

Full Length Research Paper

Characterization of Dairy Cattle Production Systems in and around Wolaita Sodo Town, Southern Ethiopia

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This study was conducted in and around Wolaita Sodo town with the objective of assessing dairy production systems practiced in the area. A total of 180 households were randomly selected from three Kebeles in Sodo town and three from the surrounding. Dairy cattle producers were interviewed using a pre-tested semi-structured questionnaire. Two major dairy production systems, mixed crop/livestock in rural area and urban were identified. Most of producers kept indigenous dairy (crosses in town) cattle for milk production (62.7) and enhancing crop farming (48.9%) (followed by milk production) in urban and rural areas respectively. Dairying was found as a good source of income contributing about 46.7% and 13.3% for urban and rural producers. Dairy cattle husbandry practices such as feeding, watering, housing, breeding, milking, calf rearing, waste management, and record keeping were different in the two production systems. Family labor was the major source of labor for performing dairy activities where milk related activities were the responsibilities of women in both systems. The main feed resources identified in the area were natural pasture, crop residues, non-conventional and purchased feeds. Almost all households (97.8%) in rural areas were used on farm produced feeds and grazing, while in the town 67.7% were used purchased feeds and road side grazing. Tape water and river were the major sources of water and all the respondent reported watering frequency was once a day. Most (68.9%) of dairy producers used family house for their animals. 55.8% of the respondents were used natural mating whereas 43.1% used artificial insemination(AI) for breeding their dairy cows. However, 70.9% of the households preferred AI than/over natural mating. Major constraints for dairy production in the area included land shortage, feed and water scarcity, adulteration, feed cost and waste disposal. Milk and its products demand increasing forever, urbanization and substantial population growth are opportunities for dairy development in the area. Thus, market connections, access to improved breeds, improved management, veterinary and extension services, access to credit, land and training are important issues for smallholder dairy producers.

Key words: Dairy production, Ethiopia, Smallholder, Wolaita.

INTRODUCTION

Livestock play a vital role in economic development, particularly as societies evolve from subsistence agriculture into cash-based economies. Ethiopia is endowed with good dairy production potential mainly due to relatively fair natural resources availability, suitable climate, and large cattle population. There are, different types of milk production systems can be identified based

on various criteria. Milk production systems can be broadly categorized into urban (peri-urban) and rural milk production systems based on location (Redda, 2001 and Asrat *et al.*, 2013), while based on market orientation, scale, and production intensity, dairy production systems can be categorized as traditional smallholders, privatized state farms, and urban and peri-urban systems (Ahmed *et al.*, 2004).

Earlier reports showed that the contribution of dairy sector to the total household income is substantial. For instance, Yilma (1999) reported that, milk and milk

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products contributed 20-36% to the total farm income of smallholder farmers in Selale and Holleta areas of central highlands and 12-50% in and around Boditti, Wolaita zone (Asrat *et al.*, 2013). Beyene and Abrahamsen (1994) also reported milk and milk products contributed up to 46% contribution to household income in Southern Ethiopia.

Currently the demand for dairy products in Ethiopia exceeds the supply and this is expected to induce rapid growth in the dairy sector (Haese *et al.*, 2007). Factors contributing to this include rapid population growth, increased urbanization and income growth (Ahmed *et al.*, 2004). Dairy products are traditionally used in Ethiopia and milk and its products are not consumed in enough volume. Although total annual milk production in the country tends to increase, per capita milk consumption tended to decrease and demand is not yet satisfied. For instance, per capita milk consumption decreased from 19 kg/year in 1980 to 17kg in 1993 and below 15kg in 2000 in spite of the estimated increase in annual growth rate in milk production from 1.7% during the period 1980-1993 to about 2.2% during the period 1994-2000 (FAO, 2004). The performance of the Ethiopian dairy sub-sector has been lagging far behind that of the neighboring countries with comparable agro-ecological conditions.

Generally, the productivity of dairy sector in Ethiopia is below the neighboring countries and expected level because about 97% milk is obtained through traditional system (subsistence goal production) and there are number of factors contributed for this. These include high human and livestock populations (that compete for land and other resources), land shortage, animal disease prevalence, feed scarcity and poor genetic potential of indigenous cattle breeds. The situation of dairy sector in Wolaita Zone in general and in and around Wolaita Sodo town in particular is no exception it is known for its high population density and land scarcity, which is believed to have partly been driven by a substantial rural to urban migration. Urban farming is a typical feature of Wolaita Sodo town where a significant proportion of the population is engaged and animals are fed with household kitchen wastes, purchased feeds such as green grasses or hay, etc.

