Rural Urban Linkage in Market-oriented Dairy Development in Ethiopia: Lessons from the Ada'a Dairy Cooperative

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Abstract

Addis Ababa, with an estimated human population of over 3 million, has a high demand for cereals, pulses, fresh vegetables, fruits, milk and milk products and meat and eggs. The Ada'a Woreda is one of the important areas that supply the well known '*maja'* teff, chickpeas, fresh vegetables, eggs and chicken, meat and milk. The Woreda capital, Debre Zeit town, is only 45 km southeast of Addis Ababa and has a very good road and railway connection. The Ada'a Dairy Cooperative was established in 1998 in Debre Zeit based on its comparative market advantage, the conducive agro-ecological conditions for dairy production and the available support services. The cooperative was established with 34 members and an initial capital of 3,400 Birr. The main objectives are to minimize transaction costs, reduce price fluctuations over seasons, increase production efficiency, improve incomes and create job opportunities. Milk collection and marketing started in January 2000, with a daily total of 308 liters. The association has made significant progress so far and currently has over 850 members (about 50% female) who individually own over 3000 dairy cows. The current capital of the association has increased to USD 138,029. The number of milk collection sites has increased to 10 and job opportunity has been created for 62 staff. Daily milk collection has increased to over 8,000 liters and is mainly sold to the Dairy Development Enterprise (DDE) in Addis Ababa. The cooperative has established a small processing unit for the production of butter, yoghurt and cottage cheese during periods of excess supply. Members use mainly crossbred animals and the management level is relatively intensive with limited land area. Most animals are stall fed. The cooperative supplies inputs such as grass hay, concentrate feeds, veterinary drugs and services, and artificial insemination service to members at reasonable prices. Rural dairy farmers are joining the cooperative, taking advantage of market access for their milk. Inputs required in dairy production include feeds and water, labour, veterinary drugs and services, artificial insemination and equipment and utensils. The largest input in terms of volume and financial requirements is feed. These involve roughages and concentrate feeds. The main rural areas that provide roughage feeds (grass hay and crop residues) include Selale, Ada'a and adjacent Woredas, and Arsi. Concentrate feeds such as bran, middlings, oil seed cakes, molasses are supplied by ago-industries around Addis Ababa, Debre Zeit and Nazareth, but the row materials come from various parts of the country. Molasses is supplied from Wonji and Shoa Sugar Estates. Another major input is water which is used for animal consumption, washing and cleaning purposes. Most dairy farmers use expensive municipal water supply. Most of the milk collected is supplied to DDE. Pasteurized and processed products are mainly sold in Addis. Some fresh milk is also sold directly to hotels and restaurants in Addis Ababa, Debre Zeit, Dukem and Nazareth towns. In addition, milk collected from Ada'a by the Sebeta agro-industry is processed and supplied to urban centres as far as Bahir Dar. Manure produced from dairy farms is also supplied to a limited extent to rural areas, particularly to horticultural crops producing farms. A strong and organized rural-urban linkage is evolving informally at the moment and this should be recognized and strengthened to benefit both rural and urban dwellers in taking advantage of the value chain. Although urban and peri-urban dairy production system plays important role in the national economy, the system has been marginalized and there is limited research and institutional support addressing this issue. This paper presents the activities and achievements of the Ada'a dairy cooperative and also highlights the rural and urban linkages through the value chain of milk production, processing and marketing.

1. Introduction

Urban populations are growing in many developing countries. According to FAO (2004), by the year 2030, the current percentage of urban population will swell from 75% to 83% in Latin America and Caribbean, from 37% to 53% in Asia and Pacific and from 38% to 55% in Africa. In 2000, 1.9 billion people lived in cities of the developing countries and this is projected to grow to 3.9 billion in 2030. Globally, at the moment there are over 20 cities that have human population of over 10 million. Currently, urban and sub-urban farmers are the major suppliers of food to over 700 million city dwellers.

