, production, gathering (bulking), processing, transportation and retail trading. In the study area, crop residues were mainly used as source of livestock feeds together with natural pastures. Due to its relative palatability of the straw, most of the farmers prefer barley straw to feed their dairy animals. During the rainy seasons, farmers rely mainly on natural pasture. Farmers provide supplementary concentrate feed only to oxen and lactating cows because of its high price, which made it costly to feed to other animals. Most farmers do not have access to training on ration formulation and improved feeding techniques. They feed their animals based on their own experience and by copying what other farmers in the area are doing.

Currently, there are two categories of AI service providers. These are government and community service providers. There is only one government technician who provides the AI services in the study area. This AI technician is based at the district health clinic at Bekoji. Those who live in close proximity to the service center get AI service from this source. The service charge is 6 ETB per conception. A farmer can repeat up to 3 times if conception fails to happen. However, there were cases where the conception fails to happen after 6 times repeated insemination. The most prevalent animal diseases mentioned by key informants and farmers are mastitis, Foot and Mouth Disease (FMD), black leg and parasites. Even if farmers have access to formal credit sources like Oromia Credit and Saving Institution (OCSI), they tend not to use this service due to short loan repayment periods. The other important gap observed with regard to micro-finance credit is lack of awareness of farmers about its terms and conditions that led to its avoidance by the community. Farmers abstain from using this credit mainly due to lack of understanding of its terms.

In general, the majority of smallholder farmers on average held three local breeds and two improved breed cows. In some cases, exceptional progressive farmers owned as high as 37 heads of improved breeds, mainly Holstein-Friesian and Jersey breeds. The feeding regime of the study area is dominated by communal grazing. However, very few farmers' practice, paddocking, indoor feeding (zero grazing), cut and carry feeding systems. Average milk yield per dairy cow for local breed is 2 liters per day and for improved breeds, it is 10 liters per day (morning and evening milk). According to some key informants, there are farmers who get up to 17 liters per day per cross breed dairy cow. This suggests that there is a room for improvement of milk yield per improved dairy cow from the current average of 10 liter/day/cow to 17 liter, which is equivalent to about 70% increases. The immediate problem of low milk yield is attributed to poor feeding, low genetic makeup of the existing breeds and general animal husbandry.

Relative to all other fresh milk channels, higher proportion of final price of fresh milk reaches to producers when milk is sold along the channel to individual consumers in Bekoji town. Hence, this channel is relatively more efficient as compared to other fresh milk channels.

Profitability analysis for dairy production elucidates that on average a dairy producer obtains a gross margin income of 50 ETB per improved cow per day, which shows involvement in dairy production is a profitable venture for smallholder dairy producers of the study area.

According to FGD and key informants the major prioritized challenges that hampers the development of the dairy value chain of the study area based on their order of importance include feed shortage and undeveloped forage seed production, low quality and poor timeliness of AI and animal health service provision, lack of awareness and knowledge regarding improved feed formulation, information gap on credit services and weak coordination between union, primary cooperatives and farmers.

The following interventions are suggested to overcome the priority constraints of the dairy value chain actors and make use of the available opportunities in order to improve the dairy value chain in the study area.

Introduce improved forage seeds

In line with improvements in natural pastures, crop residue utilization and feed conservation practices, introduction of improved forages plays a central role for revitalizing the dairy sector of the study area. Introduction of improved forages will be facilitated through use of government nurseries for multiplication, seed production and FTC for demonstration or creating showcase to farmers.

To ensure sustainable development of the sector, attention is needed to develop herbaceous forage legumes and fodder trees species which can mitigate the constraints of feed scarcity. Incorporation of these species are important as part of sustainable farming system. Particularly leguminous forages are important feed sources for supplementation of low quality crop residue. Fodder trees also provide an important source of feed and have considerable potential for increased use, especially to maintain green leaf into the dry season.

Training of farmers on improved feed formulation techniques and scale up/out good practices: It is evident that the poor feeding system is partly attributed to the high cost of industrial by-products like oil seed cakes and wheat bran retailing at price of 900 and 360 ETB/100kg, respectively as well as low awareness by farmers of positive gains associated with improved feeding system. To create knowledge based smallholder dairy development in the area, there is an urgent need for training of dairy producer farmers on feed formulation and feed preservation techniques. This needs to be coupled with scaling up/out of the achievements of few progressive farmers on achieving high milk yields through the adoption of improved feed formulation techniques. Furthermore, there is a need to allocate budgets for forage demonstration at FTCs. This should be accompanied by developing a mechanism to monitor the proper use of earmarked budget on FTC for demonstration of improved forage development.