Though dairy operation plays an important role to the livelihood of the engaged households in the area through income generation and home consumption, there is limited work so far conducted to understand dairy production patterns in and around Wolaita Sodo(WZAO, 2011), which is a prerequisite to make development interventions. And production (supply) and consumption (need) of milk and milk products are not balanced because of the ever increasing demand and traditional production system constrained by different factors (Asrat *et al.*, 2013). Therefore, the overall objective of this study was to assess dairy cattle production systems in Wolaita Sodo town and its surroundings thereby identify constraints and opportunities.

MATERIALS AND METHODS

Description of the Study Area

The study was conducted in and around Wolaita Sodo town, Southern Nation Nationalities and People Regional, located at 390km south of Addis Ababa. It is situated at latitude of 8°50'N and longitude of 37°45'E with an altitude of 2025 meters above sea level. The study area has mean annual temperature of 20°C and receives rainfall of 450-1446 mm (WZAO, 2011).

Sampling procedure

Wolaita Sodo town is sub-divided into three administrative locations; Mehal, Merkato and Arada sub-cities. A total of 180 households, 90 (30 each) from Wadu, Merkato Gebeya and Hibret Kebeles from Sodo town and 90 (30 each) from Damot Waja, Kokate Marachare and Offa Gandaba from the surrounding Kebeles that have at least one milking cow were selected based on milk production potential and randomly respectively. Both in the town and its surroundings, the households were selected randomly using simple random sampling technique. The survey work was supported by secondary data collected from the zonal, town and district level Offices of Agricultural Development (OAD).

For an individual interview a semi-structured questionnaire was used to collect the required information on socio-economic characteristics and family size of the households, cattle keeping activities and their reproductive characteristics, feeding and watering management, animal health, historical information of cattle keeping activities, milk production systems, constraints and opportunities.

Statistical Analysis

Data collected during the individual interview were analyzed by using SPSS version 20.00 (SPSS, 2012).

RESULTS AND DISCUSSION

Dairy production systems

In the study area, two major dairy cattle production systems were identified; namely mixed crop/livestock production system in the rural areas and the outer edge of the town and urban dairy production system that operated within the town. The characteristics of these dairy production systems prevailing in the study area are briefly discussed below.

Mixed crop/livestock dairy production system

Mixed crop/livestock dairy cattle production system was

Table 1: Socio-economic characteristics of households in the studied area.

Variables	% of total respondents(N=180)	Variables	% of total respondents(N=180)
Male	56.7	Male	60.6
Female	43.3	Female	39.4
Total family size*(years)		Members of HH	
<10 year	49	Husband	56.1
11-25	13.3	Wife	43.9
26-40	12.7	Occupation of HH	
>41	25	Farmers	
Educational status		Laborer	4.4
Illiterate	40.6	Government workers	10
< Grade 8	36.7	Trader	11.1
High school complete	5.6	Retired person	17.8
Certificate holder	8.3	Others	7.2
Diploma and above	17.2		

* Mean (+SD) = 6.51(+ 2.53) for total family size, HH=Households

practiced in the surroundings of Sodo town. In this type of production, crop cultivation and livestock production are complementary, in which, livestock provides power for land preparation and manure as fertilizer, while crop by-products represent an important source of animal feed.

In this production system, different cereal crops predominantly produced include: barley (*Hordeum vulgare*), wheat (*Triticum aestivum*), maize (*Zea mays*), teff (*Eragrostis tef*) and sorghum (*Sorghum bicolor*). Tuber crops such as sweet potato (*Ipomoea batatas*), potatoes (*Solanum tuberosum*), enset/false banana (*Ensete ventricosum*), yam (*Dioscorea*) and Cassava (*Manihot cassave*) were also commonly used. Residues of these crops are commonly used as animal feeds. Similar farm inputs are reported from different parts of Ethiopia where crop/livestock production system is a typical feature: Asrat *et al.*, (2013) in Boditti, Tolera and Said (1992) in Wolaita; Zewdu *et al.*, (2003) in the mid highlands of Ethiopia; Chewaka (2006) in Yirgachefe area and Funte *et al.*, (2010) in Umbulo Wacho watershed in Southern Ethiopia. Natural pasture is used as the main source of livestock feed followed by crop residues (such wheat, barley and teff straws, maize stover; and pulse like beans and peas by-products). Similar types of livestock feeds were reported by Tolera (2009) in Wolaita and Funte *et al.*, (2010) in Umbulo Wacho watershed in Southern Ethiopia.

