



Smallholder dairy value chain development: The case of *Ada'a woreda*, Oromia Region, Ethiopia

Nigatu Alemayehu, Dirk Hoekstra and Azage Tegegne

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Box 30709, Nairobi 00100, Kenya
Phone: + 254 20 422 3000
Fax: +254 20 422 3001
Email: ILRI-Kenya@cgiar.org

Box 5689, Addis Ababa, Ethiopia
Phone: +251 11 617 2000
Fax: +251 11 617 2001
Email: ILRI-Ethiopia@cgiar.org

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Abstract

In the past decades, public sector support for dairy development in Ada'a mainly focused on dairy production and supply of inputs/services, with limited involvement of the private sector and partners. There was also no clear distinction between the dairy system development potentials in urban, peri-urban and rural areas. With the help of a participatory commodity value chain development approach, introduced by the IPMS project, the Ada'a Office of Agriculture managed to address some of these issues in the peri-urban dairy production system. Training, including sharing of knowledge with experienced farmers and follow-up events, especially field days, was used to build capacity of extension staff and farmers. This has helped to promote linkages between producers and input suppliers/service providers. With the help of Ada'a Dairy Cooperative and the Cooperatives Promotion Office, it was possible to organize collective action for marketing of fluid milk by dairy producers in three peri-urban locations. Production of backyard fodder was successfully linked to 143 peri-urban farmers involved in commercial livestock production. The artificial insemination (AI) service delivery system during the project's life changed from public sector dominated system in 2005 (100%) to a private sector dominated system in 2010 (98%). Still considerable efforts need to be made to further improve the effectiveness and efficiency of the system, while the recently IPMS-introduced hormone assisted mass insemination approach should be further explored, especially since pregnancy rates improved by 100%. As a result of increased demand for dairy products in Addis Ababa and other major urban centres, many more private agribusinesses for supply of inputs and processing of milk established themselves in Ada'a, which can be instrumental in leading development. Government can and should increase its capacity to develop, promote and regulate these new actors to ensure quality of services/inputs and processed products. The impact study conducted by the project in the peri-urban system showed that in 2010 annual gross production value from fluid milk reached over three million Ethiopian birr (ETB)¹, a fiftyfold increase. Annual income/household also increased from less than ETB 1000 in 2005/06 to ETB 19,000 in 2010.

Key words: Dairy, innovation, value chain, intervention, smallholder, marketing

1. Ethiopian Birr (ETB). In December 2012, USD 1 = ETB 18.22.

I Introduction

The IPMS project, funded by the Canadian International Development Agency (CIDA), was established to assist the Ministry of Agriculture in the transformation of smallholder farmers from a predominantly subsistence-oriented agriculture to a more market-oriented (commercial) agriculture.

The project adopted a 'participatory market-oriented commodity value chain development' approach which is based on the concepts of innovation systems and value chains. Crucial elements in the approach are the focus on all the value chain components instead of only a production technology focus as well as the linking and capacitating of value chain partners and the assessment, synthesis and sharing of knowledge among partners.

The project introduced this approach in 10 Pilot Learning Woredas (PLWs) in four Regional States in Ethiopia with the objective of testing/adopting the approach so that it can be promoted nationwide. An integral part of the approach is the identification of marketable commodities and the value chain constraints and interventions. This was accomplished through a participatory process in all PLWs.

This case study focuses on the development of smallholder market-oriented dairy development in one of the PLWs, Ada'a woreda in Oromia Regional State, with the objectives of i) documenting diagnostic results and value chain interventions, ii) providing proof of results (proof of concept), and iii) identifying challenges and lessons learned to be considered for scaling out.

This study is organized into the following sections. Section 2 deals with methods and approaches used in the study, while Section 3 presents background information, including description of the PLW and the history and diagnosis of smallholder dairy development. Section 4 presents value chain interventions like extension, production, input supply as well as marketing and credit issues. Section 5 dwells on results and discussion on production/income, input supply/marketing, gender/environment/labour use, organizational and institutional aspects, while Section 6 deals with challenges and lessons learned.

2 Methods and approaches

In launching a commodity development project, IPMS used a *woreda* level participatory market-oriented value chain planning approach aimed at identifying i) main farming systems, ii) potential marketable crop and livestock commodities at farming system level, iii) constraints, potentials and interventions for each value chain component and iv) value chain actor assessment with potential (new) roles and linkages. Different value chain actors were involved and consulted in this planning exercise. Secondary biophysical and socio-economic data were collected, followed by open-ended interviews with focus groups and key stakeholders. Results were presented in a stakeholder workshop in which priority marketable commodities were determined together with key intervention areas and partners.

This was followed by some more detailed studies on selected commodities. Such studies were conducted by partner institutions and/or graduate students and/ or IPMS staff using formal surveys, interviews and observations. To implement the program at *woreda*, Peasant Association (PA) and community levels, the project facilitated different knowledge management and capacity development approaches and methods to stimulate the introduction of value chain interventions by the actors concerned.

2.1 Baseline information

The baseline situation was established on the basis of the project's initial rapid assessment, data from a formal baseline survey conducted in the Ada'a PLW in 2005 and data from some special diagnostic studies conducted later.

2.2 Documenting changes, processes and results

Several sources were used for regular documentation of changes, processes and results, including six monthly progress reports, annual M&E reports, and MSc theses research results, records kept by the OoARD and Ada'a Dairy Cooperative, personal observations and diaries.

An impact survey was conducted during the period June–October 2010. The survey covered all 27 rural Peasant Associations (PA) of the Ada'a *woreda*. Trend data were collected for a number of households that produce milk and milk products, inputs, outputs, and price and market participation for the years 2005/06 up to 2009/10. Group interviews with farmers, DAs and other key informants were used to collect the relevant data. Secondary data from DAs and experts' and other *woreda* level reports were also used to complement or/and verify the data collected using group interviews.

To supplement the above-mentioned information, a commodity stakeholder workshop and key interviews were arranged to obtain information on processes and linkages created.

3 Background to smallholder dairying in Ada'a woreda

3.1 Location

Ada'a woreda lies between longitudes 38°51' to 39°04' East and latitudes 8°46' to 8°59' North covering a land area of 1750 km² on east of Addis Ababa (Figure 1). Most of the land (90%) is plain highland ranging between 1600 to 2000 metres above sea level. The woreda is characterized by sub-tropical climate and receives 860 mm rainfall/annum. In general, the main rainy season occurs between mid-June and September, followed by a dry season that might be intercepted by the short rainy season in February and March.