Ethiopia has an estimated human population of 77 million and is projected to increase to 140 million in the coming 25 years. Similarly, the current urban population of 6 million is projected to reach 36 million by 2025, an increase of 350%. The major urban centers in the country include Addis Ababa, Dire Dawa, Harar, Bahir Dar, Mekelle, Awassa, Nazareth (Adama), Gondar, Dessie, Jimma, Asella, Debre Markos, Debre Berhan and Jigjiga, The highlands of the country, dominated by crop livestock production system, cover about 40% of the total land area, and house 88 % of the human and 73% of the cattle populations. Addis Ababa, the capital city, has an estimated population of about 3 million with an annual growth rate of well over 5%. This population constitutes 4% of the country's total and about 28% the urban population. The daily food requirements of the city will increase substantially in the coming years. The projected human population and requirements for cereals and meat and milk up to the year 2030 are presented in Table 1.

Table 1. Projection of human population and major food requirements in Addis Ababa

Years	Population (000)	Cereals (tons)	Meat (tons)	Milk (liters)
2000	2,395	5,613,750	523,950	115,568,400
2010	3,328	7,488,000	698,880	154,152,960
2020	4,246	9,553,500	891,660	196,674,720
2030	5,080	11,445,750	1,068,270	235,629,840

Source: Wolday Amaha and Kifle Eshete, Food supply & distribution systems in Addis Ababa Feb.2002.

One of the major food requirements in Addis Ababa is milk and milk products. In Ethiopia, dairy production is mainly of subsistent type largely based on indigenous breeds of cattle. Milk production from this system is low to support the demand for the continuously increasing human population, particularly in urban centers (Azage and Alemu, 1997). Market oriented urban and peri-urban dairy production systems, based on up-graded dairy stock and purchased conserved feeds (Staal and Shapiro, 1996) are emerging and dominating most urban centers. The systems involve the production, processing and marketing of milk and milk products that are channelled to consumers in urban centres (Rey et al., 1993; Staal and Shapiro, 1996), with a number of beneficiaries along the value chain.

There is a large demand supply variance for milk and milk products in Addis Ababa indicating the untapped potential for development of urban and peri-urban dairy production systems. Market-oriented urban and peri-urban dairy production systems have tremendous potential for development and play a significant role in minimising the acute shortage of milk and dairy products in urban centres. There is also a strong rural-urban linkage in these systems in terms of supply of labour, feeds and water and also manure. Currently, due to increases in economic pressure, competition for limited resource, and market forces the level of intensification is increasing in these production systems. These urban and peri-urban dairy farms are currently facing new challenges associated with intensive production

systems. Availability of land, management skills, labor force, feeding resources, genetic improvement, control of diseases and parasites, reproductive problems, waste management, quality control, processing and marketing and other socio-economic considerations are becoming important factors influencing and determining the survival of these production systems. Although these systems are critical in terms of milk supply to Addis Ababa, the attention given to them is not often adequate. These systems are not also homogenous and have different requirements and needs. Azage *et al.* (2000) identified about seven sub-systems which are briefly described below.

2. Dairy Production Sub-systems in and Around Addis Ababa

Traditional crop/livestock farms in rural areas: These farms are located between 25 and 130 km of Addis Ababa. They are small farms with an average of four dairy cows, and provide very little or no specialized inputs to their dairy enterprise. They sell fresh milk on a daily basis to the government owned Dairy Development Enterprise (DDE). Excess milk is processed into butter and a local cottage cheese, *ayib* and sold in local markets.

Intensified dairy/crop livestock farms: These are smallholder farms located around Addis Ababa and exercise some form of intensive dairy production system. These farms have had experiences with dairy development projects under the Ministry of Agriculture. Projects such as the Selale dairy development project and the smallholder dairy development project have been operational in these areas and have influenced the production system. Improved genotypes, artificial insemination, improved forages, concentrate feeding, housing, calf bucket feeding and early weaning are common practices by farmers. Compared to those traditional crop/livestock farmers, land holding is about half the size and milk production is about 15% higher, but the number of cows per household is the similar.

Crop/livestock farms with intensive cropping: These farms are located relatively closer to Addis Ababa city, between 25 and 60 km. The farms and herds are 25% larger than the traditional crop/livestock farmers. The cropping system is more intensive and often use fertilizers. They provide supplementary feeds to their animals. Fresh milk is sold to the DDE and they seldom practice making dairy products.