In this dairy production system, cows are kept for multipurpose and fed on grazing land and crop residues. Dairy products such as butter milk, butter and traditional/cottage cheese are marketed to buy farm inputs and family needs.

Though there are dairy cooperatives established since 2010 in the area by the support of the regional bureau of agriculture in order to help local people especially of women raise income from value addition on milk, none of the members were skilled of the milk processing, handling and preservation technique, etc. In addition,

there is little shared responsibility and inadequate equipment available and they have been weakly operational according to respondents.

Urban dairy production system

Urban dairy production system was commonly practiced in Sodo town. However, dairy producers in this system were reported they challenged by land and feed shortage. This dairy production system is market oriented like most urban dairying of Ethiopia and other East African countries is characterized by market orientation. The types of feed commonly used in this production system include purchased concentrates and roughages of conventional and non-conventional sources. In addition to these, different fruits, wastes and road side grazing were also used.

Scio-economic characteristics of households

The socio-economic characteristics of the respondents are presented in Table 1. Of the total respondents, 56.7% were males and the remaining (43.3%) were females. Most of the respondents (87.3%) were in the age category of 25-60 years, while 12.7% were over 60 years old. About 41% of the total respondents were illiterate; however in the town the proportion of literates were higher.

The results in general indicate that most of dairy cattle owners in the study area are literate; indicating that with good extension and training program they can improve their dairy production systems which are mainly based on traditional system currently. The average family size by age category showed that the almost half of household members (51%) were within productive age group categories in both urban and mixed crop/livestock production systems. The overall mean number of family size in the study area was 6.51.

Table 2: Purposes of keeping cattle in urban and rural production systems from the respondents' perspective

Purpose	% of total respondents	
	Sodo town (N=90)	Surroundings(N=90)
Milk production	62.16	20
Milk and meat production	-	24.4
Enhancing crop farming	-	48.9
Calf rearing	11.1	4.4
Security	4.44	2.2
Dung production(as fuel)	22.2	-

N=Number of respondents

According to the respondents' belief, age or sex of the household head, educational level and family size have implications on the livestock husbandry practices. They think that male household head has power and capacity in collecting feeds and performing outdoor cattle management activities than females and educated households improve at least some of the livestock related routine managements. Some of the respondents also reported that because of land shortage and expansion of town, they are shifting their mode of life from farmer either to trader and/or daily worker.

Dairy cattle owners generate income from different sources. For the majority of rural producers, dairying is not the main income source where sales from crops accounting for about 53.3% of the total household income. Although butter and sour buttermilk were marketable dairy products throughout the year, the income obtained from these products was not significant. As observed during the study, for urban producers, the contribution of the dairy operation is substantial (46.7%) of the total household income. However, the overall contribution of dairying to the total household income in the present study was 30%. This was in agreement with 31% reported by Asrat *et al.*, (2013) in and around Boditti and 34% reported by Ahmed *et al.*, (2003) from around Holleta.

According to the respondents, cattle purchasing, selling and breeding activities were mainly operated by adult males. From the total number of respondent households, 95.6% of adult males were involved in purchasing and selling of cattle and breeding activities. Male family members are, in most of the cases, in charge of cattle tending especially in the mixed crop/livestock production system in rural areas. But other family members were also found to be involved in this activity especially females less than 15 years age. Routine dairy activities like feeding, milking and nursing of sick animals, on the other hand, were performed by female family members. In the case of urban producers, these activities are operated by hired labor (if the farm is somewhat intensive) in addition to family members. All activities related to milking, milk handling, processing (churning) and milk selling were performed mainly by household wives and other adult female members and/or female children above 15 years old.