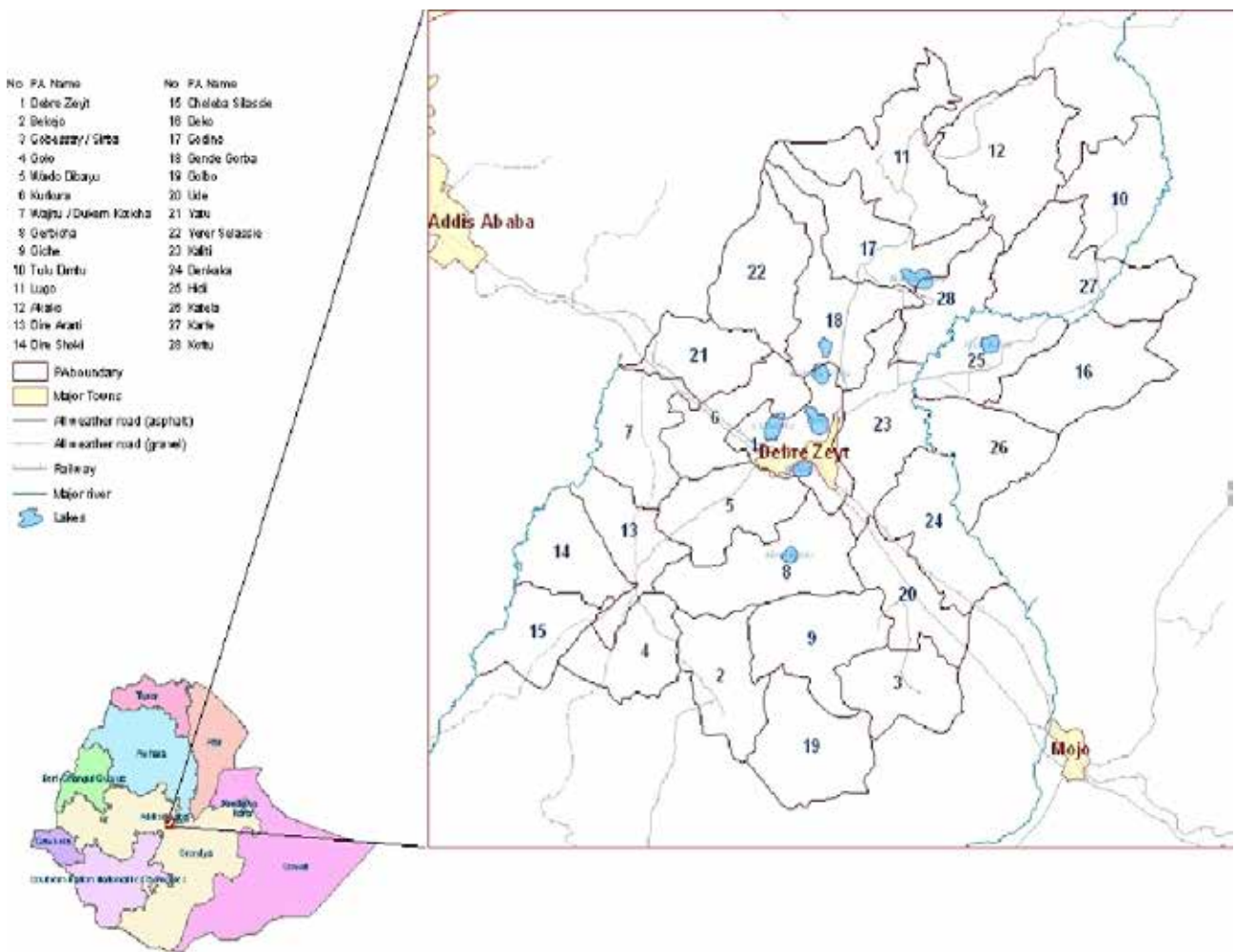


Figure 1. Location of Ada'a district and the PAs in the district

Mean annual temperature ranges from about 8–28°C. Black clay Vertisol is the dominant soil type, with good soil fertility but with water logging problems in those areas where the land slope is below 8%. Household average farm size varies from 1 to 2.5 ha and the major farm operation is done by oxen power. Farming system is mixed crops–livestock production system. Major crops grown are teff, wheat (mainly bread variety) and pulses. Chickpea is the main pulse crop grown in the *woreda* and used as a crop rotation to wheat and teff crops. Irrigated horticultural crops represent a newly emerging business in areas where small-scale irrigation has been identified as potential venture.

Livestock farming under smallholders' management consists of dairying, cattle/oxen fattening, poultry and small ruminants fattening. Apiculture is emerging in some pocket areas like the Yerer Mountains. Population of the *woreda* including Debre Zeit town is estimated to be 300,000 people, of which 50% is rural population whose livelihood is based on agriculture.

3.2 Dairy production systems

The dairy sector in Ethiopia has large potential and role in the commercialization of the agriculture sector due to the country's large human and livestock population. The other contributing factors to dairying are the favourable climate for improved dairying, and the relatively disease-free highland environment with potential for animal feeding (Anteneh et al. 2010) and a huge gap between demand and supply of milk (Tegegne et al. 2007).

In the commercial dairy sector, improved crossbred cows contribute to more than half of the dairy output in urban centres like Addis Ababa (Tegegne et al. 2007). Despite the potential for market-oriented livestock development, smallholder dairy development performance and its contribution to poverty reduction and economic development has remained very low. Constraints to the development of livestock sector in general and dairy in particular includes shortage and fluctuation in quality and quantity of feed, poor breeding program, poor management practices, diseases, poor market infrastructure, poor service delivery, policy and institutional arrangements

According to smallholders dairy production system classification of Tegegne et al. (2007), the smallholders' dairy production system in Ada'a can broadly be divided into three systems, namely, i) urban, ii) peri-urban and iii) rural systems. The characteristics of the producers are significantly different among the different production systems. In this section, we describe the different dairy production systems that exist in Ada'a.

Urban dairy system

Urban farmers are characterized by a production system in which cattle are permanently kept indoors. Urban dairy farmers have little or no agricultural land and most inputs are bought from market. The sale of fluid milk is the major source of income from dairying. Urban dairy farmers tend to be better educated, better off financially and are more receptive to education and technologies. About 91% of the crossbred cows in Ada'a are owned by urban dairy farmers (Girma 2008). The urban dairy system enjoys better private sector service in terms of AI, animal health services and concentrate feeds. Therefore, this urban dairy is categorized as small-scale intensive dairy production system.

The Ada'a Dairy Cooperative is operational in Debre Zeit town. The cooperative was established in 1997 with 38 members and has grown to about 838 members, of which 50% are women. Initially milk was sold in Debre Zeit town and to Sebeta agro-industry. Since 2004, the cooperative started to supply milk to Shola agro-industry. In 2005, the cooperative sold about 5000 litres daily.

Peri-urban dairy system

The peri-urban dairy is characterized as a semi-intensive crop–livestock farming system. Farmers keep crossbred cows indoors with supplementary concentrate feeding. All farmers own farming land hence the roughage such as crop residues are domestically produced. As compared to the rural dairy system, peri-urban dairy systems are mostly located along roads within reasonable distance to urban centres and involved in fluid milk market.

The history of peri-urban dairy system in Ada'a goes back to the era of Derge (1974–1991). The Ude Dairy Producers Cooperative, located 10 km south east of Debre Zeit, was one of the biggest dairy producers' cooperatives in the country. This cooperative started with the highest blood level of Holstein Friesian cows imported from Kenya. Market outlets of milk were members of the community that buy milk at ETB 0.50/litre in the eighties. Milk market was the major problem to this cooperative.

Following the downfall of the Derge regime in 1991, producers' cooperatives were dismantled, facilities destroyed and cows distributed to individual members. Since the input supply system and market channel had been disrupted, most farmers were not successful in dairy production and they had to sell their cows to urban dairy farmers; yet other cows were herded to butchers and hence smallholder dairy production in Ude PA declined to almost zero.

In the late 1990s, after a decade of slumber, smallholders' dairy again began from scratch around Ude PA through distribution of crossbred cows to individual farmers by the Ada'a Office of Agriculture and Rural Development (OoARD) and the Debre Zeit Agricultural Research Centre of the Ethiopian Institute of Agricultural Research. Recipient farmers had no basic knowledge of dairying, no organized input supply system and had poor market outlet. Peri-urban dairy farmers were individually selling milk to different outlets like neighbours, hotels and restaurants in Debre Zeit and to Sebeta Agro-industry. Later on, Sebeta Agro-industry dropped out due to reduced quality (high bacteria count) and adulteration (mix of milk with water).

As a consequence, many dairy farmers became discouraged and managed their cows on least cost ration of low quality feed that reduced the productive and reproductive potential of crossbred cows. Some farmers gave up dairying altogether and sold their cows to the flourishing urban dairy system. In the mid of 2000s, ILRI provided the Gendegorba women credit and saving association (a potential group for peri-urban dairy production) with crossbred cows after training on basics of dairy cattle management and milk hygiene and by linking them to market their milk to the Ada'a Dairy Cooperative.

The ILRI Debre Zeit Research Station also provided some technical backstopping and provided input supply service such as AI and veterinary services and forage genetic material. While peri-urban dairy production can be expanded to more areas, a key bottleneck is the sale of milk and poor milk quality.

