

# Developing the butter value chain in Ethiopia



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# Acronyms

AI	artificial insemination
CIDA	Canadian International Development Agency
CSA	Central Statistics Agency
DA	Development agent
DFATD	Canadian Department of Foreign Affairs, Trade and Development
EIAR	Ethiopian Institute of Agricultural Research
ETB	Ethiopian birr
FAO	Food and Agriculture Organization of the United Nations
GIS	Geographic Information System
IFPRI	International Food Policy Research Institute
ILCA	International Livestock Centre for Africa
ILDPA	Integrated Livestock Development Project
ILRI	International Livestock Research Institute
IPMS	Improving Productivity and Market Success (IPMS) of Ethiopian Farmers
IWMI	International Water Management Institute
LIVES	Livestock and Irrigated Value chains for Ethiopian Smallholders
MoARD	Ministry of Agriculture and Rural Development
NGOs	Non-Governmental Organizations
OoA	Office of Agriculture
OoARD	Office of Agriculture and Rural Development
PA	peasant association
PLWs	Pilot Learning <i>Woredas</i>
SNNPR	Southern Nations, Nationalities and Peoples Region
USAID	United States Agency for International Development
USD	United States dollars



# I Introduction

Ethiopia is endowed with a staggering number of livestock resources. Recent estimates indicate that 54 million cattle, 25.5 million sheep, 24.06 million goats and 0.92 million camel are found in the rural sedentary areas of the country (CSA 2012/2013). The CSA survey further indicates that 12%, 2.8% and 30% of the cattle, goat and camel population, respectively, are kept for milk production. Annual milk production is estimated at 2.8 billion litres from cattle and 165.12 million litres from camels. The dairy sector constitutes about 13.7% of the total agricultural production and 39.4% of the total livestock production in 2011 (FAOSTAT).<sup>1</sup>

Although the country has a large potential for milk production, it still lags behind even relative to other African countries. For example, in 2011, the value of total milk production was USD 1.1 million compared with USD 1.22 million for Kenya which have total cattle herd of only 34% of that of Ethiopia (FAOSTAT). Consumption of milk is also low compared to the African and world averages.

The low consumption of milk and milk products coupled with the huge potential for dairy development clearly indicates that there is ample opportunity to improve the sector. This is even more appealing given the considerable potential of dairy production in creating income-generation opportunities and its further contribution in improving human nutrition, particularly for women and children (Ahmed et al. 2004).

Depending on the purpose of production, scale and production intensity, the dairy sector in Ethiopia can be categorized into four major production systems; pastoral/agropastoral, rural smallholder farmers, urban and peri-urban systems and commercial private farms. Recently Tegegne et al. (2013) classified the dairy production systems in the highlands as urban, peri-urban and rural systems, based on the geographical location and their main production objective.

Smallholder farmers in the highlands produce fresh milk and processed products such as butter and local cheese (ayib). In the rural areas, fresh milk is used for household consumption, and processing into butter and sold in near or far away markets. Zegeye (2003) also asserts that butter dominates dairy marketing and the transaction in the form of raw milk is limited to the surroundings of major urban centres.

To contribute to the development of the dairy value chain the Livestock and Irrigated Value chain of Ethiopian Smallholders (LIVES) project conducted a baseline study in 10 zones in the 4 major highland regions of Ethiopia. In 9 of the 10 LIVES zones, dairy development is identified as having a commercial potential. Analysis results of data from this baseline survey are presented in this paper. The major objective of the analysis is to determine the importance of the butter system for dairy farmers and whether or not there is spatial dimension to where butter production is more important. Moreover, the paper includes results of analysis of data from a rapid butter value chain assessment study conducted by the Improving Productivity and Market Success (IPMS) of Ethiopian Farmers project in its 10 Pilot Learning *Woredas*. The rapid assessment study describes the butter production and marketing system.

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1. <http://faostat.fao.org>.

The paper starts by describing butter production system in Ethiopia and its importance in the LIVES project areas. It then presents results obtained from the LIVES baseline data exercise as well as from the rapid butter value chain assessment study conducted by the IPMS project. The final section presents conclusions and recommendations on strategies and interventions to increase the size and efficiency of the butter value chain in the country.

## 2 Butter production in Ethiopia

Traditional butter production involves extracting fat from the milk. It is produced by churning cream or sour milk, a process which damages the membranes of butterfat found in cream or sour milk resulting in the production of small butter grains. These butter grains float in the water-based portion called buttermilk. The buttermilk is then drained. Finally, the grains are pressed and kneaded together.

### Traditional butter making

Traditional Ethiopian butter (locally known as kibe) is often prepared by women and is made from soured milk (ergo); cream is not used. The sour milk is placed in a clay churn or a bottle gourd (calabash). Under normal storage conditions, milk sours within 4–5 hours. The souring retards the growth of undesirable organisms and makes separation of fat easier. Milk is fermented for 3 to 5 days either in a gourd or a clay pot with a capacity of about 10 litres. Prior to use, the gourd or clay pot is smoked using dried branches and barks of *Terminalia browni* and *Olea africana* trees. Besides adding a distinct flavour to the butter, this practice has a bacteriostatic effect and may reduce processing time by heating the churn.

To produce butter, the sour milk (ergo) is thoroughly mixed with a wooden stick (locally called mesbekia) and is churned in a gourd or clay pot at about 70% of holding capacity. About 7–10 litres of milk is used in a single churn. The churn is stoppered with a plug, a false banana leaf, or a piece of skin or leather stretched over the mouth and securely tied. The churn is then agitated. Different agitation methods exist depending on the location. These include: a) the churn is placed on the floor, on a soft pad of material such as sheep skin or straw, tilted at an angle of 75° to the horizontal, and rocked back and forth; b) the churn is hung on a tripod and swung to and fro; c) the churn is rocked on the lap and d) the churn is shaken with both hands.

Figure 1. Traditional clay pot (left) and gourd (right) butter churners.



The break point, i.e. the point when butter starts to form, can be detected by a change in the sound of the milk. Formation of the butter grains is checked through a hole made at the neck of the gourd. Most often a straw is inserted into the churn through the vent: if there are small butter grains adhering to the surface of the straw, the break point has been reached.

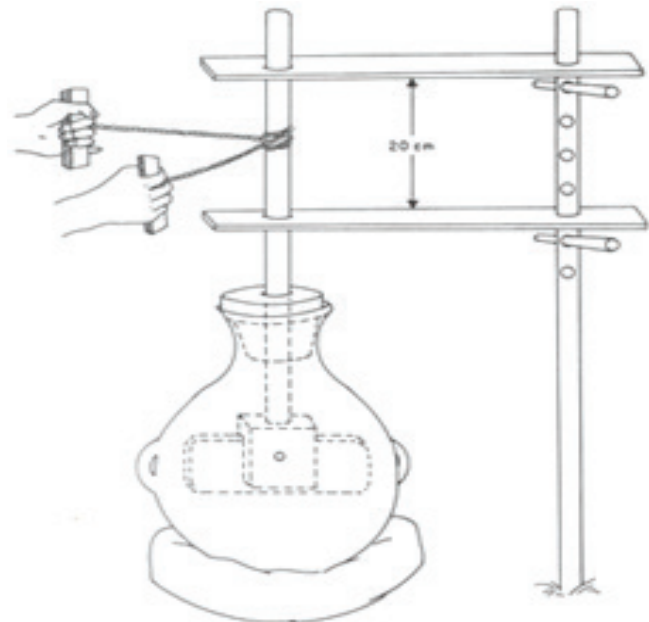
After churning for a few more minutes, the straw is again inserted through the vent. If the straw is clean, this indicates that the butter granules have coalesced into larger grains. The churn is then rotated on its base; the grains which collect in the centre form lumps of butter which are skimmed off. The butter is then kneaded in cold water and washed to remove visible residual buttermilk.

About 600 gm of butter is produced from 10 litres of milk from local cows, i.e. about 16.5 litres of milk is required to produce 1 kg of butter. After removing the butter produced, the liquid that remains after processing the buttermilk is heated gently and slowly in a clay pot and is allowed to cool down and then separated into local cottage cheese (locally known as ayib) and whey.

The time taken to churn butter using gourd ranges from 25 to 60 minutes and that of the clay pot ranges from 60 to 80 minutes. The amount of milk collected per churn ranges from 5–10 litres, and the amount of butter produced per churn ranges from 200–600 gm.

Efficiency of butter making is markedly influenced by temperature and acidity of the sour milk. If it is too cold, butter formation is delayed and the grains become small and difficult to handle. If the temperature is too high, the yield of butter is reduced because a large proportion of the fat remains in the buttermilk, and the butter will be spongy and of poor quality. Sour milk should be churned between 10 and 12°C in the hot season and between 14 and 17°C in the cold season.

Figure 2. Traditional clay pot butter churner with the ILCA developed internal agitator with paddle blades.



The traditional method is time consuming and less efficient. To address this issue, improved churn was developed and introduced by the International Livestock Centre for Africa (ILCA) (O'Mahony and Bekele 1985). The technology is a simple, low cost agitator that could be assembled inside the churn. The improved churn consists of a central shaft, paddle blades, and restraining shafts, which fix the agitator in position. The paddle balances are fitted on the central shaft. The agitator is driven by pulling on a rope wound around the main shaft of the agitator. The agitator is driven

by pulling on a rope wound around the main shaft of the agitator (O'Mahony and Bekele 1985). The improved churn greatly reduces the churning time and improves efficiency of fat recovery.

Another improved churner developed over the traditional churner was the improved aluminium manual butter churner (Figure 3). The churner is rotated manually and is easy to clean thus improving the quality of the butter.