Purposes of keeping cattle

In the mixed crop/livestock production system of the study area (rural areas), dual purpose cattle of local and/or crosses(not more than 50% blood level) were kept to produce milk for household consumption and male calves with the intension of providing draught power later on. The most important significance of cattle is that they are an asset that can readily be converted into cash needed to purchase of farm inputs like fertilizers and improved seeds for the next crop production cycle. The role of animal dung in the area is high related to land scarcity where it is used as fertilizer for farm land in rural and as fuel in urban areas respectively. In rural or mixed crop/livestock production system, the primary purpose of keeping cattle is also noted by other authors for different crop/livestock production systems in different parts of the country (Tola *et al.*, 2004; Tadesse *et al.*, 2005; Yigrem *et al.*, 2008).

Dairy cattle husbandry practices

Feeds and feeding systems

Animal feeds represent the major input in any dairy operation. Common feed resources in the study area varied between production systems. In the mixed crop/livestock production system, grazing on marginal and/or communal land areas and after crop harvest are the major feed resource (Table 3). In addition, almost all households (97.8%) in rural areas use animal feeds from their own crop farm even though it is not satisfactory in addition to grazing, while others use own farm and purchased feed together with grazing. On the other hand, 67.7% of dairy producers in the town use purchased feeds from different sources together with road side grazing. About 32.9% and 44.4% use roadside and/or home-yard grazing with some purchased feeds and other feed resources such as kitchen and open market wastes.

Both conventional and nonconventional feed resources are used in the study area like most parts of Ethiopia. Feed resources commonly used by dairy producers include grazing, natural grass, hay, purchased green grass and cereal crop residues. Other animal feed

Table 3: Major feed sources and feeding systems identified in the study area.

Major feed sources and feeding systems	% of total respondents	
	Sodo town (N=90)	Surroundings (N=90)
Feed resources		
Grass/pasture	100	100
Conserved feeds	55	66
Crop residues	49.5	100
Purchased feeds	67.1	38.5
Non-conventional feeds	77	71.5
Feeding practices		
Grazing	32.9	44.4
Tethering	26.7	7.8
Cut and carry system	12.2	25.6
Others	28.2	22.2

N=Number of respondents

resources include pseudo stems of enset (false banana) and banana; their leaves; maize and sorghum stover, improved forages like elephant grass (*Pennisetum purpureum*) and pigeon pea (*Cajanus cajan*). Mixed homemade concentrate feeds such as cotton seed with maize grain; cotton seed with coffee leaves; fruits and fruit seeds like avocado; root crops like sweet potato, sugar cane (*Saccharum officinarum*) and its tops especially in dry season are also commonly used. Moreover, plant weeds and non-conventional feeds like *Attalla* (local beverage by-product), kitchen wastes and edible leaves of other plants such as 'Korch' and grabble are also fed to animals. The current result agrees with the report of Asrat *et al.*, (2013) in and around Boditti.

The cereal crop based system, which is mainly found in the rural areas, is similar in feed resource use with most mixed crop/livestock production systems of Ethiopia (Yigrem *et al.*, 2008; Yilma and Ledin, 2000; Zewdu *et al.*, 2003; Tadesse *et al.*, 2005). Crop residues are also the major feed sources in the area as is the case in most parts of the country as reported by Tolera (2009). In the area, annual food crops particularly cereals and root crops are dominant, and crop farming is highly integrated with livestock production, particularly with cattle rearing.

In the study area, cattle graze along roadsides and/or common grazing area or tethered and graze in the backyard that agrees with the report of Asrat *et al.*, (2015) in Humbo Woreda. During the dry season, unlike cereal crop based systems of the mid-highlands of Ethiopia, farmers feed their cattle with enset and banana pseudo stems and leaves, sugar cane and its tops, and leaves from different trees. Similar feeding practices were also reported in various parts of the country (Tolera and Said, 1992; Tolera, 2009; Chewaka, 2006; Asrat *et al.*, 2013 and Yigrem *et al.*, 2008).

Dairy producers in the urban areas mainly use purchased roughage and concentrate feeds along with non-conventional feeds like *attella*. There is no hay making practice for later use during the dry season where feed is less available. Therefore, during the dry season, urban producers rely on purchased animal feeds such as

sugar cane and green or dry grass. According to Mekasha *et al.*, (2003), in intra-urban and peri-urban dairy farmers around Addis Ababa milk shed and Yigrem *et al.*, (2008) in Shashemene-Dilla areas, hay is also the most common feed resource. In the studied area, hay stacking practice was not observed, which should be encouraged for future use in the dry season where feed scarcity is the main problem to cattle producers.