Rural dairy system

Rural dairy is located in the mixed crop–livestock farming system of the *woreda*, which covers 12 PAs mainly specialized in fattening. The average cattle herd size is 5.34/household, which is larger than cattle herd sizes in both urban and peri-urban areas. Out of this herd size, 1.87 consists of local cows and the rest represent other categories of cattle such as oxen, heifers, bulls and calves. Very few crossbred cows are kept in the rural dairy system. The rural dairy system focuses on butter production rather than fluid milk. Animals are kept in open kraals during the night and left on open grazing fields. Green grass and concentrates such as Noug cake and wheat bran are provided as supplements to lactating cows, fattening animals, ploughing oxen and to donkeys when they are at work. Breeding takes place through natural mating using local bulls. About 6% fresh milk is sold to neighbourhoods and the remaining 94% is either home consumed or processed into butter, local cheese (*ayib*) and whey of which 20% is sold (Girma 2008). This indicates that fresh milk and butter sales contribution under rural dairy is not a priority; however, their nutritional contribution to households could be of considerable importance.

3.3 Diagnosis: opportunities and challenges

Most people start dairy business simply because they have heard that somebody in the community benefited from dairy farming. Sometimes, there is also a strong push from the extension system. Farmers acquire crossbred cows without having the necessary skills and preparations to manage specialized breeds of cows.

Another problem in dairy is lack of sufficient knowledge about dairy nutrition and unavailability of skill on feeding and watering. In principle, modern dairy cow feeding depends on performance of animal like level of milk production per day, stage of lactation, age, reproductive performance, blood level, nutrition quality of the feed, the feed cost etc. However, most peri-urban dairy farmers do not follow those techniques which results in poor productive and reproductive performances. Heat detection is one of the areas that also need skills and poor reproductive management results in many crossbred cows having long calving interval of up to 25 months. Such long calving interval induces high operational cost per cow which is not affordable by many farmers, causing farmers to pull out from the business. Animal mortality, milk hygiene and sanitation are the other basic challenges in dairy production. Milk produced in peri-urban and rural area was often rejected because of poor quality. Milk quality problems are triggered by poor udder management, unhygienic milk container and other accessories, personal sanitation, the cleanliness of the dairy environment and unsuitable means of milk transportation.

In the past, several projects advocated forage seed multiplication, sale and use in the rural and peri-urban areas, while success was limited partly because of lack of market-oriented dairy development. The existing public agricultural extension system in general and livestock service in particular are not well equipped to respond to commercialization of smallholder agriculture and knowledge based market-oriented livestock production (Gebremedhin et al. 2006). Also the public sector dairy extension service, (Ada'a OoARD) is geographically mandated in rural and peri-urban dairy zones with very limited service provision to urban dairy farmers. The Urban Agriculture Office in the municipality of Debre Zeit town is supposed to provide these services, but the office is not yet well organized and lacks capacity.

Good opportunities for dairy development in Ada'a are the presence of established private and public institutions working on dairy research and development. Public institutions include the Ethiopian Meat and Dairy Technology Institute (EMDTI), National Veterinary Institute (NVI), School of Veterinary Medicine under the Addis Ababa University, Debre Zeit Agricultural Research Centre under Ethiopian Institute of Agricultural Research (EIAR), the woreda Office of Agriculture and woreda Livestock Health, Marketing and Development Agency. Some of the private institutions involved in milk collection and processing include Genesis Farms, Holland Dairy, Bora Dairy, Sebeta Agro-industries, Ada'a Dairy Cooperative, Lema Dairy and Family Dairy.

There is demand for increased dairy production because of rapid urbanization in nearby Addis Ababa. According to Anteneh et al. (2010), data collected from the Ethiopian Custom and Revenue Authority, import of dairy products in Ethiopia was around 1.3 million kg in 2004 with an estimated value of ETB 42.1 million. Increased local dairy production could therefore contribute to import substitution.

4 Value chain development interventions

Dairy value chain development in Ada'a, particularly input/service supply and processing and marketing, is undertaken by various actors supported by the extension system, research and projects like IPMS. It is noted that during the life of the project, several value chain actors involved themselves especially in milk collection/processing and supply of feed, supply of improved dairy animals, as well as in expanding and/or establishing themselves in the district. Also, sister projects operated by Land O'Lakes, SNV and ILRI/IFAD Fodder Adoption Project started supporting value chain actors and some of these interventions are described here. Ada'a OoARD in collaboration with IPMS also introduced complementary value chain interventions and created linkages with existing and newly established value chain actors/projects concerned with dairy value chain development.

In the initial workshop, stakeholders decided to concentrate on milk value chain development in the peri-urban and urban systems where the commercial dairy business is the dominant practice. Possibility for market-oriented dairy production in rural areas is limited since production is mainly geared to home consumption and processing milk products for local use.

4.1 Extension interventions

For the last three decades, the public extension system has been the sole service provider. It paid little or no attention to the different farming systems and ecologies. Also much of its efforts concentrated on input supply and services, such as AI, supply of heifers and veterinary services. The impact of these extension activities were measured based on the number of inputs supplied or services provided. Result-based M & E methods focusing on output, outcome and impact were not known.

The IPMS project through the Ada'a OoARD introduced a new extension approach, distinguishing between different dairy production systems, involvement/linking other value chain actors (private input/service supply, milk collectors and processors) and projects. It also included the use of participatory approaches for capacity development and knowledge management, in which diagnosed problems and interventions were regularly reviewed and amended by the value chain actors and service providers.

Dairy extension in peri-urban dairy

An integral part of the initial rapid assessment was to delineate the peri-urban areas—Peasant Associations (PA)—based on potential for dairy development. Based on this delineation, target groups (including female) and other major actors in the value chain were identified for initial development. Subsequently, 20 dairy farmer couples from Denkaka, Ude, Kurkura and Yatu PAs were selected for modern dairying training. Selection took place by Ada'a OoARD field staff in consultation with Development Agents (DAs) from the selected PAs. Initial training was provided for three consecutive days by researchers on housing, fodder production, feeding and ration formulation, heat detection, animal

health, improved breeding and milk hygiene. The training included theoretical sessions using audio visuals as well as practical training and visits to the Genesis dairy farm, Debre Zeit Agricultural Research Centre and model dairy farmers. Successful farmers shared their experiences, explained the difficulties they faced and how they overcame those challenges.

At the end of the three-day training, stakeholders in the milk value chain were invited for a dialogue with trainees. Invited stakeholders were feed processors, milk processors, feed retailers, microfinance institutes, Oromia Cooperative Bank, Cooperatives Promotion Office, Ada'a OoARD, IPMS, Land O'Lakes, SNV, and Ada'a Dairy Cooperative. Different issues in input supply, production technology, credit and marketing were raised and discussed. Eventually most of them obtained solutions on the spot.

Subsequent trainings focused on fodder development, including forage seed multiplication in collaboration with the IFAD–FAP project. Regular visits and follow up of forage seed multiplication plots were undertaken to learn from and plan later operations. Several practical training and field demonstration were carried out on urea molasses block preparation and straw treatment for about three years.

The project facilitated annual refreshment training to DAs and consecutive field days to share knowledge and lessons learned.

The same extension approach was applied to peri-urban dairy farmers in Gendegorba PA in 2006 and Godino PA in 2008.

Dairy extension in urban areas

The project extension intervention in the urban dairy production focused on capacity building (feeding, housing, breeding, milk hygiene and reproductive health, heat detection and general animal health). In collaboration with Ada'a Dairy Cooperative, IPMS organized a three-days training for 180 urban dairy women farmers on modern dairy management. The cooperative identified trainees, selected topics of training and led the whole program while Debre Zeit Agricultural Research Centre provided trainers. After the training, visits and study tours were organized to Genesis farms and model dairy farms for farmers and public staff from extension, research and Cooperatives Promotion Office. The training was participatory as individual trainees shared their experience with others. Dairy manuals were distributed to all trainees. The project together with partners also formed a dairy platform that created an opportunity to have a meeting every six months for sharing of knowledge and information about dairy development, through organizing seminars, study tours and field days.