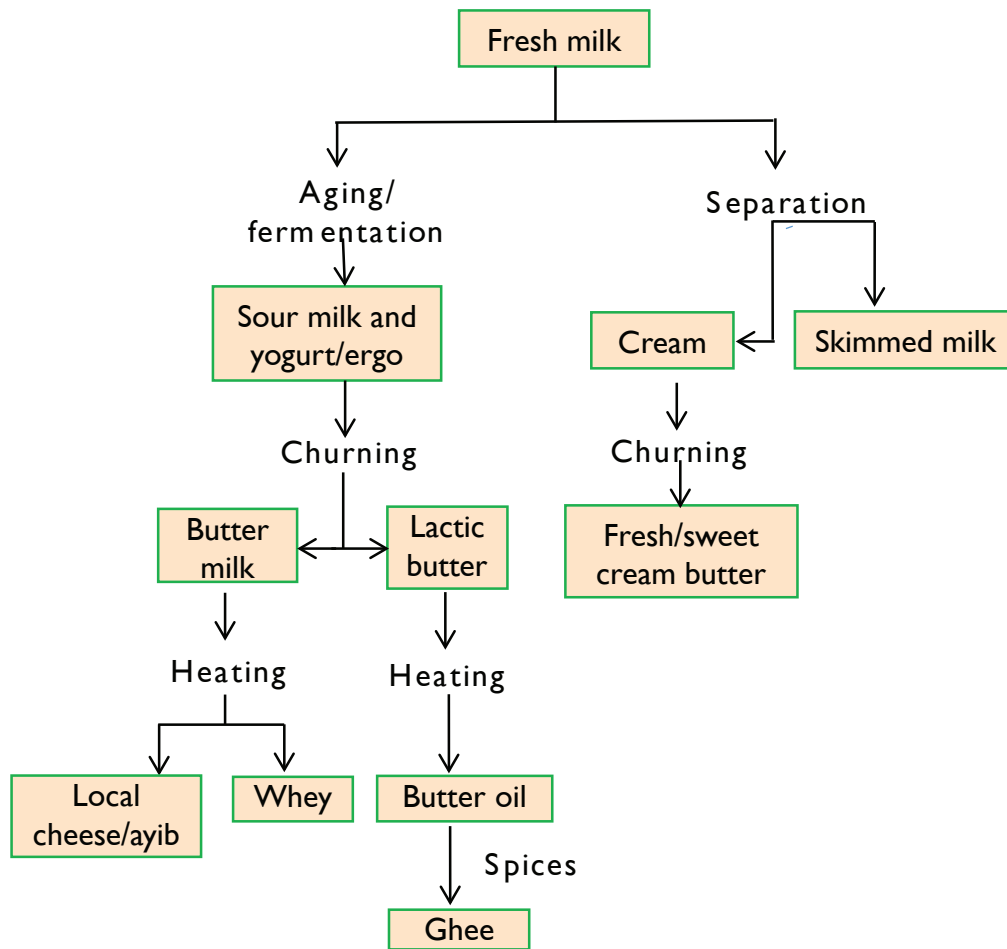
Figure 3. Improved aluminium manual butter churn.



In contrast to the traditional butter production practice, commercial production of fresh butter has been initiated by cooperatives and private dairy enterprises, usually in and near urban centres. Fresh milk is first separated into skim milk and cream and the cream is then used to make the fresh butter. Equipment commonly used for this commercial processing includes cream separators and aluminium butter churner.

The butter processing in the traditional and commercial sectors are summarized in Figure 4. The traditional butter processing starts with aging/fermentation of the milk, while the modern processing starts with separation of the milk into cream and skim milk.

Figure 4. Process in the traditional and modern butter production.



### 3 Importance of butter in the LIVES project areas

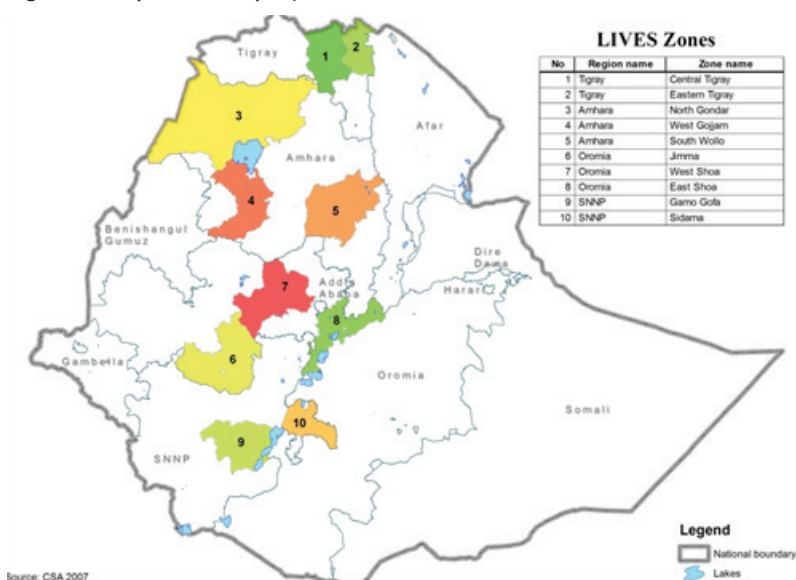
#### 3.1 The LIVES project

The Livestock and Irrigated Value chains for Ethiopian Smallholders (LIVES) project is aimed to contribute to environmentally sustainable, enhanced income and equitable wealth creation for smallholders and other value chain actors through increased and sustained market off-take of high value livestock and irrigated commodities. The LIVES project, supported by the Canadian Department of Foreign Affairs, Trade and Development (DFATD), is implemented by ILRI and IWMI, in collaboration with the Ethiopian Institute of Agricultural Research (EIAR), the Ethiopian Ministry of Agriculture, regional bureaus of agriculture, livestock development agencies, regional agricultural research institutes and other development projects.

The LIVES project is designed to support the commercialization of smallholder agriculture by testing and scaling out/up of successful lessons to other parts of Ethiopia. The project aims at developing the value chains for selected livestock and irrigated crop commodities in each of the four major highland regions (Tigray, Amhara, Oromia and Southern Nations, Nationalities and Peoples Region (SNNPR)) in Ethiopia. The project targets direct interventions in 31 clusters of districts in 10 zones (Figure 5). Dairy value chain development is targeted in 9 of the 10 zones.

The project carries out a range of activities in five focus areas: capacity development, knowledge management, promotion, commodity value chain development and research/documentation. Gender and the environment are integrated and mainstreamed in all components of the project.

Figure 5. Map of LIVES project zones.



Source: CSA 2007

Table 1. Area, and human and livestock population in the LIVES project zones and proportion to respective national figures excluding nine non-sedentary zones in Afar and Somali regions

Zone	Area (%)	Human population (%)	Cattle (%)	Sheep (%)	Goats (%)
East Tigray	10,377.5 (0.92)	157,836 (0.21)	732,701 (1.37)	287,625 (1.13)	993,935 (4.40)
Central Tigray	6099.4 (0.54)	698,278 (0.95)	405,097 (0.76)	518,835 (2.04)	240,341 (1.06)
North Gondar	45,934.1 (4.07)	911,653 (1.24)	2,446,359 (4.59)	757,210 (2.98)	1,147,203 (5.07)
South Wollo	17,059.6 (1.51)	320,738 (0.43)	1,673,334 (3.14)	1,944,501 (7.64)	737,587 (3.26)
West Gojam	13,525.4 (1.20)	782,904 (1.06)	2,044,085 (3.83)	836,413 (3.29)	238,528 (1.06)
Jimma	181,26.1 (1.60)	348,215 (0.47)	2,317,678 (4.35)	824,485 (3.24)	310,642 (1.37)
West Shoa	14,788.8 (1.31)	398,585 (0.54)	2,101,502 (3.94)	903,165 (3.55)	314,629 (1.39)
East Shoa	9988.7 (0.88)	507,825 (0.69)	1,031,652 (1.93)	320,326 (1.26)	475,393 (2.10)
Sidama	6538.2 (0.58)	431,183 (0.58)	2,077,636 (3.90)	377,506 (1.48)	298,866 (1.32)
Gamo Gofa	11,285.0 (1.00)	527,682 (0.72)	1,438,752 (2.70)	800,704 (3.14)	336,941 (1.49)
Total	153,722.8 (13.6)	5,084,899 (6.9)	16,268,796 (30.5)	7,570,770 (29.8)	5,094,065 (22.5)

Source: Human population, CSA (2007); Livestock population, CSA, Atlas of Agricultural Statistics (2006/07–2010/11).

## 3.2 LIVES baseline data collection methodology

In order to develop the dairy value chain in the selected zones, the project conducted community-level baseline survey, in addition to making careful diagnostic observations on the operation of the value chain. The baseline survey was conducted during July–September 2012. Quantitative data on value chain actors at district, zonal and regional level were collected using structured questionnaire from 196 sample peasant associations (PAs) (about a quarter of the total targeted PAs) in the 31 project districts in the 4 regions. Baseline data on dairy production and marketing was collected from 8 zones, 25 districts and 93 PAs. See Table 2 for details.

Table 2. Sample PAs for dairy commodity development in the selected zones/districts

Zones	No. of districts	No. of PAs	No. of LIVES PAs*	No. of dairy PAs**	No. of dairy sample PAs***
Central Tigray	3	66	61	48	11
Eastern Tigray	4	84	77	53	14
North Gondar	3	128	94	54	13
South Wollo	3	106	95	51	13
West Gojam	3	120	80	39	9
West Shoa	3	108	87	36	8
East Shoa	3	99	73	60	16
Sidama	3	107	38	38	9
Total	25	818	605	379	93

\* Some of the PAs in a district did not have potential for the LIVES commodities.

\*\* PAs in a district where dairy was a potential market-oriented commodity.

\*\*\* PAs sampled on proportionality to size basis.