Specialized dairy farms: These are large farms located within 15 and 60 km from Addis Ababa. Their average holding is 8.9 ha and 17 cows and use specialized inputs such as improved genotypes, AI, forage production, improved housing, concentrate feeding, veterinary care, etc. They sell fresh milk in relatively large quantities of over 30 liters per day primarily to local informal markets or to the DDE. Most farm owners have additional off-farm activities often generating more income than livestock.

Peri-urban farms in secondary towns: These farms are located in and around secondary towns within 25 to 50 km from Addis Ababa. Cattle are grazed on owned or rented land. Special inputs are linked to the type of genotype and involve artificial insemination and supplementary feeds to grazing and stall-fed roughages. These farmers, on average, own five dairy cows. The primary outlet for milk is either the DDE or local informal markets.

Intra-urban dairy farms in Addis Ababa: These dairy farms are specialized and intensive production units based on zero grazing of crossbred and high grade cows. There is no or little grazing within the city and stall-feeding is based on purchased hay and concentrates. The level of exotic blood in the herd is highest and annual milk production per cows is high and milk is directly sold to the local market.

Urban dairy in secondary towns: These are specialized dairy farms found in most secondary towns within the milk shed. In these small towns, farmers have more access to grazing; stall-feeding is

therefore less intensive. The level of exotic blood in the herd is high, but herd size is the smallest and averages about two cows per farm. Milk is sold fresh to local markets or the DDE, or processed into butter and *ayib* and sold. Most farm owners have off-farm activities representing about two-third.

3. Milk Supply to Addis Ababa

A recent study by Teferra Abreha (2006) from the Addis Ababa Urban Agriculture Department indicates that in the Addis Ababa milk shade there are about 66,766 cattle and 31,062 (46.5%) are estimated to be crossbred dairy animals. The main milk suppliers are urban dairy farmers in Addis Ababa and peri-urban dairy producers located around the city in Oromia and Amhara Regions. The estimated annual milk production from these two sources is 49,505 tons and 5,005 tons, respectively, totaling 54,510 tons. However, milk is supplied from various other sources in addition to the above two major suppliers. The total estimated milk supplied to Addis Ababa annually is presented in Table 2. Considering the total population of 3 million in Addis Ababa, the estimated per capita consumption has increased from about 16 liters in 1998 (Azage and Alemu, 1997) to about 22 liters. However, assuming an average consumption of 250 ml of milk per person per day, the total annual requirement will be 273,750,000 L, indicating a short-fall of 208,247,000 liters. The current supply therefore only fulfils about 24% of this assumed demand.

Table 2. Annual milk supply to Addis Ababa city

Source	Amount (L)
Addis Ababa Urban farmers	45,243,000
DDE	4,500,000
Sebeta Agro-Industry	8,760,000
Individual milk collectors	4,000,000
Others	2,000,000
Total	65,503,000

Source: Teferra Abreha, 2006.

4. The Ada'a Dairy Cooperative

The Ada'a dairy cooperative was established to respond to this huge demand-supply variance in milk and milk products in Addis Ababa is one of the major suppliers of milk and milk products to Addis Ababa city and represents two of the production sub-systems described above. These are composed of both the urban dairies in secondary towns and peri-urban dairy farms in secondary towns. The cooperative was established in September 1998 with 34 founding members who purchased a single share of 100 Birr each and an additional Birr 10 for registration fee. The initial capital of the cooperative was only 3,400 Birr (US400). The first two years were devoted to making organizational arrangements for the cooperative to be effectively operational. The main objectives of the cooperative during its formation were to minimize the high transaction cost for the sale of milk and reduce price fluctuations over season, particularly during fasting, reduce wastage of products due to poor handling procedures and lack of processing facilities, increase production and productivity of dairy farms and improve the overall incomes of member farmers, supply inputs such as feed, health services, etc. to member farmers at reasonable prices, provide training in dairy cattle management, milk hygiene and milk handling and milk processing to member farmers, ensure urban-rural linkage for dairy development in the Woreda, assist farmers to form milk units and establish milk union at Woreda level, introduce saving and credit system to member farmers, and collaborate with other dairy

cooperatives (nationally, regionally and internationally) to enhance dairy development. With the above objectives, milk collection and marketing activity started in January 2000. The cooperative, although informally established in 1998, got its legal certificate of Registration from the Oromia Regional State in September 2000. Some activities of the cooperative are presented in Figures 1 to 5.