Knowledge sharing events

One of the knowledge sharing events used in promotion of dairy is annual *woreda* level farmers field days. In these field days, at least five farmers per PA and public sector staff from *woreda* administration, cooperative promotion offices, Office of Agriculture staff, DAs, Unions, research organizations, financial institutions, private sector and NGOs participated in the event. Field days are used to showcase innovative farming practices, share on-farm research and demonstration results, and build farmer to farmer as well as farmer to other stakeholders understanding. Field days gave participants a chance to get insight about successful farmers' story.

The IPMS project sponsors annual farmers' field days. The field days usually began with a visit to model FTCs, model farmers involved in crop and vegetable production, livestock and beekeeping activities, natural resource management and energy saving activities. Model farmers explained their achievements and changes in their livelihoods and also identified those who supported them for the success. After the field visits, a panel discussion was held on what had been learned, who takes what responsibility and how to scale up these best practices. During these field visits, decision-makers and

policymakers from the region, zones and neighbouring *woredas* were invited to attend the event and lead the panel discussion. After discussions, lunch was served and awards were given to the model farmers, institutions and individuals who contributed to the betterment of agricultural development in the *woreda*. Besides field days, regular meetings, dairy platforms and seminars were also used as a means to convey and share knowledge (Table 1).

Table 1: Annual participation in knowledge sharing and capacity development events on dairying

Events	No. of events (2005–10)	Description	Public staff		Farmers		Private sector	
			Male	Female	Male	Female	Male	Female
Field days	5	Farmers and stakeholders share experience	80	40	120	20	40	0
Platforms	4	Stakeholders meeting on dairy and fodder innovation	28	10	24	23	1	0
Seminars	5	MSc thesis presentation on dairy	6	4	0	0	0	7
Refreshment courses for DA	5	Refreshment courses for DAs on improved dairy management and forage development	50	30	0	0	0	0

4.2 Dairy production interventions

Besides the introduction of improved dairy management techniques including housing, feeding, breeding, health and milk hygiene, emphasis was also given to on-farm forage/feed production.

Crop residue production and improvement

The main sources of feed in Ada'a are crop residues of teff, wheat and chickpeas. It is noted that teff straw is more expensive than any other cereal straw. In addition to its use as feed, it is important for construction of houses and mulch. The straw called '*ch'ed*' is mixed with mud and used for plastering walls. Straw mixed with mud is used for making grain stores '*gotara*' and cooking places called '*medeja*' and for other reinforcement purposes. Teff straw has very good digestibility and is high in nutrient content comparable to high quality forages like Rhodes grass and oats. Indirectly, project partners influenced the availability of residues of teff and chickpea through introduction of higher yielding varieties.

To improve palatability and uptake of teff straw, the project demonstrated treatment with urea molasses at FTCs and farmers' fields. The procedure for straw treatment with urea molasses is as follows.

- Construct an over-ground silo using local materials (wood and mud) or dig a pit for under-ground silo.
- Build silo having dimensions of 2 m length, 1 m width and 1 m height. Each silo can hold up to 400 kg of straw.
- For above-ground silo, the wall is lined with mud. This should be devoid of holes to allow air tight condition. The floor should have gentle slope to allow drainage of any excess liquid to the lowest layer.
- In case of a pit, excavate soil in V shape.
- Construct silo with shelter to protect treated straw from direct sunshine.
- Inputs required include plastic sheet, nail, hammer, urea, molasses, straw, water, buckets, jericans, sprayer, spade, wooden fork, barrel and a jug measuring 1 kg
- Use fertilizer grade urea. The ratio of water–urea–molasses solution to straw was 1:1 (100 litres of solution for 100 kg of straw). This proportion gives a moist and soft material

- To prepare 100 litres of solution, add 5 kg urea in to 85 litres of water and stir very well until the urea dissolves and clumps of urea disappear from the solution. Add 10 litres of molasses and stir very well until the molasses and the urea solution mix well.
- Use 0.2 mm polyethylene plastic sheet to properly line the inner side of the silo.
- Spread batches of about 20 kg of untreated straw in the silo and sprinkle 20 litres of the urea–molasses solution uniformly over the straw layers using a sprinkler/sprayer.
- Mix the straw with the solution using local fork-like material. Treat the remaining batches of straw in the same way after pressing by trampling and packing before the next layer is placed on top.
- After the silo is filled, cover it tightly with the plastic sheet lined previously to exclude entrance of air, to prevent ammonia from evaporating and to protect water from seeping.
- Cover with sacks full of sand or stone to ensure the silo is air tight.
- Ensile for about three weeks before use. The treatment period could be as short as 7 days in warm climate and up to 8 weeks in cold climate.
- After three weeks, open the silo and check for smell (fresh silage smell) and colour (golden)
- Aerate for about 30 minutes before feeding to animals.

Molasses improves the palatability of the straw and supplies easily soluble sugar. It also stimulates multiplication of rumen microbial population, and thus improves the digestibility of the straw.

Fodder production

In peri-urban areas, farmers were also encouraged to establish backyard forages. Production of perennial forages such as Napier grass (*Pennisetum purpureum*) and alfalfa (*Medicago sativa*) were introduced in places with irrigation facilities. Production of annual forages such as oats and vetch were also promoted under rain fed conditions.

In Godino PA, inter-cropping cereal crops with forage legumes such as maize in alleys of *Leucaena* was promoted for two growing seasons. Cereal grain yields were not significantly depressed by the presence of forages, pointing to the possibility of introducing forages to the cereal-cropping systems.

Urea molasses block (UMB)

The project demonstrated preparation of UMB at FTCs and farmers' fields. UMB is a high protein concentrated feed source that supplies Non-Protein Nitrogen (NPN) to rumen microbes. The blocks also contain important minerals and vitamins. UMB is a good way of providing readily degradable protein and fermentable energy to ruminant animals, and help increase the protein supply to ruminants in situations where this may be limiting. Molasses is a source of energy and available in concentrated form. The procedure for preparation of UMB is found in the following e-Resources. <http://www-naweb.iaea.org/nafa/aph/stories/2006-umm-blocks.html>

4.3 Input supply and service interventions

The three major bottlenecks for dairy development in the two production systems in Ada'a are unavailability of crossbred cows, shortage of feed supply and diseases.

Supplying genetically improved dairy animals

Various interventions were explored by IPMS and other projects to improve the supply of genetically improved dairy animals. These include i) establishing private bull stations, ii) producing crossbred heifers iii) linking dairy producers with sellers of crossbred animals and iv) improving the AI system.

Establishing private bull stations

Although bull service has a danger of spreading reproductive diseases and that repeated use could result in inbreeding, in peri-urban areas where AI service is out of reach and heat detections are difficult, bull service is considered as an alternative means to meet the demand for crossbred animals. Hence, two private bull stations were established in Denkaka and Godino PAs. The bulls were bought from Holetta cattle genetic improvement station and handed over to trained farmers. Farmers charged ETB 30/service.

Producing crossbred heifers

A Dutch company, known as *Cow-Grow* at Hidi PA, has purchased about 200 Boran heifers for crossbreeding using Holstein Friesian semen imported from Holland. The purpose of the farm is to be a source of crossbred heifers for dairy farmers.

Linking dairy producers with sellers of crossbred animals

As a result of the various platform meetings and project efforts, dairy producers have been linked to some of the existing 'sources' of genetically improved dairy animals such as the Ada'a Office of Agriculture, the Ethiopian Meat and Dairy Technology Institute (EMDTI) and Debre Zeit Agricultural Research Centre and Gobe Ranch.