Participatory methods were used to collect PA (*kebele*) level quantitative data through focus group discussions and key informant interviews. Furthermore, agricultural records of the district office of agriculture (OoA) and *kebele* administration as well as records held by development agents (DAs) and other sources were reviewed. Data collection was conducted by LIVES regional teams, research staff from regional agricultural research institutes and experts from regional, zonal and district level offices of agriculture.



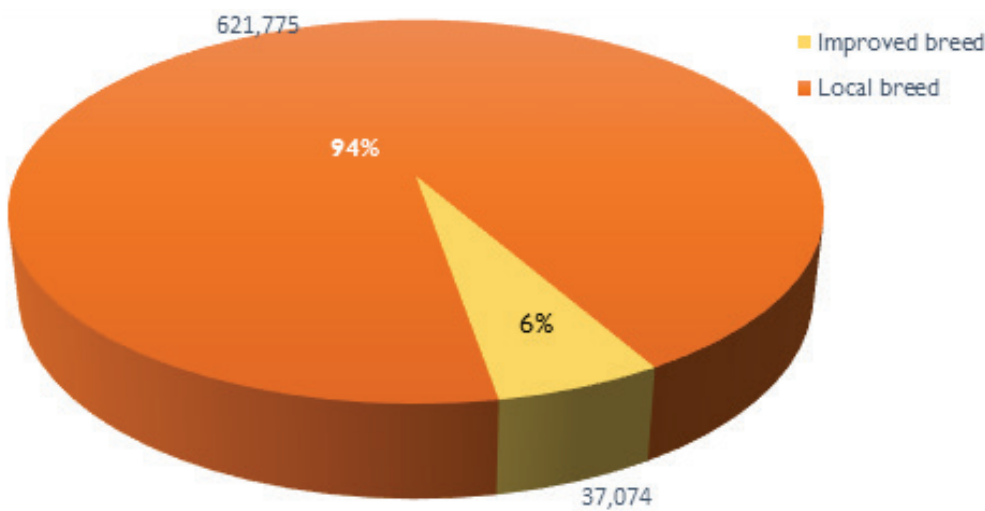
The baseline survey focused on establishing PA level baselines for the selected livestock and irrigated crop value chains. The PA level data were then used for extrapolation to generate aggregate baselines for all selected potential dairy PAs.

### 3.3 Baseline data results

#### Dairy cattle population

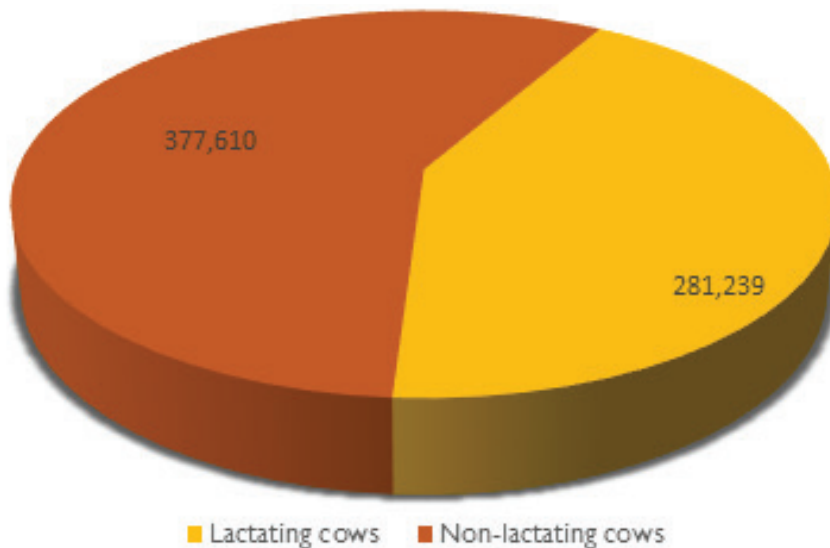
The total number of cows by breed is presented in Figure 6. In total, there are 658,849 cows in the 379 LIVES dairy potential PAs out of which 37,074 (6%) are of the improved dairy breed type. The percentage of crossbred cows in our study is higher than the national estimate of 1% provided by CSA (2013).

Figure 6. Number of cows by breed in LIVES targeted dairy PAs.



The percentage of lactating cows out of the total number of cows is 42.6% across the sample PAs (Figure 7). This has a significant implication in total milk production and feed utilization, as about 57% of the cows have to be fed and managed without producing calves and milk.

Figure 7. Lactating and non-lactating cows.



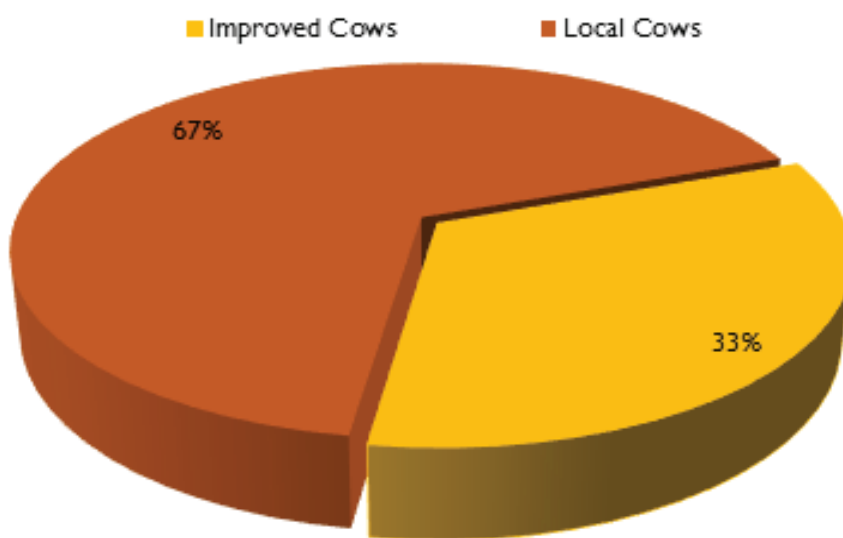
Source: LIVES community baseline survey.

## Milk productivity/production

Survey result showed that average milk yield of local cows was 1.75 litre/day over a lactation period of 190 days. According to a recent estimate, the national average of daily milk yield of a local cow is 1.32 litre with a lactation period of 180 days (CSA 2012/13). The estimated daily average milk yield for an improved dairy cow is 7 litres with a lactation period of 242 days.

In total, the total estimated annual milk production in the targeted dairy PAs is estimated at 127.3 million litres of which 41.9 million litres is produced by improved dairy breeds. This indicates that although the population of improved dairy cows accounted for about 6% of the total cow population in the targeted dairy potential PAs, improved dairy cows contribute about 33% of the total milk production (see Figure 8).

Figure 8. Proportion of annual milk production (litres) in LIVES dairy potential PAs by breed.



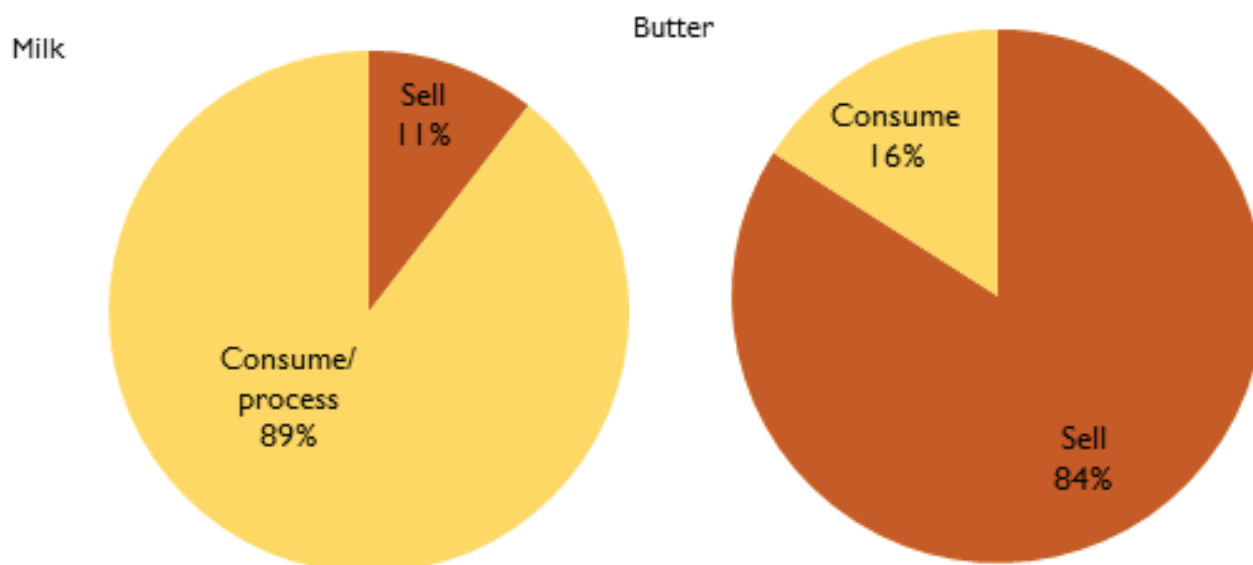
Source: LIVES baseline survey (2012).

## Butter production and sale

Survey results also showed that a total of 4932.6 t of butter was produced by all 379 LIVES project PAs in a year. Assuming a conversion factor of 16 litres of milk per a kg of butter, butter production accounts for about 62% of the total milk production. Most of this butter is produced and sold by females in male- and female-headed households.

The total number of milk producing households is 170,302 in the 379 LIVES targeted PAs. Out of these, 143,054 households (84%) sell butter (Figure 9), while only 10% sell fluid milk. The total amount of butter sold is estimated at 3707.3 t (75.2% of the produce) with a market value of 418 million Ethiopian birr (ETB).

Figure 9. Proportion of dairy households that sell milk and butter in the LIVES project PAs.



Source: LIVES Baseline survey (2012).