Feed resources observed in the present study were similar to the commonly used feeds in other urban dairy farming systems in Ethiopia (Mekasha *et al.*, 2000; Gebreselassie, 2006). In the study area, supplementary feed was mainly given to lactating cows (69.6%) followed by pregnant dairy cows (30.4%) with the intention of boosting next lactation milk and draught oxen in rural areas (95.6%). In their study around Shashemene-Dilla areas, Yigrem *et al.*, (2008) also reported a similar value (58%).

Water resources and watering practices

The main sources of water in the present study were rivers, tape water, spring and borehole (Table 4). Majority (57.7%) of the respondents in the rural areas obtain water from rivers while 56.6% in the town used tap water. Dairy producers that use river water for their animals do not treat it.

Frequency of watering to dairy animals varies from one production system to another, which is affected by different factors, among which season, accessibility (getting easily), performance and/or breed of the animals (that describes the amount of water), and type of predominant feed (dry or wet) and feeding systems (indoor or outdoor where some water is available). In the studied area, all of the households provide water to their animals once a day except the household that live around or near watering points or rivers whatever the season is.

Housing system

About 81% of the households in rural or mixed crop/live-

Table 4: Water resources and frequencies of watering in the study area

Water resources	% of total respondents	
	Sodo town (N=90)	Surroundings (N=90)
Rivers	16.7	57.7
Tap water	56.6	17.8
Spring water	11.1	10
Borehole	15.4	14.4

N=Number of respondents

stock system kept their cattle within family house, while 19% used a separate shelter and open barn/shed or fences within their own compounds. This is in agreement with Yigrem *et al.*, (2008) in Shashemene-Dilla; Asrat *et al.*, (2015) in Humbo Woreda, and Asrat *et al.*, (2013) in Boditti, Wolaita zone. According to the respondents, cattle are housed together with the family because of the fear of thieves, to protect animals from extreme environmental hazards and also for ease of husbandry practices such as feeding, watering, milking, waste management.

In the urban production system, housing cattle with the family was uncommon and was only practiced by farmers or households around the periphery of the town. The majority (56.8%) of the households in the town areas used cooking places (kitchen), 35.1% separate houses and 8.1% open barn/shed or fences within their own compounds respectively for their animals. All the interviewed dairy producers in the area reported they clean the barn every day. Though housing cattle in separate house has its advantage, dairy producers in the present study area mostly (68.9%) used family house for their animals rather than sheds designed in a proper way. This trend should be avoided and use of sheds or separate houses should be encouraged.

Breeding system

In the mixed crop/livestock or rural production system, most of the households (68.9%) use natural mating using local bulls, 28.9% of the households use Artificial Insemination (AI) and the rest (2.2%) use both natural mating and AI service. Whereas 42.7% of the households in the urban system also used natural mating and the majority (57.3%) used AI. According to the respondents, the reason for the limited use of AI in rural area is the fear that the size of local female cattle is not fit to carry and parturate the offspring of improved breeds.

Based on the type of livestock production system, there are different factors that determine the preference of breeding methods in the area. These factors include: access and cost of AI service, ease of getting preferred service, access of breeding bull, number of services required till conception, knowledge of heat detection and size and performance of female animals in the area. Accordingly, 55.8% of the respondents in the present study area used natural mating from locally available

bulls whereas 43.1% used AI for breeding of their dairy cows. When the aforementioned factors are not considered, almost all (70.85%) of the households in the area prefer AI.

Genetic improvement of cattle is the key element in the production of milk and milk products. In order to respond to high milk demand and utilize potentials and resources available there, provision of genetically superior dairy cattle and/or good breeding services as per the need of producers is one of the prerequisites for the development of dairying in the studied area. There is a noticeable difference in production performance and other economically important traits between local breeds and their crosses. Consequently, getting access to improved genetic material through improved AI or breeding service is critical to enhance the development of the dairy sector in the area.