Improving AI system

The project introduced private AI service through recruitment of two young high school graduates from two peri-urban PAs namely Godino-Gendegorba and Ude-Denkaka. The two technicians were selected by the PA administration based on a criteria set by the *woreda* OoARD. The Oromia BoA permitted the candidates for three months training at the Assela TVET with additional one-month apprenticeship at the Abernosa ranch. To support the technicians, the project imported three packages of AI kits with accessories (insemination gun, gloves, bags, scissors and forceps) from Kenya including liquid nitrogen containers with 3.5 litres capacity. The technicians charge ETB 20/insemination to cover their expenses. Semen and liquid nitrogen is supplied through the Ada'a OoA. To enhance the AI service delivery of the Ada'a Dairy Cooperative, the project also provided AI equipment and accessories. Other projects, especially [Land O'Lakes](#), also contributed to improvement of the AI system through importation of improved semen and supporting private AI technicians.

In the final year, the project and regional partners introduced/tested a new system of mass insemination with the help of hormonal oestrus synchronization. The mass insemination programs were carried out in Ada'a and Ambo for about 300 cows. A 2-day workshop was organized to share experiences and review regional and federal level plans for AI in general and action research on mass insemination. Furthermore, presentations and discussion were held in Oromia Region to create awareness and funding support for research and development activities. In each of these events, it is emphasized that even though this mass insemination intervention is key for dairy development, it cannot stand by itself and needs to be complemented by programs developing other value chain interventions including fodder development, animal health services, processing and marketing.

Feed supply system interventions

To improve the feed supply system, private forage seed multiplication and distribution and commercial feed supply interventions were encouraged.

Forage seed multiplication by smallholders

The traditional way of forage production was buying seeds from the open market with little or no information on origin, variability and quality. Although there is an increasing demand for forage seeds as well as willingness by farmers to multiply forage seeds, lack of reliable institutional set up has obstructed the continuation and sustainability of the operation.

The project has attempted to involve smallholders in commercial forage seed multiplication since 2007. The followings are the activities undertaken by the project to introduce smallholders forage seed multiplication in the *woreda*:

- Identify farmers interested in forage seed multiplication by briefing them on the economic benefit of forage seed multiplication.
- Link forage seed growers to forage seed buying company.
- Identify forage seed accessions suitable to the area (EIAR and OoARD).
- Build the capacity of voluntary farmers and DAs (training on seed multiplication, forage agronomy, disease control and pest management).
- Arrange experience exchange and visits to build the confidence of forage seed growers
- Ensure that seed multiplication complies with proper use of improved seed, and fertilizer and pesticide application.
- Encourage that improved seed supplied was replaced after production to the *woreda* OoARD to engage new seed farmers in subsequent years.
- Facilitate contract agreement between growers and the seed company that stipulates the amount of seed to be purchased from the contracting party, price, and decision regarding any possible leftover seed.
- Conduct regular monitoring and evaluation of the seed production process by stakeholders (seed company, OoARD, IPMS and farmers during the growing season).

Commercial feed suppliers

In the urban dairy system, feed supply is a major problem since urban dairy farmers have little or no land to produce fodder. While some private suppliers of concentrate feed existed, more private companies established themselves responding to the increased demand in and outside the district. The project facilitated linkages between these feed suppliers and dairy producers. In addition, the Ada'a Dairy Cooperative started selling hay and concentrate to its members.

Improved animal health delivery service

The project did not actively introduce new interventions, other than linking farmers to the following animal health service providers. According to Girma (2008), the veterinary clinic of the OoA provides animal health services and the coverage is limited to only 3.3% of clinical treatment, 67.6% vaccination, 10% drug sales as well as 10 and 14.3% calve delivery service. The Faculty of Veterinary Medicine is another public service provider which introduced the 'open-air clinic', accounting for the provision of 7.7% of the clinical service and 9.3% of the drugs sales. The remaining 89% of clinical treatment, 80% of drug sells, 30% of the vaccination and 85% of delivery service are provided by private licensed business professionals and part-time animal health specialists. There were about four licensed private veterinary service providers and a number of part-time service providers in Debre Zeit town. The increasing ratio of service provision by private sector calls for the attention of the public sector to focus and strengthen regulatory and advisory roles.

4.4 Marketing and processing interventions

To solve the marketing problem of peri-urban farmers, the project staff in collaboration with Cooperative Promotion Office organized collective action in selected sites (hubs) to bulk milk for transportation and sale. Three sites were actively targeted by the project, namely, the Ude, Gendegorba and Godino PAs. Dairy farmers in Ude PA are individually registered as members of the Ada'a Dairy Cooperative. They agreed to bring milk to one collection centre and sell individually to the cooperative. Some dairy farmers also sell milk to other private milk processors. The Gendegorba model is similar to that of Ude, but all the members are women organized themselves in a saving and credit association. Dairy farmers in Gendegorba PA sell their milk to the Ada'a Dairy Cooperative only. Farmers in Godino PA have organized themselves into a Service Cooperative and sell milk to the Ada'a Dairy Cooperative and other processors. Milk marketing by urban dairy farmers is enhanced by other projects/donors which supported the Ada'a Dairy Cooperative in the establishment of a processing plant to add value to the milk collected.

5 Results and discussion

The results from the various value chain interventions introduced/supported by the Ada'a OoA/IPMS and others are described below. Most of the information is linked to the impact of the interventions on the peri-urban system, since most of the effort by the IPMS concentrated on this system.

5.1 Increasing dairy production and income

According to the project's impact survey, the number of farmers involved in dairy production increased from 5 PAs with 56 dairy farmers in 2006 to 10 PAs with 174 dairy farmers in 2010. The expansion in peri-urban dairy production occurred mainly around the main tarmac road due to the perishable nature of the product (Figure 2).