The prices of butter and milk across the PAs averaged around ETB 112.75/kg and ETB 6.91/litre, respectively. This translates into a price ratio of about 1:16.3, which is roughly the same as the conversion rate of 16 litres of milk into 1 kg of butter. The price ratio based on the IPMS baseline data collected in 2005 was 1:9.4. The value of butter has, therefore, appreciated by about 73% indicating the increasing importance of butter relative to milk in the LIVES targeted areas.

### The effect of distance/travel time on household decision to participate in fluid milk and/or butter market

To analyse the effect of distance/travel time on milk and butter producers' decision to participate in the market, the sample PAs were categorized into two with the help of Geographic Information System (GIS) models. The first category includes PAs with 50% or more of their geographical area within a one-hour walking distance from population centres of more than 5000 inhabitants. While the second category includes those PAs with 50% or more of their geographic area beyond the one hour walking distance.

Out of the 93 sampled PAs, 8 fall within the 1 hour radius while the remaining 85 PAs were outside this boundary (see Table 3). On average, 343 and 451 households per PA are involved in milk production from local cows in the nearby and remote PAs, respectively. On the other hand, 204 and 31 households per PA produce milk from improved cows from the nearby and remote PAs, respectively, and we found statistical evidence of this difference.

Table 3. The spatial distribution of the sampled PA with respect to major market centres

		50% of the PA area fall within	
		<= 1 hr	> 1 hrs
Number of domain PAs		24	344*
Number of sampled PAs		8	85
Average number of households producing milk from local cows per PA		343	451
Average number of households producing milk from improved cows per PA		204	31
Average number of households selling per PA	Milk	56	46
	Butter	266	383

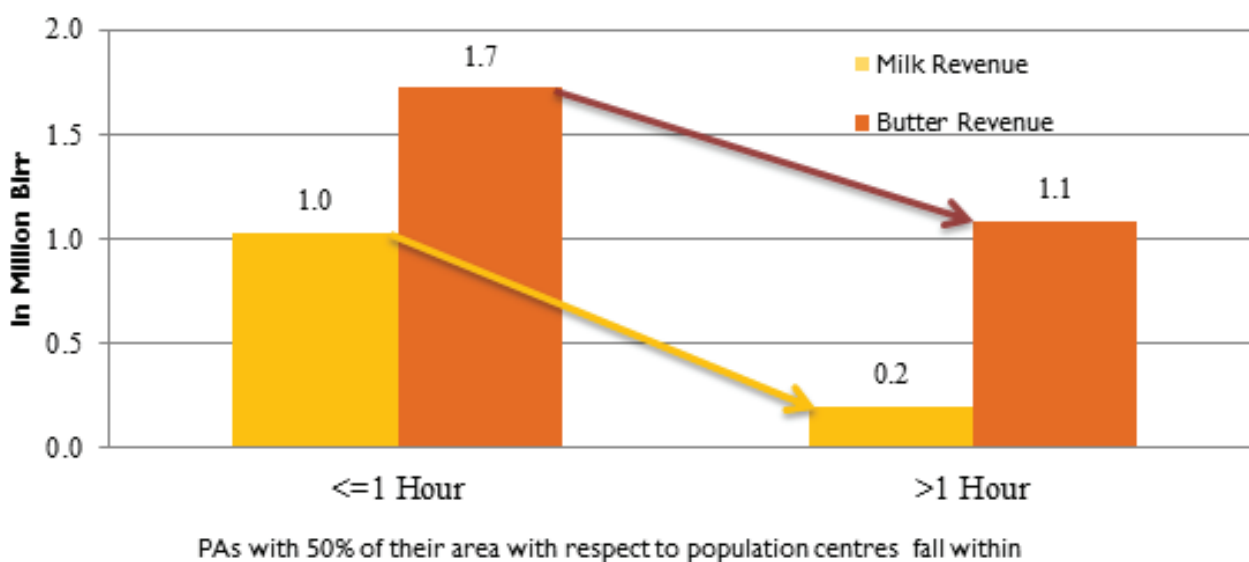
\*Total number of dairy potential PAs are 379 but since we could not locate 11 PAs on our GIS database, these were not included in the discussion.

Source: LIVES baseline survey (2012).

## The effect of distance/travel time on milk and butter revenue

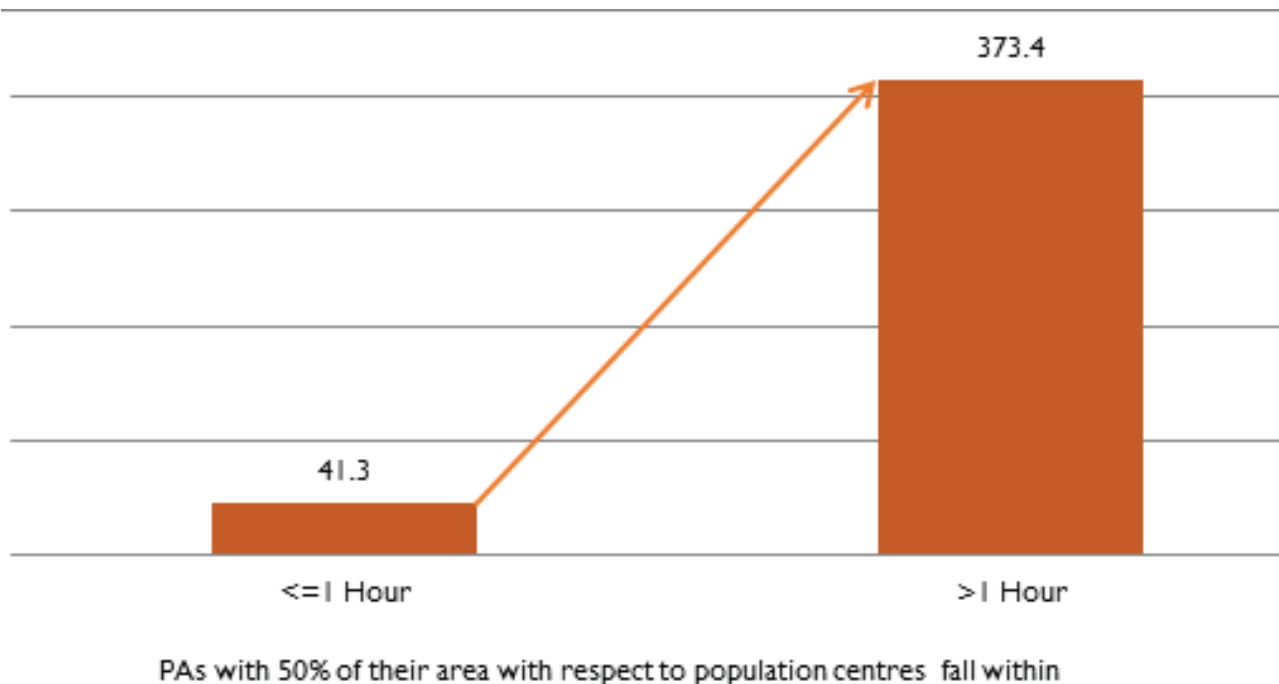
Average revenues from sales of milk and butter for the sample PAs from the two categories show that the largest revenues from both butter and fluid milk/sample PAs are found in PAs nearest to consumption centres (see Figure 10). As expected, sales revenues from milk/sample PA decline dramatically (by 80%) with increase in travel distance. It is interesting to note that average sales revenue of butter/sample PA in nearby PAs is in fact higher than the sales revenue from butter in the more distant PAs. However, if the results of the sample PAs for butter are extrapolated to the two dairy domain areas (more or less than 1 hour travel distance) total revenue from butter sales in areas more than one hour travel distance are 9 times more than in areas within a one hour travel distance (Figure 11).

Figure 10. Average revenue from sale of milk and butter per PA.



Source: LIVES baseline survey (2012).

Figure 11. Total revenue from sale of butter by domain of PAs.



Source: LIVES baseline survey (2012).

A more thorough household level survey is planned by the LIVES project to investigate household level and institutional factors determining market orientation in the dairy value chain.