Improve the effectiveness and efficiency of AI services

We need to improve the timely availability and effectiveness of AI services through well-trained AI technicians and use of selected semen at the time of heat period. This can be achieved through:

- In-service training of local service providers: To enhance the technical skills and knowledge of the AI technicians, short-term training and refresher courses on relevant areas of AI services will play central role for enhancing the dairy industry of the study area.
- Training of farmers on AI services (especially heat detections and reporting) or encouraging the use of farmer AI technicians where it is necessary.
- Training of farmers on community bull selections.

Improvement in the current AI system's effectiveness and efficiency can be made through:

- Introducing innovative knowledge and technology options including the use of sexed semen or sex fixer to increase the probability of female calves born in the dairy system.
- Expanding different organizational and institutional models in AI and animal health services: For instance in the study area, in collaboration with Oromia AI institute and Livestock Agency, FAO provided 30 days training for nine farmers on how to recognize various semen types, early detection of animal heat and proper insemination procedures. In the meantime necessary equipment were also given to trained AI technicians. Based on the success stories of this training, expanding the number of trainee farmers and improving the provision of facilities (like motor cycles) for trained community AI and animal health technicians could help transform the traditional dairy system of the study area into more market oriented dairy sector.
- Revitalizing the activity of cattle ranches: Farmers in the study area used to get breeding heifers and bulls from ranches such as Gobe and Abernosa. However, these ranches were privatized to increase their efficiency and increase the participation of private sector in the livestock industry. Despite the intention of the government, these ranches are unable provide breeding heifers and bulls to the local communities. There is a need to reconsider mechanisms to bring these ranches back to their main objective of supplying better genetic materials to the community. This could be done through a dialogue with the private sector and proper follow up so they stick to their initial plan of more efficient multiplication and dissemination of these materials.
- Capacitating established dairy cooperatives: Apart from encouraging dairy producer farmers to participate in collective action by forming dairy cooperatives, already established cooperatives need to be strengthened in terms of basic infrastructural facilities.
- Supporting the acquisition of refrigerated trucks: With the prime purpose of integrating the dairy cooperatives with the potential milk buyers, FAO purchased milk coolers for the cooperatives union. But this positive step still needs refrigerator trucks to collect evening milk from the dairy cooperatives to the union. Such trucks are also need to transport chilled milk to terminal markets without breaking the cold chain. This could be achieved through linking them with financial service providers (banks) by providing credit guarantee to the banks for procurement of the trucks.
- Awareness creation on credit service terms and conditions: Micro-finance institutions need to create a platform for organizing training on credit service terms and conditions for dairy producers.
- Creating regular stakeholder forum for various value chain actors: Creating regular platforms for dairy producers, dairy cooperatives, union, private traders and potential consumers as a mechanism for creation of market linkage and experience sharing platform is crucial. This initiative will enable them to discuss common problems, find solutions to them and strengthens networking between important dairy value chain players.
- Improving the service provision of the union: In order to address the chronic shortages of trained AI technicians and high price of improved feeds, improving the service provision of the unions to its members in the form of acting as "Business Hub" by providing those mentioned inputs would alleviate the current problems. This will help to provide all the required services and inputs (AI and animal health services, milk chilling and processing facilities, mini milk quality control laboratory and credit facilities) at one place.
- Encouraging quality based payment for raw milk: In order to improve the quality base of the supplied fresh milk to the cooperatives, the cooperatives needs to adopt a quality based payments for both member and non-member farmers. This creates a sense of competitions among dairy producers to supply milk of the required quality standard.

Table 8: Summary of suggested interventions (short, medium and long term)

Stages of value chain	Challenges	Suggested interventions	Implementer	Time horizon
Input supply	• Poor feeding techniques (too much dependent on pasture grazing)	• Training farmers on improved feed formulation techniques and scale up good practices	MoA, Research centers, developmental organizations	Short-term
	• Low quality and untimeliness of AI and animal health service provision	• In-service training of local service providers • Training of farmers on community bull selections • Training of farmers on AI services, especially heat detections and reporting • Introduce new innovative knowledge and technology options including the use of sexed semen or sex fixer to increase the probability of female calves born in the dairy system.	MoA, Research centers, developmental organizations	Short-term
	• Information gap on credit services	• Awareness creation on credit service terms and conditions	OCSI, developmental organizations, MoA	Short-term
Production	• Feed shortage and less use of supplementary feed; • Very high price of industrial-by products; • Lack of awareness and knowledge regarding improved feed formulation; • Non-market oriented milk production	• Training farmers on improved feed formulation and animal husbandry practices • Encourage the development of herbaceous forage legumes and fodder trees species • Training farmers on improved feed formulation techniques and scale up/out good practices	MoA, Research centers, developmental organizations	Short term
	• Shortage of government and private ranches and multiplication centers for the supply of improved breeding stock;	• Revitalizing cattle ranches such as Abernosa and Gobe	MoA, Research centers, developmental organizations	Short term
Marketing &processing	• Inefficiency of processing machines • Lack of cooling refrigerated milk transporting trucks • Inadequate waste disposal for cooperatives	• Supporting cooperatives through supply of better capacity processing facilities such as cream separators, churns, refrigerators and other necessary facilities. • Supporting the cooperative union in procurement of refrigerated truck by provision of credit guarantee to banks so	MoARD, Research centers, developmental organizations, financial institutions	Short term