Figures 1 and 2. Founders having the first meeting under a tree and the first meeting of the Executive Committee

Figures 3 and 4. Milk transportation and milk on delivery at a collection centre

Figures 5. Training on dairy technology at the ILRI Debre Zeit Research Station

5. Current Status

Over the last few years, the cooperative has made a significant progress (Table 3). Currently there are a total of over 813 full members composed of 422 male and 391 (48%) female. The cooperative members now have over 3000 dairy animals and a capital of 1,654,216 Birr (USD 191,018). The number of milk collection sites has increased to 10 around Debre Zeit town. The cooperative has created job opportunity to 65 young regular staff (32 are female), with salary ranging from 60 to 300 Birr per month. Recently, an AI technician and a veterinarian have been employed. The annual milk collection has increased from 288,000 liters in 2000 to about 2.6 million liters in 2005.

The current milk collection has increased to about 8,000 liters per day and the cooperative has purchased 3 cooling tanks. A small processing plant has been established and production of butter, *ayib* and cheese is underway. The cooperative supplies grass hay and concentrate feed mix to members at reasonable prices. It has expanded activities and established rural-urban linkage and this will enhance the participation of subsistence farmers in market-oriented production system through formation of farmers' group. Project team, staff in Bureau of Agriculture and other stakeholders are studying the feasibility of formation of milk groups and the possibility of establishing low cost milk collection centers at village levels in rural communities. The cooperative has recently received about 800 square meters of land in Debre Zeit town and has completed the construction of an office, conference hall and a milk processing plant (Figure 6).

Table 3. Achievements of the Ada'a Dairy Cooperative

Items	1998	2005
Total No. of members	34	813
▪ Male	34	422
▪ Female	0	391
Share sales, Birr	3,400	7,487
Capital, Birr	3,400	1,654,216
No. of cows	560	3000
Milk collected, liters	*288,000*[a]	2,568,200

1 USD = 8.6 Birr; [a]*Milk collected in 2000.*

Figure 6. The new cooperative office and milk processing plant under construction

6. Major inputs

6.1 Feeds

The key technical options to improve dairy production system are feeds, breeds, and disease control and prevention. In addition, policy and institutional support services are key issues that determine the success of dairy production systems. The major input in any dairy production system is feeds. Conserved hay, agro-industrial by-products and commercial concentrate rations are the major feed resources used by dairy farmers. Hay and straw (teff, wheat, barley) make up almost the entire basal diet. Agro-industrial by-products such as bran, middlings, oil cakes, molasses are fed as supplement.

They are purchased as complete ration, formulated by mixing two or more ingredients at home or using a single ingredient *per se* (Yoseph Mekasha *et al*., 1999). Non-conventional feed resources do play an important role in peri-urban dairy production system. These resources include hulls of pulse and other crops, traditional brewery and alcohol residues, poultry waste, vegetable and fruit wastes (Yoseph Mekasha *et al*., 1999). These feeds are cheap and have a far reaching impact in complementing the daily dietary needs of animals in urban dairy farms. Traditional brewery and liquor residues and pulse hull particularly are available throughout the year.