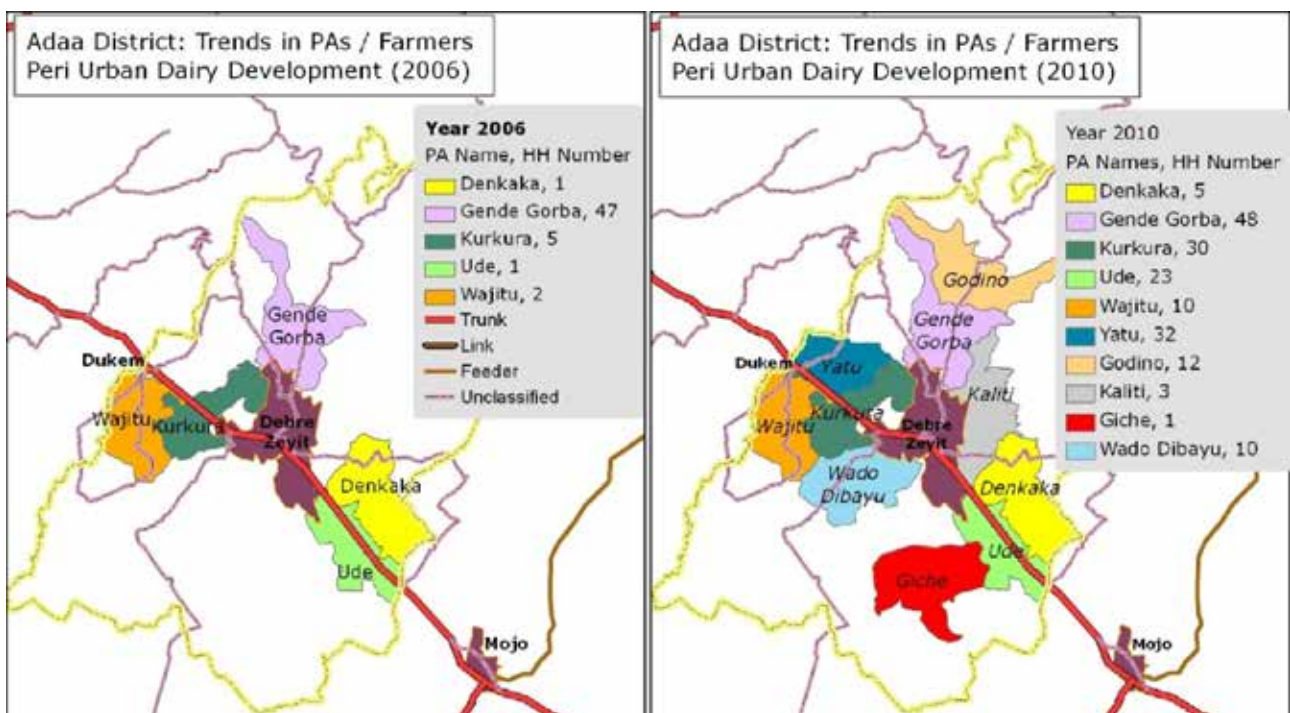


Figure 2. Interventions in peri-urban dairy production

Based on the same 2010 impact survey, the various interventions in terms of number of dairy cows, production/productivity and income showed significant increases as compared to the base year of 2005/06. The number of cows producing milk increased from 15 to 219. The number of households selling milk increased from 55 in 2005/06 to 142 in 2010. Average milk yield of crossbred cows in 2010 was 9.40 ± 2.33 litre/cow per day; which showed an increase in productivity by 34% compared to the 7 litre/cow per day during the baseline year 2005/06. Lactation length of local cows increased to 305 days compared to less than 240 days. Milk production in crossbred cow varied within and across the peri-urban PAs, and is attributed to differences in management and feeding system of the individual owner. At the beginning of the project intervention in 2005/06, the total annual gross production value from fluid milk sales was ETB 56,000 and increased to ETB 3 million in 2010. Assuming that on average 95% of the milk is sold, average income from sale of milk/household per year increased from less than ETB 1000 in 2005/06 to ETB 19,000 in 2010. The increase in gross production and sale value of milk sales is partly attributed due to increase in price of milk from ETB 1.75/litre in 2005/06 to ETB 5.20/litre in 2010 (Table 2). No impact assessment was made for urban dairy farmers.

Table 2: Impacts on peri-urban dairy intervention through key indicators measurement

Indicators		Year of production				
		2005/06	2006/07	2007/08	2008/09	2009/10
Households producing milk (No.)	Male	55	74	92	109	142
	Female	1	10	11	14	37
	Total	56	84	103	123	179
Improved dairy cows producing milk (No.)		15	77	97	137	219
Average milk yield (litre/cow per day)		7.00	7.67	8.44	9.25	9.40
Total production (litre/year)		32,025	180,130	249,697.4	386,511.3	627,873
Average price (ETB/litre)		1.75	2.37	3.46	4.53	5.20
Total production value		56,043	426,908	863,951	1,750,895	3,264,940

Source: IPMS project impact survey (2010) •

5.2 Increasing fodder production and availability

Backyard fodder production

As a result of commercialization of dairy development in peri-urban areas, the number of farmers who participated in backyard forage production increased from less than 10 before 2005 to 143 in 2010. These farmers practice stall feeding. Peri-urban farmers on the average allocate about 0.2 ha of land for forage production (Girma 2008). Areas like Godino PA that has irrigation facility grow both perennial forage crops like Napier and alfalfa as well as annuals like oats and forage legumes like vetch.

Increased production of crop residues

The newly released 'Kuncho' teff variety by the Debre Zeit Agricultural Research Centre has been adopted by 80% of the farmers. Grain yield from this new teff variety has resulted in tremendous increase from 1 t/ha from traditional varieties to 2 to 3 t/ha from Kuncho. Straw yield has also increased substantially. Berehe (2006) reported the ratio of teff grain to straw yield to be in the range of 1:2.5 to 3.5. Based on a 1 to 3 ratio, straw yield is estimated to have increased from 3 t/ha to 7.5 t/ha.

5.3 Supply system for genetically improved dairy animals

The scale of dairy development in Ada'a has created a favourable environment for business oriented input and service delivery, which was in part stimulated by the OoARD/IPMS project partners.

Private bull stations

Two private farmer bull stations which were established with bulls supplied from Holetta dairy cattle breed improvement centre were not successful due to physiological/health problems of the bulls. The OoARD/IPMS gave feedback to the station management about the poor performance of the two bulls and forwarded the complaints of farmers. Subsequently, the Debre Zeit Agricultural Research Centre distributed four improved bulls with known pedigree. The number of bull stations increased from two in 2006 to 5 in 2010. The owners charge ETB 30/service. Although there are no records kept by owners, a rough estimation by DAs indicate that each one produced 30 calves per year of which 50% are female.

Linking dairy producers to suppliers of improved dairy animals

About 24 crossbred cows in 2009 and 4 in 2010 were sold to peri-urban farmers by EMDTI, EIAR-DZ and Gobe ranch. The office of agriculture also distributed 82 pure Boran heifers in 2009/10 using farmers' own financial contributions.

It was also noted that the crossbred cows provided to farmers by government institutes were sometimes culled cows from the herd. Although farmers were aware about the condition of the cows, they sometimes reasoned '*something is better than nothing*'. However, after one season of production, these farmers felt they were cheated.

Improving AI services

There are now four categories of AI service providers in Ada'a. The first is the public sector service provider operated by the OoA. The second is a private AI service delivery enterprise operated by former district AI technicians. The third service provider is the Ada'a Dairy Cooperative and the fourth is the farmer AI technician recruited/trained and equipped by IPMS.

All service providers charge dairy owners different rates per insemination. The OoA charges ETB 4/insemination, Ada'a Dairy Cooperative charges ETB 12/insemination, private farmer technician charges ETB 20/insemination. The specialized AI private entrepreneur charges different rates, i.e. ETB 30/insemination to urban farmers when using local semen and ETB 130/insemination for imported semen by a private company. Rates charged by the private AI entrepreneur to peri-urban farmers varies depending upon the distance of the dairy farm; charges vary from ETB 50 to 60 for local produced semen and from ETB 150 to 200 for imported semen/insemination.

Table 3 shows trends of AI service delivery by the different actors since 2009. The role of the public sector in AI service delivery has declined and further diminished in 2010 as the public sector gave 17 insemination in 2010 or 2% compared to 100% service in 2005. On the contrary, the role of the private sector reached 98 % in 2010 (Table 3).

Table 3: Summary of AI service providers by actors in Ada'a PAs

PA	Public sector service delivery					Private AI service Tilahun			Ada'a Dairy Cooperative 2010	Private farmer technician 2010
	2006	2007	2008	2009	2010	2009	2010	2010 imported		
Debre Zeit	452	555	449	44	5	512	438	16	NA	10
Gendegorba	2	3	16	17	0	53	45	16	30	15
Godino	0	0	3	11	0	3	5	0	0	30
Kurkura	17	25	88	8	5	31	51	30	30	0
Ude/Denkaka	25	23	17	0	4	16	15	2	8	0
Wajitu	3	5	12	8	3	3	8	0	0	0
Yatu	12	21	11	0	0	32	39	20	0	0
Total	511	632	596	88	17	650	601	84	68	55

Sources: Personal communication with Ada'a OoARD, Ato Tilahun, Ada'a Dairy Coop, Tezazu (farmer AI technician).

Results of the study in October 2011 on hormonal oestrus synchronization and mass insemination in Ada'a and Ambo districts undertaken by the mobile team of Oromia region with support from the IPMS project showed that 60% of the inseminated cows were pregnant. This is more than double the national average after first insemination usually between 20 and 30% (G/Medhin 2008). This indicates that the new system has potential to become a more effective and efficient system—AI technicians handled on average 50 cows/per week instead of 5 to 6 under the conventional service delivery system. However, experience so far has shown that high quality capacity building and major organizational arrangements have to be made to make the new system functional for scaling out.

An action research was suggested to generate more data and improve the effectiveness of the AI delivery i.e. double insemination and use of sex fixer and sexed semen to increase the probability of birth of female calves. The assessment on the impact of hormonal oestrus synchronization and sex fixer treatment in Oromia is under preparation for field evaluation.

5.4 Feed supply system

Fodder seed supply

In 2007, improved forage seed was produced on 50 ha by public institutions such as EMDTI, Debre Zeit Agricultural Research Centre, National Veterinary Institute and private commercial farms like Genesis Farms, Alfa Farm, and Cow-Grow. Alfalfa and Napier grass are the dominant forage crops grown in the area. Genesis Farms imports alfalfa seed and sells at ETB 500/kg.