Milking practices

Majority (95.3%) of the households milked their cows thrice a day; at 6-7am in the morning, 3-4pm in the afternoon and 8-9pm in the evening. Beyene (1994) also noted similar practices in some enset producing areas of Wolaita Zone. All the dairy producers in the area wash the cows' udder before milking with clean water. The average daily milk yield per cow in the present study area reported by the majority (87.3%) of respondents was 2.95 liter which is by far higher than CSA (2015) report (1.35 liter) in the country.

In almost all cases, milking was predominantly handled by household wives or adult females. In some special cases in town, milking was handled by hired labor. Milking in different parts of Ethiopia is primary handled by women, which agrees with the current result.

Calf rearing practices

Majorities (94.1%) of the respondents were practiced partial suckling prior to milking, and colostrum was given to calves freely and about 55% of the respondents continue it from 5 to 7 months of age. This result is in line with the reports of Asrat *et al.*, (2015) from Humbo Woreda (80%) and Asaminew and Eyasu (2009) in Bahir Dar and Mecha areas (80.7%). The remaining households in the town that kept cross breeds and got high incomes from milk sale never allow partial suckling

but for the first 15 days gave milk freely. They provide milk for the calves by using different equipments. However, with respect to weaning, the majority (65.1%) of households allow weaning (after the dam became pregnant especially in rural area), 17.2% when there is feed availability for the calves, 10.7% wean when the cow becomes aggressive or reduced milk production for the calf while the rest 7.1% of the households wean calves when the dam becomes dry. Colostrum feeding practices in the studied area lasts for 5 to 7 days in almost all producers' case.

Supplementary feeds, mostly fresh grasses were provided to calves at one month of age in the majority of the households (84.4%) while 11.1% provided supplementary feeds starting from 15 days after birth. In case of urban producers, the majority (58.2%) started supplementation 7-15 days after birth, which revealed that the urban producers follow early weaning practices with the assumption of profit maximizations from sale of milk that was otherwise be used by calves. The rest 41.8% start supplementation after one month of age which is similar with that of rural producers. This condition was also reported by Yigrem *et al.*, (2008) for Shashemene-Dilla and Asrat *et al.*, (2013) for Boditti areas respectively.

Manure management

All the interviewed dairy cattle producers in the rural livestock system used animal dung primarily as fertilizer. In addition, it is also used as household fuel. Manure from these animals play a very important role for farming of their food crops, particularly for coffee, enset, maize, root crops and fruits found in the garden of the farmer. Enset usually requires a large quantity of organic fertilizer and thus animal dung had special attention than the cereal crops. Some people who do not have the capital to afford their own cattle, kept dry and pregnant cows and calves that belonged to other people until calving or growing for the benefit of using the manure to fertilize their crops.

Disposal of manure in urban agriculture is one of the major problems of dairy producers. Majority (58.9%) of urban producers paid out extra money to dispose off or transport (farmers around the periphery of towns to fertilize their crops) animal dung out of the town for carter men, 22.2% of households used the cow dung primarily as household fuel and others (13.3%) used it to fertilize fruits within their compounds.

Manure collected from urban dairy farms can be made available to the surrounding rural farmers for use as organic fertilizer and thereby reduce operating cost of farmers exhausted on purchase of inorganic fertilizers. The other important option which leads to technological application is that manure can be used as a source of energy through biogas production, if all the necessary infrastructures are available, it can be installed within

reach of urban farmers compound that agrees with the options reviewed by Ermias and Asrat (2015). Proper manure management is one of the major routine activities in dairy production that is must to clean manure and urines from the dairy house to assure good and hygienic working conditions.

Record keeping practices

Though the trend of record keeping is almost not familiar in smallholder (traditional) dairy farming in many parts of Ethiopia, 42.7% (town) and 27.8% (surroundings) of dairy producers were found to maintain breeding/AI and farm/reproduction records respectively, in the present study area. However, 29.4% of dairy producers did not practiced record keeping did not know the importance of record keeping. In disagreement to the present result, Asrat *et al.*, (2013) reported 95% of respondents in and around Boditti town, Wolaita zone were not practiced record keeping.

Constraints and opportunities of dairy cattle production

Constraints

Table 5 presents the major constraints to dairy cattle production in the study area. Ranked by the respondents; land shortage (1st), feed shortage and waste disposal (2nd), and water scarcity (4th) in the town, while land shortage (1st), adulteration (2nd), feed shortage and water scarcity (3rd) in surroundings were among the major constraints to dairy cattle production. The result of current study is similar with reports of different scholars in different parts of the country.