### Summary of key results

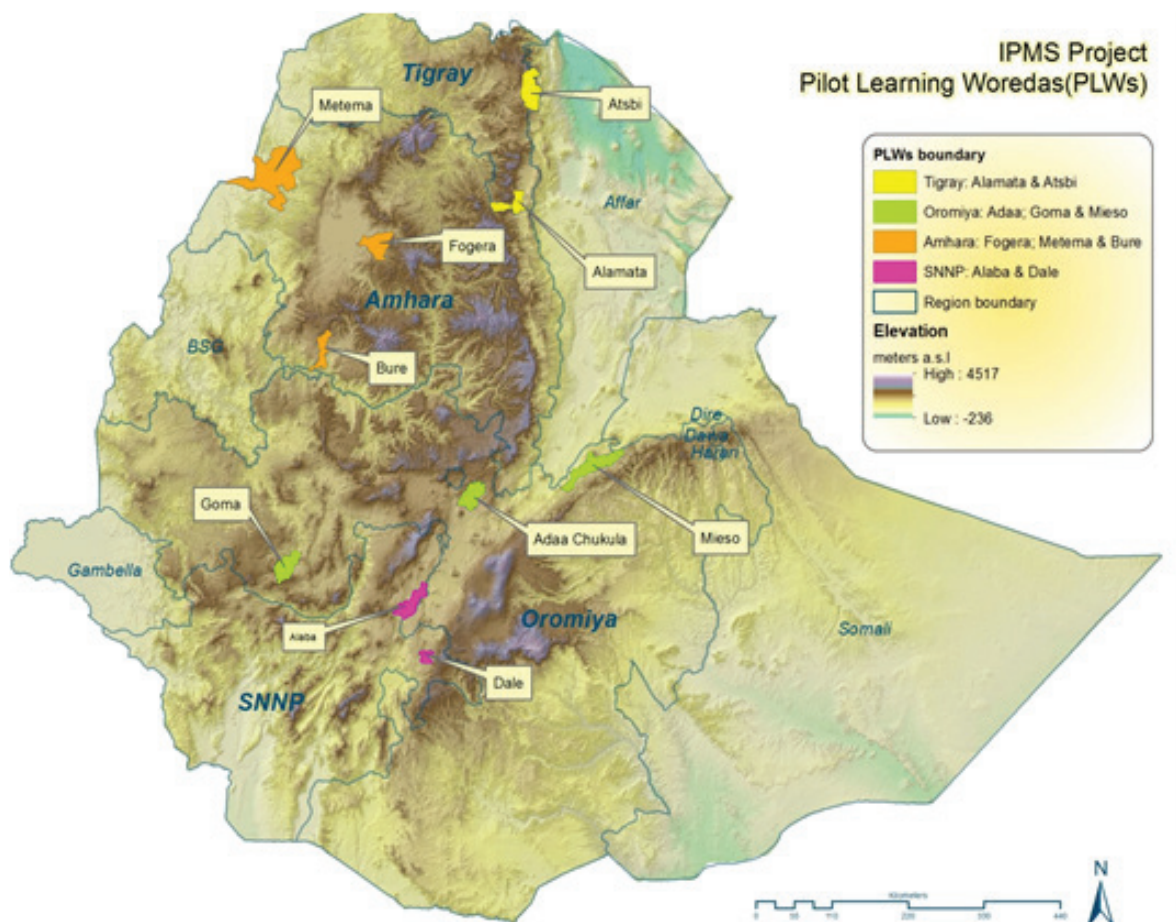
In summary, the LIVES project baseline study shows that in the LIVES project areas, the number of crossbred cows is 6% of the total dairy cattle population. However, improved dairy cows account for 33% of the total milk production. The proportion of lactating cows is only 43% of total dairy cattle population, which has significant implications for total household milk production and feed utilization. Traditional (lactic) butter production and marketing is highly commercialized in that 84% of the farm households who produce butter sell butter and 75% of the butter produced is sold. Unlike the sale of fluid milk, which mainly takes place in and near urban centres, butter is produced and sold in rural areas. Butter churning takes place at household level mainly by females, both in male and female-headed households.

# 4 Rapid assessment of the butter value chain

## 4.1 The IPMS project

The IPMS project preceded the LIVES project and operated from 2004 to 2012 in 10 Pilot Learning *Woredas* (PLWs) in the 4 major highland regions of Ethiopia.

Figure 12. IPMS project districts (*woredas*).



Funded by the Canadian International Development Agency (CIDA), the project introduced the commodity value chain development approach in the 10 PLWs in partnership with the staff of the then Ministry of Agriculture and Rural Development (MoARD). A learning approach was adopted, based on the project's four pillars, i.e. knowledge management, capacity development, commodity value chain development and learning and promotion (studies/research/documentation).

An integral part of the project activities were diagnostic studies to better understand existing systems with the aim of designing interventions and establishing baselines. One of the rapid diagnostic studies focused on a rapid assessment of the butter production and marketing system.

## 4.2 Rapid butter value chain assessment methodology

The study was conducted in 2007–08 production year and all data and information pertain to the same year. The research followed the rapid appraisal of value chain approach (Holtzman 1995; Morris 1995). The study was conducted in four Ethiopian regional states of Tigray, Amhara, Oromia and the SNNPR, with particular focus on the 10 Pilot Learning *Woredas* (PLWs) (districts) of the Improving Productivity and Market Success (IPMS) of Ethiopian farmers project (2 PLWs from SNNPR and Tigray each and 3 PLWs from Amhara and Oromia regions each).

Data on butter production and marketing were collected from experts of the offices of agriculture, selected butter producers from potential production areas and actual butter market visits in the PLWs. A checklist was used to generate the required information from all three groups of respondents. This helped to verify the data through triangulation. The checklist employed enabled to examine key variables including the smallholder butter production characteristics, input supply, extension service, credit supply, processing and marketing.

## 4.3 Results from rapid assessment of the butter value chain

### Butter production system

#### Butter producers

Most of the butter is produced by sedentary farmers within the districts. However, in Metema PLW, butter production within the district also takes place by transhumant farmers who seasonally migrate from adjacent highland districts.

In Metema *woreda* a large group of cattle herders from parts of the highlands of Northern Gondar (Gondar Zuria, Dembia and Chilga districts), migrate to Metema with their cattle (mainly cows) at the beginning of the rainy season in search of grazing areas and stay there for about four months before they return back. The butter produced by these transhumant is highly significant with regard to the total volume of butter sold in the *woreda*, even though some is also sold outside the *woreda*.

In Kelisha PA in Atsbi Womberta PLW, which borders the lowland areas of Afar, farmers herd their cattle in areas far away from the homestead, make butter and carry it back to the homestead weekly or fortnightly.

#### Cattle breeds for butter production

Butter is almost entirely produced from milk of local cows in all the PLWs. The milk yield from local cows is low (1.32 litre/day). Butter producers in some of the *woredas* (e.g. Bure, Mieso) reported that they prefer local cattle for butter production because of the high fat content in the milk. Butter producers in Bure *woreda* are so sensitive to fat content of the milk that they even differentiate among the local cows based on milk fat content. They give special name to

cows of high milk fat content such as ‘Ye kibe lamoch’ which literally means butter cows. The same situation also applies in Mieso *woreda*.

## Feeding

Grazing areas and crop residues are the most common feed resources in all *woredas*. However, during the dry season, most *woredas* experience feed shortage resulting in reduced milk/butter production. The effect of dry season feed shortage on milk/butter production is more pronounced in drought prone areas like Mieso, Atsbi and Alamata PLWs. For example, in Atsbi *woreda*, according to Office of Agriculture and Rural Development (OoARD) experts, average daily milk production from local cows in the rainy season is around 2.5 litres/cow and this is reduced to 1–1.5 litres during the dry season (January to May). Supplementary concentrate feeding is not practiced in the rural areas where most butter is produced. In urban and peri-urban areas, farmers use supplementary concentrate feeds for improved crossbred dairy cows that produce milk for sale.

## Butter production

Processing of milk into butter is primarily done by female household members. Butter is used for home consumption and is an important milk product targeted for marketing. Butter is used for cooking and cosmetic purposes for skin and hair treatment. Butter meant for cosmetic purposes is often fresh while mature butter is preferred for cooking. In most *woredas*, the demand for butter increases with the level of household cash income, which also varies seasonally. For example, when households generate cash from the sale of cash crops, their demand for butter increases.

Major butter producing areas have been identified in the PLWs. Each PLW has important butter producing locations near or far away from major consumption centres; a fact also noted in the LIVES baseline results. An exception is Ada’a PLW, where no major butter producing areas were found and only small amounts of butter are produced mostly for home consumption. The likely explanation for this limited production of butter in Ada’a is that sale of fluid milk is common due to relatively well-developed fluid milk market. For farmers who do not have easy access to fluid milk market (because of distance and transportation problem), butter can be a better option and better economic use can be made of labour required for processing milk. Similar observations were made by experts in Mieso, where only small amounts of butter is produced primarily for household consumption due to the high demand for fluid milk by the predominantly Muslim population. In the lowland district of Metema, it was noted that due to the high temperature, butter is processed into butter oil, which can be stored for a longer period.

## Butter markets

There are a number of butter markets in the PLWs. In most cases these markets are open fields and do not have any form of market infrastructure. The markets are operational on certain days of the week. Dale *woreda* has the highest number of butter markets among the PLWs. According to OoARD experts, at least one butter market exists in each of the 36 PAs in the *woreda*. In Metema PLW it was noted that there was no butter market/outlet in the towns; butter is sold in the PAs where it is produced.

## Sale and income of butter

In almost all the PLWs (except Ada’a), butter is primarily produced for sale and women in the household are responsible for butter making and marketing. They decide on the amount of butter to be sold and are responsible for managing the income. Interviews with butter producers showed that the revenue from butter sales is used primarily for covering household expenses and some amount is channelled for saving or investment, and to cover various expenses such as payment of fertilizer loans and purchase of inputs for livestock.

In some PLWs, traditional milk and butter saving groups play the role of enabling households’ pool their income from butter sales. The income will then be used to cover relatively large expenses such as wedding ceremonies. For example, in Dale *woreda*, a traditional butter group known as shufo exists whereby a group of women come together and each member takes turn to receive butter produced by all other members.



Local saving institutions are also used by butter producers to save part of their income from the sale of butter. Key informants in Gomma *woreda* revealed that they save part of their income from butter sales at local social saving and credit institutions like equb and idir as well as in saving and credit cooperatives and MFIs.

## Butter input/service supply system

### Inputs

#### *Feed supply*

Most fodder consumed by dairy cattle is produced on farm. In farms near urban centres, dairy farmers who target fluid milk markets purchase fodder (hay, crop residues) from local markets and sometimes concentrate feeds. In rural areas, farmers rely entirely on natural pasture and crop residues to feed their cows.

#### *Churners*

Butter producers in all the *woredas* indicated that they make use of traditional churners. In some of the PLWs, efforts have been made by the OoARD and NGOs to introduce modern churners for smallholder butter producers.

In Metema, the Integrated Livestock Development Project (ILDIP) provided training for *woreda* OoARD experts and DAs on the use of modern churning technology. After the trainings, the project distributed two types of churners, wooden and aluminium churners to selected butter producers in selected PAs (Kumer, Gendewuha and Gubay). Farmers reported that they experienced problems with both types of churners, especially the wooden churner. OoARD experts explained that it was difficult to clean the churner after use as it is made of wood. This in turn affects the quality of the butter. The aluminium churner saves time and energy. However, butter producers complained about the lack of spare parts since there are no suppliers in the *woreda*. It was observed during the rapid assessment that the churners distributed by the project were still being used by butter producers. In Atsbi *woreda*, an NGO called World Vision distributed improved churners for selected producers. However, producers reported that they were no longer using them as they were not more productive than the local ones.