Through the project facilitation eight farmers from Godino and Dire Pas entered into a contractual agreement with Eden PLC to multiply forage seeds on 3 ha of land, of which three accessions of oats (ILRI-5518, ILRI-5453 and Bako 8237) were multiplied on 2 ha of land. These farmers sold 10.5 qt of oat seeds to the company at ETB 7245 in 2007. The seed producers also returned the amount of seed they received and reserved some for multiplication in the coming year. During the project life, a private company called Cow-Grow PLC has also started forage seed multiplication for sell.

The IFAD-FAP project carried out an opportunity cost analysis, comparing vegetable and forage production. Based on the cost analysis, perennials forages were found economical compared to some vegetables, except for onion. However, following the sharp increase in food prices in 2008, farmers opted for vegetable production than forages.

Commercial feed processors/sellers

There are now five sources of animal feed in Ada'a; these are: 1) feed processing plants (Alema PLC, Ada'a Dairy Cooperative, Genesis Farms, Bora Dairy, etc.) 2) factory by-products (Ada'a Biscuit, Awash flour mill, East Africa biscuits PLC, sugar factories etc.) 3) concentrated feed retailers (who sell homemade concentrate and/or factory by-products), and 4) grass hay and cereal straw sellers (Ada'a Dairy Cooperative, retailers).

Peri-urban dairy farmers produce roughages for their own farm use and usually purchase concentrates from retailers, while urban dairy farmers who do not own farm land purchase both roughage and concentrate feeds from various sources. In Godino PA, where farmers have irrigation facility, the project facilitated the development of commercial fodder production for marketing to urban dairy farmers. However, these farmers recently purchased crossbred cows and now preferred to feed their animals than selling green forage to urban farmers. Genesis Farms has recently started selling green alfalfa at ETB 1.00/kg and the demand for it is increasing. This experience may stimulate smallholder farmers to embark on commercial forage production.

5.5 Marketing and processing

As a result of interventions by various actors and projects, the Ada'a Dairy Cooperative started milk processing to add value to the milk delivered by its members. This new milk processing plant has a capacity to process 30,000 litres of milk on two shifts. The establishment of this milk processing plant has encouraged the further development of dairy farming in the area. Currently, six other private milk processing plants (Sebeta agro-industry, Lema Dairy, Bora Dairy, Family Dairy, Holland Dairy and Genesis Farms) have joined the market. This has resulted in high and fierce competition for milk among these processors and hence the price of milk has increased sharply partly due to this competition (see Table 4).

Table 4: Milk collected by Ada'a Dairy Coop at Ude Gendegorba and Godino collection centres

Date	2007/08		2008/09			2009/10		
	Ude	Gendegorba	Ude	G/gorba	Godino	Ude	G/gorba	Godino
January	3731	1073.4	3489	18,426.5		4879	21,153	1750
February	4019	11,852	3184	19,628		4568	21,156	2275
March	4060	12,802	2668	19,566		3983	20,210	2297
April	3451	12,645	2385	18,141		3766	19,309.5	2185
May	3134		2741	17,775		3317	17,980.5	2630
June	3599		2776.5	18,848	1364	3469	19,230.5	2321
July	4554		2699	17,902	1656			
August	4116		3324	18,859	1794			
September	3303	8042.5	4731	13,644		4046	17,980.5	1926
October	3816	8194	4096.5	14,754.5		5031	8432	1888
November	3826	8312.5	3787.5	15,958		5217	20,182	1058
December	4000	9217	3960	17,170		4950	21,032	1034
Total	45,609	72,138.4	39,842	210,672	4814	43,226	186,666	19364
Average	3800.75	9017.3	3320.1	17,556	1604.7	4323	18,666.6	1936.4

The creation of milk marketing hubs in peri-urban areas, in which milk is collected and bulked for transportation to a processor, has had an impact on the sale of milk to these companies. Records of the Ada'a Dairy Cooperative show that the Ude PA milk collection centre was able to attract only 11 dairy farmers during the first year (2005/06). In September 2005, the average amount of milk supplied/household per month was 150 litres with earnings close to ETB

300/month. In August 2006, average milk supplied/household per month increased to 350 litres and average milk sold/household per day was 11.7 litres. There was an annual increase of close to 200% of milk marketed by smallholders to the cooperative through the new market connection.

Similar collective marketing actions were undertaken by farmers in Gendegorba and Godino PAs in subsequent years. Unlike Ude PA, where farmers organized themselves informally, participating dairy farmers in Godino PA organized themselves into a formal cooperative.

The milk collected at Ude PA milk collection centre by the Ada'a Dairy Cooperative has grown from a monthly average of 3800 litres in 2007/08 to 4323 litres in 2009/10. Milk supply by dairy farmers in Godino PA also increased from a monthly average of 1605 litres in 2008/09 when the cooperative was formed to 1936 litres in 2009/10. The monthly average milk supplied to Ada'a Dairy Cooperative by dairy farmers in Gendegorba PA also increased from 9017 litres in 2007 to 18,666 litres in 2010 (Table 4).

While the increase in deliveries to the Ada'a Dairy Cooperative was substantial, it was also noted that farmers in Ude PA also used the collection hub to sell milk to other buyers. Information from key informants showed that an estimated 12,180 litres of milk was delivered to different collectors per month in 2009/10. In Godino PA also, only 60% of the milk produced was sold through the cooperative due to transportation problem.

After establishing a link with the Ada'a Dairy Cooperative, the Godino Dairy Cooperative disagreed on the premium milk price set by the Ada'a Dairy Cooperative. The Ada'a Dairy Cooperative also requested the Godino Dairy Cooperative to pay membership registration fee and buy a minimum share as a prerequisite for membership. This prerequisite was unaffordable by the Godino farmers and the deal broke down and they approached the Sebeta Agro-industry PLC to sell their milk. Agreement was reached to supply milk to the nearest collection centre which is about 10 km far from Godino.

Milk quality is a critical issue at collection centres and often is below optimal standards. According to IPMS assessment in 2008, the Ada'a Dairy Cooperative rejected 500 litres of milk daily at collection points. Lame Dairy Plant (previously Shola Dairy) rejects another 500 litres—about 12% of the total output (McNeilly 2008). The major reasons for rejections are adulteration and poor hygiene. Milk produced by Godino Dairy Cooperative is often rejected due to quality problems, as the milk was transported over long distance by horse cart. Another key problem by milk collectors is the reduction in volume of purchase during the fasting season (March to April) by followers of the Ethiopian Orthodox Church. In 2010 for example, Lame Dairy PLC reduced milk collection by a quarter and as a result tens of thousands of litres of milk was disposed (Fekede 2010, personal communication). In 2011, similar amount of stock disposal problem was reported by Ada'a Dairy Cooperative management.

5.6 Gender

Through training of couples and involvement of women in field days, the project attempted to improve the position of women in male-headed households as well as women in female-headed households. Impact studies on gender showed that about 25% of the households who own dairy farms in Ada'a were female-headed, while female ownership of crossbred cows was 33%. Uptake of improved dairy production technologies and fodder technologies by females was 40% and 30%, respectively (Aregu and Puskur 2009). This suggests that female participation in male-headed households in dairy development is important.

Couples training has multiple advantages, and these include: 1) actual operators of the business are targeted to develop skills as dairy farming is traditionally managed by women including feeding, calf management, barn cleaning, milking, processing and marketing, 2) building the capacity of producers at household level will help to strengthen

their potential to support each other as well as build trust and confidence of the household members, 3) two minds of similar skill are better in the adoption of technologies and creates synergy to in management skill, 4) ensuring sustainability of the enterprise in cases of death of one of the couples or divorced, 5) the risk of exposure to HIV/AIDS is minimized since both are all together during the whole training program.