In addition to the abovementioned factors that hinder dairying in the area, lack of skills in different aspects of dairy activities, poor extension and veterinary services and dairy cooperatives especially to urban dairy producers since there is one that was established in 2010 in Kokate Marachare which is not functioning now a days. Most farmers in general and dairy producers in particular in the area had never been received training regarding feed conservation techniques, feeding systems, housing, basic animal health(slight), reproductive management, milk handling and importance of dairy cooperatives. Similar case was reported by Nebiyu (2008) in Delbo Watersheds of Wolaita, Asrat *et al.*, (2014) in Boditti, Yigrem *et al.*, (2008) in Shashemene-Dilla and Asaminew and Eyasu (2009) in Bahir Dar and Mecha areas.

Opportunities

The major opportunities to dairy cattle production in the study area are shown in Table 6. High milk demand (1st),

Table 5: Dairy production constraints identified in the studied area.

Constraints	% of total respondents			
	Sodo town(N=90)	Rank	Surroundings(N=90)	Rank
Land shortage	100	1	100	1
Feed shortage	87.8	2	77.8	3
Waste disposal	87.8	2	-	-
Water scarcity	86.7	4	77.8	3
Feed cost	80	5	46.8	7
Adulteration	73.4	6	86.7	2
Lack of credit	43	7	68.9	5
Disease outbreak	43	7	53.3	6
Poor genetic potential	31.6	9	37.8	8
Others	17.2	10	23.3	9

N=Number of respondents

Table 6: Dairy production opportunities identified in the studied area

Opportunities	% of total respondents			
	Sodo town (N=90)	Rank	Surroundings (N=90)	Rank
Milk demand	93.3	1	68.4	2
Urbanization	87.8	2	77.8	1
Population growth	43.3	3	46.6	4
Climate condition	41.8	4	53.3	3
Government policy	37.8	5	44.4	5
Infrastructures	31.6	6	37.8	6

N=Number of respondents

urbanization (2nd), population growth (3rd) and suitable climatic condition (4th) in the town and urbanization (1st), high milk demand (2nd), suitable climate (3rd) and population growth (4th) in the surroundings were among the major opportunities ranked by the respondents.

Dairying provides the opportunity for smallholder farmers to use land, labor and feed resources and generate regular income. Therefore, market connection, improved breeds (access for AI), improved management and veterinary and extension services are the major issues for smallholder dairy development in addition to provision of credit, adequate land and training. This result agrees with the reports of Asaminew and Eyasu (2009) in Bahir Dar and Mecha and Asrat *et al.*, (2014) in and around Boditti areas.

CONCLUSION AND RECOMMENDATIONS

In the present study, two major dairy production systems, mixed crop/livestock (practiced predominantly in rural areas) and urban (practiced in the town) were identified. Most of producers kept indigenous dairy (crosses in town) cattle for milk production and enhancing crop farming in urban and rural areas respectively. Dairying was found as a good source of income for all farm families in the area contributing 46.7% for urban producers and 30% in general in the studied area. Family

labor was the major source of labor for performing dairy activities where milk related activities were the responsibility of women in both systems.

Natural pastures, crop residues and non-conventional feeds in rural areas and natural pastures, purchased and non-conventional feeds in town were the major feed resources identified in the area with grazing (road sides and on marginal areas), tethering and provision of different feeds by various means, the major feeding practices. Tape and river water were the main water resources used by urban and rural production systems respectively with once a day watering frequency. The major constraints to dairy cattle production in the area; were land and feed shortage, water scarcity, adulteration, high feed cost and waste disposal (in urban area), lack of credit, disease outbreak and poor genetic potential. The increasing milk and its products demand, urbanization and population growth were among the opportunities for dairy cattle production in the area.

In conclusion, market connection, access to improved breeds (AI), improved management, veterinary and extension services, access to credit and land are among the important things for smallholder dairy producers that responsible bodies must address. In addition to this, provision of training on improved feeding, dairy cooperative, modern dairy cattle production and researches on how to handle urban dairy farming challenges must be the major focus areas in the future

in the studied area.

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