#### *Credit*

While some credit is available for dairy producers for purchase of improved cows in and around urban centres, credit for butter producers in rural areas is not available. The need for credit to finance collective action for processing of milk was also indicated.

#### *Extension service*

The study shows that there was no extension service specifically targeting butter production and marketing. Butter producers observed that extension staff have limited knowledge on breeds suitable for butter production, relevant feeding practices and milk processing technologies.

## Butter processing and marketing

### Processing

The processing and marketing of butter is distinctly different for the two types of butter, i.e. lactic butter and fresh butter. A number of dairy cooperatives and private processors have been established in Alamata, Fogera, Bure, Ada'a, Mieso and Dale to sell fluid milk and also to produce fresh butter, especially during the fasting periods. The study observed that modern churners and cream separators are found in dairy cooperatives, often supplied by the OoARD and projects funded by NGOs. Staff of the OoARD and/or projects provided training on the use of the equipment.

Fresh butter produced by the cooperatives is sold directly to consumers in bulk or in simple packages. Cooperatives which own refrigerators and/or freezers store the butter. Processing of traditional butter is an integral part of farm activities at household level.

## Butter marketing

In almost all PAs, butter producers use cups, jugs or other local containers to transport their product to the market on foot. Women take the leading role in production and marketing of butter. Interview with butter producers reveals that most producers sell their butter in a few days after production. Butter is also stored in the household. For example, in Atsbi, butter is stored in cool places using small pots, wooden containers or plastic jugs. Butter producers indicated that as long as the butter handling process is done with proper sanitation and the containers are well fumigated,<sup>2</sup> the butter could stay for about a month without losing its quality.

The use of improved and modern packages for traditional butter is not common in the visited *woredas*. In Gomma and Alaba *woredas*, butter is wrapped with leaves of castor bean, banana, or false banana and sold in the local markets. In Dale *woreda*, false banana leaves locally known as oficho are used to wrap the butter supplied to the local markets.

In Atsbi and Alamata *woredas*, butter is made into round shapes, commonly known as butterballs and carried inside plastic containers. Butter made from fresh cream, sold by cooperatives and private processors, is usually sold in plastic bags.

Butter producers in the different *woredas* use different types of traditional and modern measuring (weighing or otherwise) equipment for marketing. In Alamata, different kinds of local units such as kuchimo,<sup>3</sup> cup or mug are used. A shape, locally known as mulmul is also used for measuring butter. In Mieso, local units known as gnogno, militia and shrimiri using local utensils like cups and jugs are used to measure butter during trade. Local units are used in butter trading in Atsbi, Fogera, Bure and Gomma *woredas*.

## Butter quality

There are no formally established standards and grades for butter. Both sellers and buyers often use traditional butter quality indicators such as origin, colour, smell, consistency and degree of adulteration with foreign materials. Yellow-red is preferable to white butter in most of the *woredas*. Most buyers suspect that white butter is adulterated with foreign materials. However, butter from cows in some *woredas* may take either yellow or white colour depending on the breed and the feeding system (green feed has high carotene content and hence high vitamin A—resulting in yellow colour of the butter).

Origin of butter is also an important quality indicator in *woredas* where butter is mostly supplied from outside the *woredas*, such as Ada'a, Alaba, Gomma and Dale. For example, in Dale *woreda*, there is a type of butter known as Hintate butter, which is used as a benchmark to compare quality of other butter in the *woreda*. According to the OoARD experts, Hintate butter, which comes from the lowlands of Wolaita Sodo, is considered to be one of the best. The same is true in Alaba *woreda* where butter from Wolaita Sodo serves as a benchmark for quality. It is worth mentioning, that well known origins of quality butter are also often most susceptible to adulteration.

In Metema, colour and smell of the butter are the main quality indicators used by buyers. According to the OoARD experts, golden colour indicates good quality. Whitish colour in semi-processed butter (butter oil) is considered to be likely adulterated with foreign matters including buttermilk and is associated with butter supplied by the transhumance. With regard to smell, semi-processed butter of good quality is said to have a pleasant smell. In most *woredas*, buyers check the quality and consistency of butter by smelling and spreading on the skin before deciding to purchase.

2. Butter containers are smoked with fragrant wood of *Olea africana* (woyera) for preservation and to enhance aroma and taste. This is locally called woyera maten.

3. 1 kg = 2.5 kuchimo, 1 kuchimo = 2 cups, 3 mugs = 1 kg.

## Market participants and channels

Market participants include butter producers, final end users and intermediary traders/and processors. Rural and urban consumers/processors consist of individuals as well as restaurants/hotels. Brokers, who facilitate trading without actually owning the product, are not very common. The existence of brokers was reported in Metema *woreda* only. These brokers usually collect their fees from the traders.

Based on the rapid assessment, the following five market channels are identified:

i. Butter producer – rural consumer

Direct sale of butter from producer to rural consumers usually takes place in local rural markets or along the road side and takes place in all the *woredas*.

ii. Butter producer – assembler/collector – rural consumer

This is another important channel dominated by the assemblers/collectors who buy directly from farmers, or in local markets or along road side and sell to rural consumers.

iii. Butter producer – assembler/collector – butter shop/retailer – urban consumer

Assemblers in Dale *woreda* collect butter from producers and sell it in Yirgalem town travelling on foot for about 2 hours. Since there are a number of rural assemblers in the *woreda*, they usually compete among themselves to collect butter from producers and rural markets. Prior contractual arrangement is not common; this means butter producers sell their product to any rural assembler offering good prices. In Fogera *woreda*, some rural collectors collect butter from PAs and supply to shops in Woreta town. They are engaged in this business seasonally, i.e. collect butter during the rainy season, from July to October when feed is abundant.

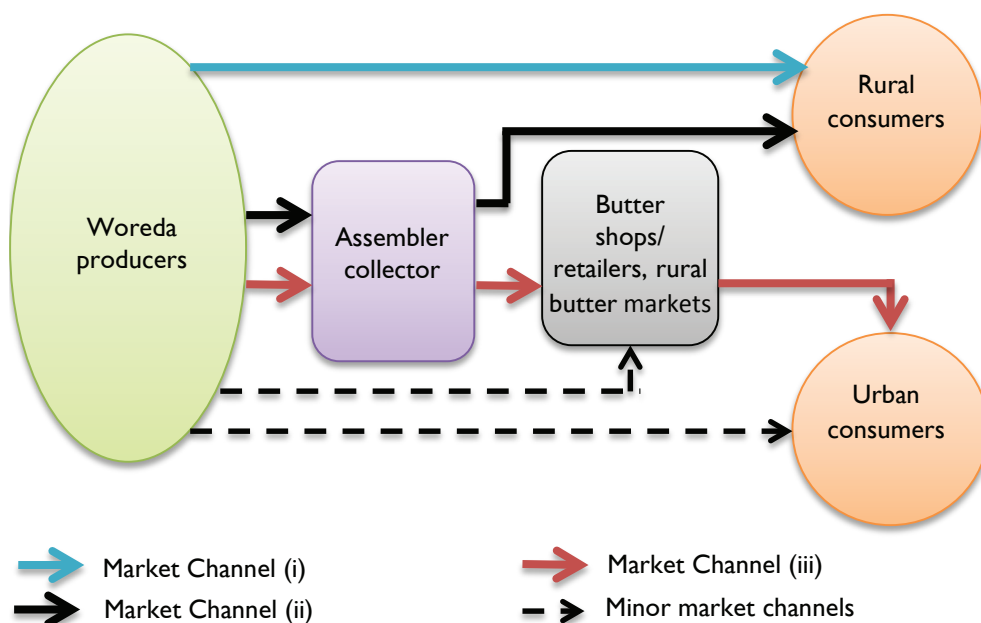
iv. Butter producers – retailers/processors

This is minor butter market channel. Retailers and/or processors sometimes buy directly from butter producers. In such cases, there is a customer type relationship between the producers and the retailers/processors. For example, in Metema there are no butter markets in the major towns and most butter is traded in rural markets. In Kokit PA, traders and hotel owners from Gendewuha town buy directly from producers at their residence. In general, farmers with large number of milking cows who often produce large quantities of butter do not take butter to the market, rather traders and hotel owners buy butter directly from the homestead. In some *woredas* (like Alamata) they refer to this as producer butter, which is usually considered free from adulteration (as compared to trader butter which is often suspected of adulteration).

v. Producers – urban consumers

Another minor butter market channel is one that takes place when producers bring their butter to urban market centres where they sell directly to urban consumers. This market channel is used by producers who live nearby urban centres.

Figure 13. Main butter trading channels.



### Butter pricing and trading

The demand for butter depends on various factors including season of the year, fasting, holidays, wedding season and availability of cash crops. Since demand and supply of butter increases or decreases depending on the months of the year, most price fluctuations are seasonal. The seasonal price variation is linked to the volume of supply and demand in the respective *woredas*. Butter supply is high in all *woredas* during and immediately after the rainy season because of availability of green fodder and water. In contrast, in the dry season, the volume of butter supply usually declines in almost all the *woredas* because of lack of green fodder and water supply. Accordingly, price of butter is usually relatively lower during the rainy season and increases during the dry season. In the coffee producing *woredas* of Goma and Dale, demand for butter increases during the coffee harvesting season. It was also noted that during this period, the volume of supply decreases, because households become less cash constrained, and therefore they are less likely to take butter to the market to generate cash income. Similar situation exists in Alaba *woreda*.

Spatial price differences were also observed between *woredas* as well as between PAs within a *woreda*. Most of these differences are related to local supply/demand situations. Generally, the market price level, the type and quality of butter and negotiation skill of buyer and seller determine the exact price.