Stages of value chain	Challenges	Suggested interventions	Implementer	Time horizon
		that it can get long term loan for this purpose. • Support the cooperatives in building appropriate premises including waste disposal systems for their processing units.		
	• No vertical linkage between cooperatives and potential buyers	• Facilitate the establishment of regular multi stakeholders platform as a mechanism of creating market linkage between the different actors of the value chain	MoA, Research centers, developmental organizations, financial institutions	Short term
	• Absence of quality based payments	• Encouraging quality based payment for raw milk	MoA, Research centers, developmental organizations	Long term
Consumption	• Problem of sanitation of milk products	• Training of farmers on milk handling and managements • Regular awareness creation and follow up on the containers used for milk and milk products, • Investigate the appropriateness of materials used for measuring cheese and butter in the market and take corrective action.	Cooperatives, union, developmental organizations, financial institutions and MoA.	Short-term

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Annex 1: People contacted during FGD and KII

No	Name	Occupation	Villages/districts
1	Kashun Yilma	Farmer	Tulu Negesso
2	Kidane Gemechu	Farmer	Tulu Negesso
3	Aschalew Guilielate	Farmer	Chefa-Woligala
4	Eshetu Tekle	Farmer	Merti- Leman
5	Alemu Siyum	Farmer	Merti- Leman
6	Desalighn Ashnafi	Farmer	Chefa-Woligala
7	Shiferaw Tamiru	Farmer	Tulu Negesso
8	Hirpha Kejela	Farmer	Chefa-Woligala
9	Tola Sori	Farmer	Tulu Negesso
10	Mekoya Megersa	Farmer	Merti- Leman
11	Belete Girma	Farmer	Tulu Negesso
12	Tsegaye Biru	Farmer	Tulu Negesso
13	Lucho Tuba	Farmer	Chefa-Woligala
14	Kebede Regassa	Farmer	Tulu Negesso
15	Tesfaye Eshetu	Farmer	Chefa-Woligala
16	Arabe Feto	Farmer	Merti- Leman
17	Demoze Seme	Farmer	Chefa-Woligala
18	Debele Tulu	Farmer	Tulu Negesso
19	Yohanes Haile	Farmer	Merti- Leman
20	Tesfaye Kasa	Farmer	Merti- Leman
21	Tadele Girma	Farmer	Chefa-Woligala
22	Asnake Girma	Farmer	Chefa-Woligala
23	Terefe Deriba	Farmer	Chefa-Woligala
24	Abebe Werku	Farmer	Tulu Negesso
25	Asnake Kebede	Farmer	Tulu Negesso
26	Mengistu Alemu	Farmer	Tulu Negesso
27	Sintayehu Zerfu	Farmer	Merti- Leman
28	Turnhe Belehu	Farmer	Tulu Negesso
29	Tsegaye Mokeya	Farmer	Chefa-Woligala
30	Berhanu Werku	Farmer	Tulu Negesso
31	Driba Beyene	Farmer	Tulu Negesso
32	Gulelate Ashenafe	Farmer	Chefa-Woligala
33	Gosaye Degefu	Farmer	Merti- Leman
34	Shurbe Fato	Farmer	Tulu Negesso
35	Driba Zerfu	Farmer	Merti- Leman
36	Mekuriya Girma	Farmer	Tulu Negesso
37	Tefera Reta	Administrator of Kenenisa Hotel	Bekoji
38	Asgedeche	Butter trader	Bekoji
39	Mesay	Dembela Processing plant	Assela
40	Kemale	Milk collector for Dembella processing plant	Bekoji
41	Meberate	Bekoji Negesso Development agent (DA)	Bekoji
42	Yohanness	Bekoji-Negesso DA	Bekoji
43	Adugnha	Lemu Areya Dairy Cooperative manager	Lemu
44	Gemeda	Lemu-Bilbilo Livestock expert	Bekoji
45	Kedir	Lemu-Bilbilo Livestock expert	Bekoji
46	Lulesegede	Arsi zone livestock coordinator	Assela
47	Ollani	FAO seed multiplication expert	Assela