5.7 Environment

Positive and negative environmental effects can be observed around manure produced by dairy animals kept in barns in urban and peri-urban settings. Poor housing and improper drainage is a major problem in these systems. This often creates discomfort and stress to the animals and reduces labour efficiency by making routine management of animals such as feeding, watering milking, cleaning and manure disposal difficult. Poor housing also results in poor lighting and ventilation of the barn. Cows under such conditions will have limited access to water, reduced feed intake, high incidence of lameness, mastitis, and reduced fertility resulting in overall poor animal performance. Manure is disposed along roads and around fences creating bad odour and health problems. Manure disposed along the roads also washes down to swampy areas and to lakes with adverse effect on human and livestock drinking water. Dried manure cakes are used as fuel for cooking by both urban and rural farmers. Smoke from the cake releases hazardous gases and carbon to atmosphere. In rural areas, use of manure for cooking also results in imbalances in nutrient cycling between crop and livestock production. In case of urban dairy farms, there is excess nutrient import to farms from crop residues and concentrate feeds produced in rural area, causing excessive nutrient load in the urban vicinity. Some farmers in urban and peri-urban system use manure to generate biogas for household fuel consumption and bio slurry for crop and horticultural fertilization. Some farmers in Denkaka PA have replaced chemical fertilizer by organic fertilizer using the slurry after biogas production. These farmers have reported improved crop productivity and grain quality from organic than chemical fertilizer. Private companies like Genesis Farms and smallholder farmers process produce and pack bio-fertilizer using dried bio-slurry and sell as organic fertilizer to growers.

5.8 Institutional/organizational changes

Several actors are now involved in the development of dairy in Ada'a and some of the original actors have changed their roles over time. An overview of actors and their present roles is presented in Table 5.

Table 5: Overview of present actors and roles in dairy value chain in Ada'a

Actor	Role
Smallholder dairy farmers in peri-urban	Business oriented production with modern dairy Multiplication forage seed Production of backyard forage
Urban dairy farmers	Business oriented production with modern dairy Knowledge source to small scale producers Use private service frequently
OoARD/IPMS	Plan and follow up dairy development with farmers Organize knowledge management activities to increase demand/participation in dairy and forage production including organize study tours, field days, exhibitions, forage demonstration plots Facilitate capacity development for farmers and DAs to develop skills Employs BSc trained animal scientist, one IPMS sponsored summer and one attachment graduated in BSc Facilitated purchase of crossbred cows and pure bred Borans Established bull station Lead dairy platforms Trained urea molasses block and straw treatment OoARD to implement a market oriented value chain development approach including training of staff Document the lessons learned Provided AI equipment to Ada'a Dairy cooperative Provided AI equipment to two private AI technicians Linked forage seed company with forage seed multipliers Linked peri-urban dairy farmers with Ada'a Dairy cooperative and private processors
Cooperatives Promotion Office	Stimulate group/cooperative formation for milk collection
Debre Zeit Agricultural Research Centre	Provide training and supplied improved crossbred
EMDTI	Provide training and supplied improved crossbred cows
Private forage seed company (Eden green Field PLC)	Purchased forage seed
Private Vet. Service	Provide veterinary service and drug sells
Private AI technicians	Provide AI service and delivery service
Ada'a Dairy Cooperative	Training of members Milk collection, pasteurization, packing and distribution Feed processing and sells Grass hay and straw sell AI service delivery Veterinary and delivery service
Food factories, and Private feed processors and retailers	Sell factory by products and/or concentrate mix
Private milk processors	Collect and purchase milk
Godino Dairy Cooperative	Established Godino Dairy Cooperative Supply milk
Godino Municipality	Provided milk processing and sell shop
IFAD-FAP	Training, organize platforms, provide forage seed, follow up monitoring
SNV	Technical and financial support in milk value chain
Land O'Lakes	Capacity building and provision of genetic material

Source: Dairy platform meeting in 2009 in Ada .

6 Lessons, challenges and recommendations

Although the project partners managed to demonstrate a sustainable commercialized smallholder dairy value chain system in Ada'a, many challenges remain for the future including:

6.1 Marketing and processing

Reducing the cost of marketing of fluid milk produced in peri-urban areas is an essential element for economically viable dairy production system. The collective action for milk marketing in the three peri-urban centres was a successful attempt to address this issue. However, to start such an activity, difficulties can be experienced because of lack of economics of scale. To help potential dairy farmers, collectors (cooperatives/private companies) could offer incentives (e.g. subsidized transport cost, reduced membership requirements) to stimulate dairy development. However, farmers should also learn not to abuse such incentives by switching between collectors, whenever convenient. Contract farming may be another option. Milk quality is another factor which needs to be addressed on-farm as well as at collection centres. Once sufficient scale has been achieved, establishing chilling facilities could be considered.

Seasonality in demand for milk as a result of fasting still results in drop in milk price and is a disincentive for producers. During the fasting season the demand for fluid milk sharply drops and wastage is common. During the fasting season in 2012, the Ada'a Dairy Cooperative decided to receive only 75% of milk produced by its members. The price per litre of milk also dropped by ETB 1.00 which was later adjusted to the previous price. The cooperative also dumped about 10,000 litres of fluid milk due to storage problem.

The common solution for such seasonal drop in demand is to process fluid milk into butter and cheese. To improve profitability, skim milk marketing has to be promoted. ESL (Extended shelf life) technology may also be targeted through filling in sanitary environments with packaging that has been sterilized. Also the cooperative has to look for other alternative market penetration mechanisms such as adding flavours, attractive packages, milk powder and expand storage facilities etc. Initiation of quality-based payment could help to promote quality milk production. Although the Ada'a Dairy Cooperative started processing of milk to add value to the raw product for the benefit of the members, the performance of the cooperative is weak compared to other newly emerging dairy processors. Business oriented management is required to make the cooperative efficient, effective and competitive. Improvement in this area is required to avert the potential danger of collapse of the system.

To increase demand for dairy products, promotion activities in urban areas through advertisement of basic and processed products should take place. In both rural and urban areas, demand for milk and milk products could be prompted through school milk programs.

6.2 Supplying inputs and services

Feed

As use of supplementary feed in the peri-urban dairy systems increases, more attention needs to be paid to quality control of the feed. One of the limitations in the case of feed processors and producers is that there is no reliable quality and nutritional composition of the feeds. Regulatory action is also weak. Dairy ration should be formulated based on age, milk production, physiological stage, climate, and genetic blood level of the animals. However, in the current practice every producer, processor and feed retailer uses his own experience to formulate ration. This requires the attention of the public sector to regulate and monitor the quality of animal feeds.

Improving animal genetic resources

The supply of improved dairy animals through creating linkages between suppliers and potential dairy farmers in Ada'a can only fill a small portion of the gap. Improvements in the effectiveness and efficiency of the AI delivery system, as demonstrated in a few areas, therefore need to be further developed to bridge the gap between supply and demand for improved dairy animals. Keeping proper and up-to-date records is the basis for genetic improvement of dairy animals. Most of the smallholder dairy farmers do not keep farm records. Records on animal identification, sire number, heat date, insemination date, calving date, type and amount feed fed, disease symptoms and treatment are not available. AI technicians don't inform dairy farmers details (sire name, sire number, batch number, blood level) of the semen used and no records are found both at farm and operators books. This will contribute for inbreeding problems and reduced performance of animals.

6.3 Credit

Lending institutions should introduce special credit arrangement for dairy farmers, since profitability of dairy is long term in nature. Also, economics of scale can be achieved through expanding herd size.

6.4 Value chain actors and roles

Dairy value chain development in Ada'a has reached a scale which enabled an entry of business oriented suppliers of inputs and services and processors of milk products, mostly without the support of the project. Such value chain actors can take a lead role in the further development of the value chain in the urban and peri-urban production systems. The government could assist in this process by developing infrastructural support mainly roads to enlarge the milk shed area. The government could also further support this development by developing a regulatory framework and capacity to ensure quality of inputs/services and products. Finally, the extension service should respond and engage in the provision of knowledge and further development of the skills of this emerging and fast expanding dairy system in the area.

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