According to Yoseph Mekasha *et al*. (1999), the estimated total daily dry matter intake is 10.20 kg and the supplement contributes about 6.48 kg. Mean total crude protein intake is 1.42±0.46 kg. The estimated total energy intake is 81.62± 25.94 MJ. The ratio of the mean supplement to basal dry matter intake is 60:40. The overall mean daily milk yield was 8.63±2.3 kg and the average lactation and 305-days milk yields are 2,612.1 ±869 kg and 2,365.6±734 kg, respectively. Fat and protein contents are 3.95±0.87 g/kg and 2.91±0.33 g/kg. Mean annual dry matter (kg), protein (kg) and energy (Mcal) intakes per cow are 3,467±256 kg, 518±62 kg and 29,794±711 MJ, respectively, while the estimated mean annual dry matter, protein and energy requirements are 3,220±210 kg, 506±50 kg and 40,584±3928 MJ, respectively. The mean annual dry matter intake is higher by 7% of the requirement and the mean annual protein intake is according to annual requirement, while the annual energy intake had a shortfall of 26.5% of the requirement. Based on the above estimates of feed intake and milk yield, the key question is how much feed does it take to produce milk. The background physiological assumptions in calculating life-cycle needs of metabolizable energy for milk production is depicted in Figure 7 and the life cycle ME and feed needs for milk production is presented in Table 4.

Based on the above calculations for ME and feed requirements, the total annual feed requirements for members of the Ada'a dairy cooperative, currently collects about 8,000 liter of milk per day, can be estimated. The total number of registered dairy cows owned by members of the cooperative is about 3,500. There are also young calves, bulls, growing heifers and bred heifers that also require additional feed. Considering the above estimate of feed requirements for production of 8,000 liters of milk, the estimated amount would be:

Daily requirement:

- Forages - 2.9 x 8,000 = 23,200 kg
- Concentrate – 0.1 x 8,000 = 800 kg
- Total – 3.1 x 8,000 = 24,800 kg

Annual requirement would be:

- Forages – 2.92 million kg
- Concentrate - 292,000 kg

6.2 Water

Water is a major input into any dairy production system. In Ada'a dairy cooperative, most farmers use expensive municipal water to water their dairy animals and for other utilities. From the literature, generally large Western dairy breeds have higher water intake ((60 to 90 liters/day) than Zebu cows weighing on average 350 kg (25 liters/day) (King, 1983). For example, in Australia a lactating grazed cow consumes about 40 to 100 liters per day (Table 5), while in New Zealand average daily water

consumption for a lactating dairy cow is estimated at 70 liters per day. FAO (1986) reported voluntary daily water intake of 14 to 39 liters per day for a 180 kg zebu cow in tropical environments depending on the season.

A rough estimate of average daily water intake of about 40 liters for high grade lactating dairy cow under Debre Zeit condition, a total of 3,000 cows would require about 43,800,000 liters of water per year. This estimate is excluding follower herds.