In general, *woredas* can be categorized into three based on their butter trading positions:

- Butter self-sufficient *woredas*, in which demand for butter is more or less met by the supply of the butter produced in the *woreda*. Alamata and Fogera *woredas* fall into this category.
- Butter exporting *woredas* in which butter production in the *woreda* exceeds demand and the excess is sold to markets outside the *woreda*. In Atsbi, the major buyers include consumers and wholesalers who sell butter in Wukro and Mekelle markets. In the case of Metema, where butter oil is produced, there are butter dealers who collect butter in large amounts during the rainy season and sell to traders in Gondar and Tigray. There are also mobile butter traders in the city carrying butter in large quantities especially during the rainy season when the transhumans arrive in the *woreda*. Bure *woreda* is another surplus *woreda*. Traders at Bure buy butter from Bure *woreda* itself and outside the *woreda* from Tilili town, which is known for its butter supply.

- Butter importing *woredas*, in which butter production in the *woreda* does not meet the demand and requires purchase of butter from markets outside the *woredas*. Ada'a *woreda* imports/buys butter from the central butter market in Addis Ababa, locally called Gojam Berenda. Another example is Gomma which purchases most of its butter from neighbouring district including Getchi (Illubabor), Gembero (Wollega), Sigo (Jimma zone), Gatera (Jimma zone) and Arjo (Wollega). Similarly, in Alaba *woreda* additional butter is imported from Wolaita Sodo, Borana and Selam Ber areas that are adjacent to the *woreda*. The same is true for Dale *woreda*. A butter retailer at the Yirgalem market (Dale *woreda*) indicated that he has been in the business for the past 10 years and buys butter from rural assemblers who bring the produce from other adjacent *woredas* such as Arbegona and Hintate.

## Summary of key results

The IPMS sponsored rapid butter value chain assessment study confirms most of the findings of the LIVES community baseline survey. Butter is an important marketable milk product in rural Ethiopia. Local cows account for almost all the butter produced. The rapid assessment study shows that producer to consumer market channel dominate butter sale for consumption in the *woreda*, while producer to trader channel dominate for sales outside the districts. In the IPMS rapid assessment study, butter markets were identified in most of the project districts. Most of the districts were butter deficient and imported butter from other *woredas* to satisfy the demand for cooking and cosmetic purposes. The assessment study also indicated that supply systems for inputs and services are inadequate and resulted in poor animal management and feed shortages. Shortage of improved breeds and the prevalence of animal diseases, especially in the rural areas where most butter is produced, are also critical problems.

## 5 Conclusions and recommendations to expand the butter value chain

The baseline survey of the LIVES project and the IPMS sponsored rapid butter market appraisal study clearly demonstrate the importance of butter in rural Ethiopia. The results of the rapid market survey conducted in the 10 Pilot Learning *Woredas* (PLWs) provided an insight into the functioning of the butter value chain. Results show that to improve the production of fluid milk and to increase the production of butter in rural areas, feed and fertility management need to be improved. Genetic improvement, especially crosses of local breeds with high fat content breeds, should also be encouraged. Since artificial insemination (AI) is not usually available in rural areas, use can be made of mobile teams and hormone assisted oestrus synchronization and mass insemination.

To improve processing of butter, collective action to churn butter could result in a reduced labour burden on women as well as reduced labour cost per unit of butter. Introducing improved, larger capacity butter churns as well as group formation may be explored to encourage such development. Marketing of butter may be improved through collective action. However, it is recommended that an assessment of the existing private butter marketing system (including the Addis Ababa market) be conducted to identify possible improvements. Considering the results of both studies and other studies, which have been conducted on dairy value chains, the following strategies and interventions for the development of butter value chain are proposed for the LIVES project.

### 1. Targeting butter production areas

The study shows that farmers who do produce and sell fluid milk in or near urban consumption centres also produce and sell substantial amounts of traditional (lactic) butter. However, as can be seen from the LIVES study, lactic butter is also produced and sold in peasant associations with little or no access to fluid milk markets and hence they sell relatively little or no milk. On the other hand fresh butter production is clearly linked to the formal fluid milk processing and marketing system in or near main consumption centres.

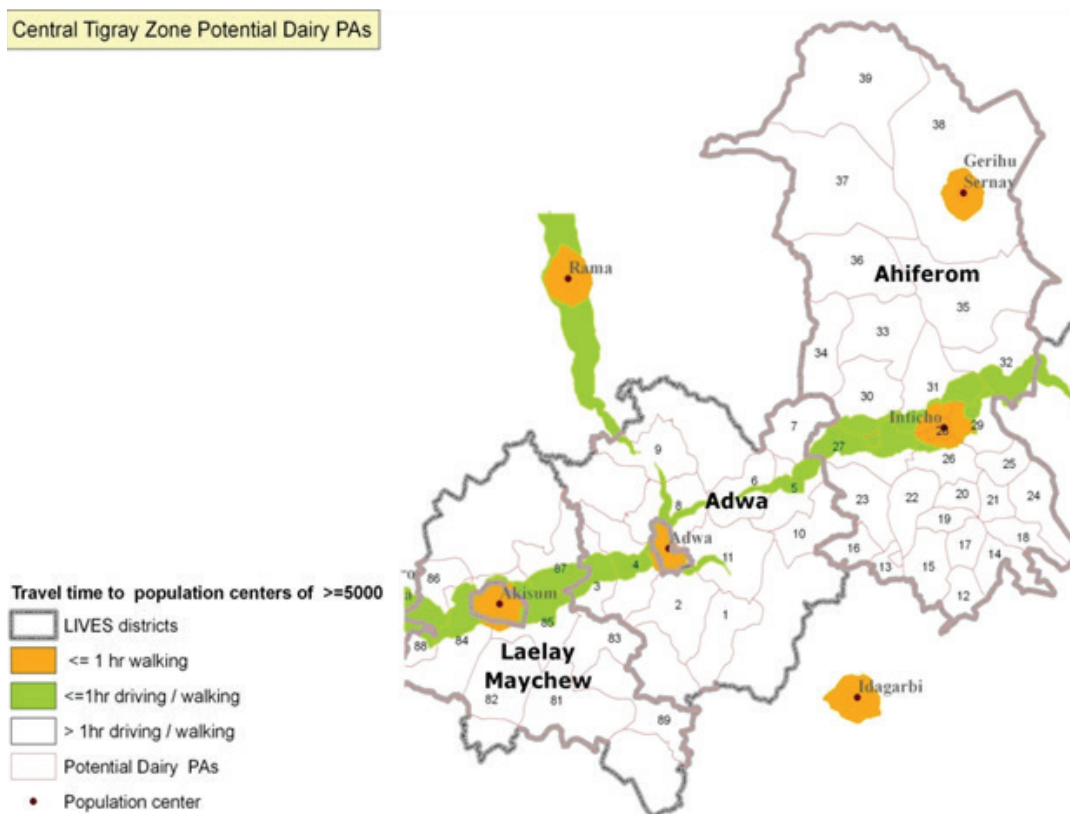
Distance/travel time to fluid milk markets is, therefore, a key consideration in targeting butter production, i.e. fresh butter production can be targeted in or near consumption centres where fluid milk is sold and processed commercially. Lactic butter production should be targeted in areas further away (in time and distance) from consumption centres.

Such geographical targeting should however be considered in a dynamic context in which distance/travel time can be changed. First of all, travel time and (sometimes) distance can be influenced by road construction. Secondly, travel time can be influenced by transport intervention, including means of transport and collective action for bulking milk along roads. Thirdly, travel time can be influenced by availing milk cooling technologies.

To target potential butter production areas in a dynamic context, use can be made of GIS technology, which can use models with varying coefficients to simulate different scenarios. To illustrate this point, the three clustered LIVES districts/PAs in Central Tigray zone are used. Potential dairy PAs have been mapped on the basis of livestock

population and (potential) market orientation. Next, the potential fluid milk production areas have been mapped assuming the existing road structure and walking on foot. The model considers fluid milk consumption centres with >5000 population and maximum travel time to these consumption centres (by foot) of 1 hour. Furthermore, the model considers average walking speed of 5 km/hour on all roads/terrain, adjusted for land use and slope. The potential fluid milk production areas thus covered are shown in amber colour. The second scenario is one in which use can be made of motorized transportation in combination with bulking of milk along the road by the producers. The GIS model was adjusted by introducing an average travel speed of 40 km/hour on the primary roads—all other coefficients were kept the same. The potential fluid milk production areas thus covered are shown in bright green colour, while the potential butter production areas are shown in white colours.

Figure 14. Targeting butter production area using GIS model.



2. Butter production interventions

This study and several others indicate that availability of feed/fodder is a major determinant for fluid milk and hence butter production, with positive effects on milk yields during the rainy and negative effects during the dry season. Therefore, improving the availability and use of feed resources to improve milk yield and cow fertility especially during the dry season is critical. Various tested interventions may be used for this purpose, including cut-and-carry systems for grazing areas, improved use of crop residues by chopping and straw treatment methods as well as silage and hay making. Use can also be made of planted grasses and legumes on field boundaries (see IPMS working paper 31 and EIAR/USAID, United States Agency for International Development, fodder papers).

The study also indicates that high fat content in the fluid milk is a preferred trait by farmers. In this context, animal breeds with higher fat content should be considered for the rural, butter-oriented production systems.

Thirdly, the LIVES baseline data also exposed another problem associated with the dairy production system in that the percentage lactating dairy cows/dairy cows is less than 45%, which indicates that calving intervals are around 2 years. This in turn means that a cow performs at half its capacity (assuming one calf a year is the theoretical optimum). A more in depth study has been planned by LIVES to examine the main causes for such inefficiency, which in turn should suggest ways to improve the situation in specific context. For now, a key factor known from published literature include fertility problems related to quantity and quality of feed which influence oestrus cycling (long anoestrus period) as well as early embryonic mortality. Another factor to consider is farmers' knowledge/attitude to fertility management, including calving interval. Farmers in rural areas often do not want their cows to conceive during their lactation period, mostly because their experience shows that milk yields drop significantly after their cows conceive.<sup>4</sup> Such perception would automatically lead to late mating/insemination and hence longer calving intervals. Extension message on fertility management combined with feeding/fodder development should be promoted to address this problem.

### 3. Butter input/service interventions

As observed in the rapid assessment study, improving butter breeds by supplying and purchasing heifers is a rather slow process. It requires identification and use of semen from good dairy type bulls—local as well as exotic. Also the use of AI services in rural areas is not widespread at the moment. Recently, mass insemination with the help of hormones and mobile teams has been introduced in areas with potential for fluid milk production. The same concept of mobile teams could be considered for rural areas where butter is the primary milk product for sale, since it would not require any permanent presence of AI technicians. A relatively short, well planned, campaign style operation, in consultation with community groups, can be organized to inseminate specially selected cows.

### 4. Butter processing

The study illustrates that the production of fresh butter is a commercial-oriented activity in which milk is bulked and processed by a cooperative or a private company, while the processing of traditional butter is a mostly individual, home-based activity. Increasing the milk/butter volume with the help of improved production and input/service supply interventions would therefore increase (female) labour demand for home processing. Given the present processing technology, churning may have to happen every day instead of once every three days. Technological and organizational interventions are therefore required to process increased volumes of milk.

Bulking and processing of the milk produced by individual households could result in labour saving by women. Use of modern churners by such groups could further improve efficiency of labour and of fat extraction. Whenever possible such initiatives should be linked to existing informal group structures.

Since most butter produced in rural areas is processed from raw milk, heating technologies may be tested in the processing methods to reduce bacterial spoilage.

### 5. Butter marketing

A number of interventions may be considered in the marketing of butter, which could have a positive impact on prices received by farmers. Since the bulk of the butter produced is marketed in Addis Ababa, regional and zonal towns, an in depth study of the butter market could help develop strategies for improving the butter market efficiency in Ethiopia.

4. Farmers' statements: 'My cow is pregnant and therefore is not milking' or 'my cow is not milking because she is pregnant'.



## References

- Abaye Tedla. 1989. Status of dairying in Ethiopia and strategies for future development. Third livestock improvement conference 24–26 May 1989, Addis Ababa, Ethiopia.
- Adugna Tolera, Alemu Yami, Alemayhu Menegistu, Dawit Alemu, Diriba Geleti, Getnet Assefa, Lemma Gizachew, Seyoum Bediye and Yirdaw Woldesemayat. 2012. Livestock feed resource in Ethiopia: Challenges, opportunities and the need for transformation. Main issues, conclusions and recommendations. Addis Ababa, Ethiopia: Ethiopia Animal Feed Industry Association.
- Adugna Tolera, Alemu Yami and Dawit Alemu. (eds). 2012. Livestock feed resource in Ethiopia: Challenges, opportunities and the need for transformation. Addis Ababa, Ethiopia: Ethiopia Animal Feed Industry Association.
- Ahmed, M.A.M., Ehui, S. and Yemesrach Assefa. 2004. *Dairy development in Ethiopia*. Washington, DC, USA: IFPRI (International Food Policy Research Institute).
- Aynalem Haile, Workneh Ayalew, Noah Kebede, Taddesse Dessie and Azage Tegegne. 2011. *Breeding strategy to improve Ethiopian Boran cattle for meat and milk production*. IPMS Working Paper 26. Nairobi, Kenya: ILRI (International Livestock Research Institute).
- Azage Tegegne, Berhanu G/Medhin, Mohammed Yousuf and Kedija Hussein. 2008. Cow and camel milk production and marketing in agro-pastoral and mixed crop–livestock systems in Ethiopia. Paper presented on conference on International Research on Food Security, Natural Resource Management and Rural Development. University of Hohenheim, 7–9 October 2008. Stuttgart, Germany: University of Hohenheim.
- Belete Anteneh, Azage Tegegne, Fekadu Beyene and Berhanu Gebremedhin. 2010. *Cattle milk and meat production and marketing systems and opportunities for market-orientation in Fogera woreda, Amhara region, Ethiopia*. IPMS Working Paper 19. Nairobi, Kenya: ILRI (International Livestock Research Institute).
- Federal Democratic Republic of Ethiopia Central Statistical Agency. 2013. *Agricultural sample survey 2012/13. Volume II. Report on livestock and livestock characteristics (private peasant holdings)*. Addis Ababa, Ethiopia: CSA.
- Gizachew Getaneh. 2005. Dairy marketing patterns and efficiency: A case study of Ada'a Liben district of Oromia region, Ethiopia. MSc thesis. Haramaya, Ethiopia: Haramaya University.
- Holtzman, J. 1995. *Rapid appraisal of commodity subsectors: The guide to developing agricultural markets and agro-enterprises*. Bethesda, Maryland, USA: Abt Associates Inc.
- Kedija Hussen, Azage Tegegne, Mohammed Yousuf Kurtu and Berhanu Gebremedhin. 2008. *Traditional cow and camel milk production and marketing in agro-pastoral and mixed crop–livestock systems: The case of Mieso district, Oromia regional state, Ethiopia*. IPMS Working Paper 13. Nairobi, Kenya: ILRI (International Livestock Research Institute).

- Ketema, H. and Tsehay, R. 1995. *Strategies for market orientation of small-scale milk producers and their organizations: Dairy production system in Ethiopia*. Rome, Italy: Food and Agriculture Organization of the United Nations.
- Mbaga, S.H., Shayo, C.V., Kurwijila, R.L. and Ryoba, R. 1990. Development of butter making techniques for smallholder milk processing. *Proceedings of 20th scientific conference of Tanzania Society of Animal Production* 17:15–2.
- Morris, M. 1995. Rapid reconnaissance methods for diagnosis of sub-sector limitations: Maize in Paraguay. In: Scott, G. (ed), *Prices, products and people: Analyzing agricultural markets in developing countries*. Boulder, USA: Lynn Rienner Publishers.
- O'Connor, C.B., Mezgebu, S. and Zewdie, Z. 1993. *Improving the efficiency of butter-making in Ethiopia. Short communications*. Addis Ababa. Ethiopia: ILCA (International Livestock Center for Africa).
- O'Mahony, F. and Bekele, E. 1985. Traditional butter making in Ethiopia and possible improvements. *ILCA Bulletin* 22:9–14.
- Sintayehu Yigrem, Fekadu Beyene, Azage Tegegne and Berhanu Gebremedhin. 2008. *Dairy production, processing and marketing systems of Shashemene–Dilla area, south Ethiopia*. IPMS Working Paper 9. Nairobi, Kenya: ILRI (International Livestock Research Institute).
- Tegegne, A., Gebremedhin, B., Hoekstra, D., Belay, B. and Mekasha, Y. 2013. *Smallholder dairy production and marketing systems in Ethiopia: IPMS experiences and opportunities for market-oriented development*. IPMS Working Paper 31. Nairobi, Kenya: ILRI (International Livestock Research Institute).
- Tesfaye Lemma Tefera, Puskur, R., Hoekstra, D. and Azage Tegegne. 2010. *Commercializing dairy and forage systems in Ethiopia: An innovation systems perspective*. IPMS Working Paper 17. Nairobi, Kenya: ILRI (International Livestock Research Institute).
- Tsehay Reda. 1998. *Small-scale milk marketing and processing in Ethiopia*. Addis Ababa. Ethiopia: Ministry of Agriculture.
- Zegeye Yigezu. 2003. Imperative and challenges of dairy production, processing and marketing in Ethiopia. In: Jobre, Y. and Gebru, G. (eds), *Challenges and opportunities of livestock marketing in Ethiopia. Proceedings of the 10<sup>th</sup> annual conference of the Ethiopian Society of Animal Production (ESAP) held in Addis Ababa, Ethiopia, 22–24 August 2002*. Addis Ababa, Ethiopia: ESAP.

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Livestock and irrigation value chains for Ethiopian smallholders project aims to improve the competitiveness, sustainability and equity of value chains for selected high-value livestock and irrigated crop commodities in target areas of four regions of Ethiopia. It identifies, targets and promotes improved technologies and innovations to develop high value livestock and irrigated crop value chains; it improves the capacities of value chain actors; it improves the use of knowledge at different levels; it generates knowledge through action-oriented research; and it promotes and disseminates good practices. Project carried out with the financial support of the Government of Canada provided through Foreign Affairs, Trade and Development Canada (DFATD). [lives-ethiopia.org](http://lives-ethiopia.org)



The International Livestock Research Institute (ILRI) works to improve food security and reduce poverty in developing countries through research for better and more sustainable use of livestock. ILRI is a member of the CGIAR Consortium, a global research partnership of 15 centres working with many partners for a food-secure future. ILRI has two main campuses in East Africa and other hubs in East, West and southern Africa and South, Southeast and East Asia. [ilri.org](http://ilri.org)



The International Water Management Institute (IWMI) is a non-profit, scientific research organization focusing on the sustainable use of water and land resources in developing countries. It is headquartered in Colombo, Sri Lanka, with regional offices across Asia and Africa. IWMI works in partnership with governments, civil society and the private sector to develop scalable agricultural water management solutions that have a real impact on poverty reduction, food security and ecosystem health. IWMI is a member of CGIAR, a global research partnership for a food-secure future. [iwmi.org](http://iwmi.org)



CGIAR is a global agricultural research partnership for a food-secure future. Its science is carried out by 15 research centres that are members of the CGIAR Consortium in collaboration with hundreds of partner organizations. [cgiar.org](http://cgiar.org)



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