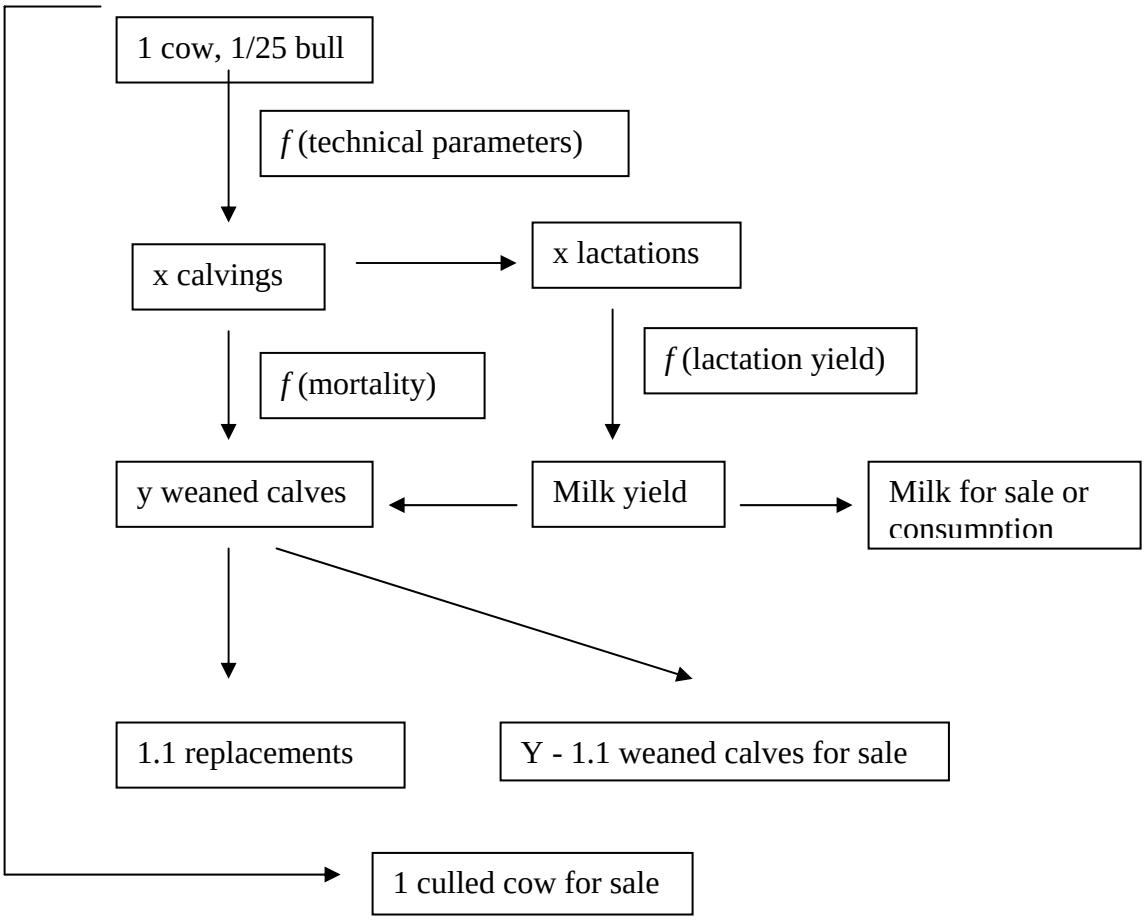

Figure 7. Life-cycle needs of metabolizable energy for milk production.

Table 4. Life cycle ME and feed needs for milk production

	Grazing zebu, no supplement	Grazing zebu, supplement	Dual purpose, supplement	Crossbred, supplement
Milk, kg	760	1290	14816	12859
MJ/Kg milk				
▪ From Forage	303.7	180.1	22.1	24.1
▪ From supplement	2.7	5.4	1.8	1.8
▪ Total	306.4	185.5	23.9	25.7
Feed/Kg milk				
▪ Forage	38.6	22.9	2.7	2.9
▪ Supplement	0.3	0.5	0.2	0.1
▪ Total	38.9	23.4	2.9	3.1

Table 5. Water requirement of livestock in tropical environments

Species	Mean body weight, kg	Voluntary daily water intake by season and temperature (liters/TLU		
		Wet (15-21^{0}C)	Dry (27^{0}C)	Dry hot (27^{0}C)
Camel	410	9.4	21.9	31.3
Cattle	180	14.3	27.1	38.6
Sheep	25	20.0	40.0	50.0
Goat	25	20.0	40.0	50.0
Donkey	105	5.0	27.4	40

Source : King, 1983

7. Major outputs

Milk

According to Yoseph Mekasha *et al*. (1999) the overall mean daily milk yield was 8.63±2.3 kg and the average lactation and 305-days milk yields are 2,612.1 ±869 kg and 2,365.6±734 kg, respectively. Fat and protein contents are 3.95±0.87 g/kg and 2.91±0.33 g/kg. Mean annual dry matter (kg), protein (kg) and energy (Mcal) intakes per cow are 3,467±256 kg, 518±62 kg and 29,794±711 MJ, respectively, while the estimated mean annual dry matter, protein and energy requirements are 3,220±210 kg, 506±50 kg and 40,584±3928 MJ, respectively. The mean annual dry matter intake is higher by 7% of the requirement and the mean annual protein intake was according to their annual requirement, while the annual energy intake had a shortfall of 26.5% of the requirement. Estimated requirements per cows and per annum based on calculated values below are presented in Table 6.

Annual requirement would be:

- Forages – 2.92 million kg
- Concentrate - 292,000 kg
- Total daily dry matter intake per cow = 10.20 kg .
- Total daily crude protein intake per cow = is 1.42±0.46 kg.
- Total daily energy intake = 81.62± 25.94 MJ.

Table 6. Estimates of annual feed requirement and lactation milk and nutrient production

	Per cow	Total
Annual feed requirement Forages, kg of milk Concentrate, kg of milk	 2.9 0.1	 292,000,000 292,000
Total annual DM intake	3723	13,030,500 kg
CP intake, kg	518.3	1,814,050 kg
Energy intake, MJ	29,791.3	104,755,000 MJ
Mil production	8,000/day	2,920,000
Fat content , 3.95 g/kg	31,6 kg	11534
Protein, 2.91g/kg	23.28 kg	8497.2 kg

7.2 Manure and urine

Assuming that members of the cooperative own crossbred or high grade dairy animals, the total amount of fresh feaces and urine production could be computed. Tesfaye *et al*. (2006) estimated fresh cow dung and urine production of Boran and Boran x Friesian cows kept under indoor feeding conditions in Hoeltta. He also estimated dry matter and organic matter contents and also contents of nitrogen, phosphorus and potassium in both cow dung and urine. The results presented in Table 7 show significant breed difference in fresh dung and urine production and composition.

Based on the estimated fresh dung and urine output for Boran x Friesian crossbred cows, the annual manure and urine output from cows owned by cooperative members is estimated at 18.8 million kg and 9.96 million liters, respectively. It is also interesting to note that the total contents of nitrogen, phosphorous and potassium contained in the manure and urine amount to about 34,000, 29,000 and 32,000 kg, respectively (Table 8)

Table 7. Least squares means for daily fresh feces and urine production and dry matter (DM), organic matter (OM), nitrogen (N), phosphorus (P) and potassium (K) yield per cow per day of Boran (*Bos indicus*) and Boran x Friesian (*Bos indicus x Bos taurus*) cows kept under indoor feeding in Holetta (Ethiopia), 2000

Fresh dung	Weight (kg)	DM (kg)	OM (kg)	N (g)	P (g)	K (g)
Boran	9.5a	1.8a	1.5a	12.5a	16.2a	12.9a
Boran x Friesian	14.7b	2.4b	2.1b	18.6b	22.6b	15.1b
SED	0.50	0.07	0.06	0.00	0.00	0.00
Urine	Volume (l)	DM (g)	OM (g)	N (g)	P (g)	K (g)
Boran	6.1a	530.7a	319.5a	7.0a	0.16a	6.8a
Boran x Friesian	7.8b	694.2b	397.1b	8.0b	0.21a	9.9b
SED	0.42	25.798	15.25	0.48	0.07	0.56

SED – standard error of difference; Means within the same column and different letters are significantly ($P < 0.01$) different. Source: Tesfaye Kumsa *et al*. (2006)

Table 8. Estimates of daily and annual cow dung and urine production based on data in Table 9.

Fresh dung	Weight (kg)	DM (kg)	OM (kg)	N (kg)	P (kg)	K (kg)
Total per day, Kg	51,450.0	8,400.0	7,350.0	65.1	79.1	52.9
Urine	Volume (l)					
Total per day	27,300.0	2429.7	1389.9	28.0	0.74	34.7
Grand Total per day		1082.97	8739.9	93.1	79.84	87.6
Total per year	18,779,250 kg					
	9,964,500 L	395,284.05	3,190,063.5	33,981.5	29,141.6	31,974.0

8. Impact on beneficiaries

The socio-economic benefits of the establishment and development of the Ada'a dairy cooperative is difficult to quantify in economic terms. Currently, the direct beneficiaries are about 800 households, with 45% women headed households and non-members who supply milk to the cooperative. The current members of the dairy cooperative include poor women, farmers, retired civil servants, retired military personnel, elderly people, young girls that are vulnerable to food insecurity and economic pressure. These households totally or mostly depend on their small-scale dairy production owning about 1 to 3 cows and solely depending on income generated from the sell of milk. Considering average members of a household to be five, this totals to over 4,250 people. A household with two improved milking cows generates an average gross income of about 200 USD per month and members are paid twice a month; ensuring continued cash flow. Employment opportunities have been also provided to 65 young (50% women) people. The rural--urban linkage is also stimulating a relatively large number of rural dairy farmers, particularly women, to participate in milk production and marketing. The cooperative is expanding its activities to reach more rural communities to stimulate and enhance dairy development and marketing in over 155,000 rural communities in the Ada'a Woreda alone. Moreover, efforts are being made for rural farmers to produce high value feeds such as alfalfa and Napier grass for direct supply to cooperative members.

In addition, the consumer community, particularly women and children, have benefited greatly from the availability of safe, hygienic and quality milk and dairy products in all seasons at reasonable prices. The market pull and income generation from dairy farming has also impacted on the environments in terms of improved animal management, product quality and waste management. The input services provided will also strengthen the benefits to members in terms of cost effectiveness and in efficiency of farm operation. The cooperative will contribute to training and developing the dairy sector among smallholder farmers and will impact on the livelihoods of smallholder farmers through contributions to securing assets, technology adoption, participation of the poor (both men and women) in markets and hence ensuring food security and economic development. In so doing, it will bring attitudinal and behavioural changes among the community. It will also serve as an example in transforming subsistence mode of production into market-oriented system and will vividly demonstrate the implementing the agriculture-led industrialization process. An example of how the value chain of milk production and marketing generates productive employment and economic benefit that could be accrued from organized milk production, processing and marketing is depicted in Table 9. The non-monetary benefits and contributions of the existence and development of the association in the development of livestock agriculture are difficult to quantify in economic terms.

9. Conclusion and Recommendation

Urban and peri-urban dairy production system is an important type of dairy production system buffering the large milk supply-demand variance in Ethiopia and in many other tropical and sub-tropical developing countries. Most of the producers have limited access to land and practice intensive production system using improved genotypes and purchased feed. The system uses diverse types of feed resources which basically are supplied from rural areas in forms of roughages (mainly grass hay and crop residues) and concentrate feeds including household by-products (such as brewers grain) and wastes of vegetables and fruits. Water is a key resource in any dairy production systems and most often urban and peri-urban dairy producers depend on rather expensive municipal water resources.

Table 9. Possible areas of productive employment and economic benefit from organized milk production, processing and marketing

Production inputs	Dairy cooperative	Processors	Retailers
Land – owners, brokers, etc	Milk collectors	Assemblers	Whole sellers
Farmstead structures – contractors, laborers, construction supply shops, metal and wood workshops, etc	Quality controllers	Quality controllers	Retailers,
Feed – farmers, daily laborers, balers, transporters, drivers, factories, retailers, etc	Drivers, laborers (loading and unloading)	Drivers, Laborers	Drivers, Laborers
Water – donkey owners, laborers, etc	Electricians, phone operators, secretaries,	Processors, managers, accountants, etc	
Animal health – veterinarians, technicians, drug stores, etc	Accountants, processors, store keepers, guards,	Processing equipment suppliers, consumables suppliers, etc	
Other inputs – chains, ear tags, bails, buckets, feeders,	Mangers		
Farm laborers			

The production system is a major supplier of fluid milk to major urban centres. The production system produces large quantities of manure and urine which may have significant environmental and public health implications unless otherwise utilized properly. Rural communities around major urban centres also benefit from the high demand for milk and milk products in cities. In most cases in Ethiopia, the market opportunity for rural farmers is in the form of butter. Through linkages with dairy marketing cooperative, however, they can benefit from marketing fluid milk through organized collection centres. Rural communities also get job opportunities to work in urban and peri-urban dairy farms.

Although there is an existing strong rural-urban linkage in dairy production in Ethiopia, it has not been well recognized and is currently very much disorganized. Apart from some isolated and incomplete studies, there is no adequate knowledge on this subject. Despite their important role, dairy producers have been marginalized and isolated from support by the public sector. Research and education and recognition of the production system are important key concerns that need to be addressed in order to be able to develop intervention strategies to strengthen rural-urban linkage in dairy production to benefit producers and city dwellers that have high demand for safe and superior quality of milk and milk products. This will create a win-win situation benefiting all involved in the value chain and in developing the sector as a strong economic force for sustainable agricultural development with a significant contribution to the realization of agriculture-led industrialization in Ethiopia, in other developing countries.

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