Journal of Agricultural Economics, Extension and Rural Development: ISSN-2360-798X, Vol. 6(3): pp, 728-740, May, 2018.

Full Length Research Paper

Characterizing Smallholder Dairy Production and their marketing: The implication of enhancing market-oriented dairy development in *Bure* district, Amhara Region, Ethiopia

Habtemariam Assefa and Azage Tegegn

Corresponding Author's E-mail: assefahabtemariam@yahoo.com

Accepted 16th May, 2018.

Livestock production in Ethiopia is the major sub-sector of agriculture with great potential due to its abundance of natural resources, a suitable climate and large cattle population. This study was carried out in the Amhara region (Bure district) where dairy farming plays a key role in people's livelihoods. The aim was to characterize the area's dairy production system and current and potential marketing participation. So far, most dairy production is for self-consumption and market oriented dairy production is still developing. Semi-structured questionnaires were administered to a randomly selected sample of 90 dairy producers across three production systems (rural, urban and peri-urban).Larger cattle population (9.97±0.77) was found in rural dairy production than the urban (7.57±0.84) and peri-urban (6.40±0.69 head/hh) systems. More cross breed cattle were found in urban (4.03± 0.62 head/hh) than peri-urban (0.3±0.12) and rural (0.07± 0.05) dairy production system. The average numbers of lactating cows in urban, peri-urban and rural systems were 2.23±1.45, 1±0.83 and 1.87±1.01, respectively. From which, in average 9.35±1.79, 1.22±0.20 and 1.96±0.34 litters of milk was daily produced per household in urban, peri-urban and rural dairy production systems, respectively. From daily produced milk in urban system, larger amount (7.72±1.63 litter) of milk was sold than amount of milk consumed (1.60±0.35 litters) but in peri-urban and rural systems no milk was sold rather it was used only for household consumption. Attela (26.2%), hay (24.3%) and crop residue (22.3%) were primary feed sources in urban dairy subsystem. In per-urban and rural dairy production system, crop residues, attela and grazing were the major feed source to dairy farming. In all airy production system, independent housing system was mainly used to shelter their dairy cattle. It accounts for 93.3%, in urban, 50.0% in peri-urban and 80.0% in rural system. Taking sick cattle to clinic was the primary mechanism used to manage the health problem in urban (74.3%), peri-urban (69.8%) and rural (57.1%) dairy production systems. The dominant cattle types sold in the urban dairy production were male calf and bull whereas in both peri-urban and rural was old cattle type. To improve milk production and market participation in the rural and peri-urban systems, effective and competitive dairy production and marketing system should be developed and also provide intensive extension supports to dairy producers.

Keywords: milk yield, dairy production system, herd structure, lactating cows, market participation

INTRODUCTION

Livestock production is the major sub-sector of agriculture that attracts the attention of government for economic development, food security and reduces poverty in the country (Abebe, 2007).Ethiopia is endowed with good livestock

production potential mainly due to its fair natural resource, suitable climate and large cattle population (Asrat et al., 2013).It is a home to an estimated 53.4 million cattle, 22.8 million goats, 25.5million sheep, 49.3 million chicken and 1.1 million camels (CSA, 2011).

Dairy production is an important component of livestock farming in Ethiopia (Azage et al., 2013). It is practiced almost all over the country, from small to large-scale and across subsistence and market-oriented farming (Sintayehu et al., 2008).Cows are the main source of milk production. Small quantities of milk are also obtained from goat and camel in some region particularly in pastoralist areas (Ketema and Tsehay, 1995). The contribution of the dairy sector to the total household income is substantial. For instance, milk and milk products contributed 20-36% to the total farm income of smallholder farmers in the central highlands and 46% in the Southern part of Ethiopia (Asrat et al., 2013). It is estimated that 10 million dairy cows are found in the country (CSA, 2011), producing 3.2 billion liters of milk per year (Land O'Lakes, 2010). However, milk production per cow remains among the lowest in the world, even by African standards (Sintayehu et al., 2008). This is due to the lack of proper supplementary feeding, poor nutritive value of pastures offered to the animals, land shortage, high animal disease prevalence and low genetic potential in milk production (Abebe et al., 2014; Asrat et al., 2013).

In the study area, the Amhara region, the demand of livestock products, particularly milk and meat, substantially increased as the result of increasing human population, urbanization trends and rising household incomes (Asaminew and Eyassu, 2009). Dairy production in the region plays very important roles in providing multi-nutrient food item for rural and urban population (Aklilu, 2004).The sector is dominated by smallholder farmers and contributes approximately 98% and 97% of the total and marketed milk production in the region, respectively(CSA, 2011).

However, the district has greater potential for production of milk and dairy products than currently practiced (Adebabay, 2009). Most farmers produce milk for self-consumption; and little is known about the few existing dairy production system and their marketing and the reasons why not more farmers participate in marketing the milk. Understanding the existing dairy production system and their marketing participation for particular location is vital to devise appropriate development interventions. It is because smallholder dairy production contributes a lot in income generating activity for poor farmers in the developing world (Duncan et al., 2013). Besides, provision of assured marketing outlets to those smallholder producers is the most necessary conditions for increased milk production and to maintain a continuous milk supply to the market (Sintayehu et al., 2008). Hence, addressing the problems of smallholder dairy production system is very crucial so as to improve the production and productivity of the sector in the district subsequently enhance volume of milk and dairy products going to the market and meet milk demand in the urban area. Then, all these will lead to develop market oriented dairy production system in the district. Therefore, this study was initiated to address the following objectives.

Objectives

- To characterize the existing dairy production system
- To analyze the participation level of smallholders in dairy marketing
- To assess possible developmental strategies to improved dairy production and marketing participation

RESEARCH METHODOLOGY

Location and Description of Study Area

The study was conducted in *Bure* district, West Gojjam Zone in Amhara Region. *Bure* district is one of the 17th districts of West *Gojjam* Administrative Zone of Amhara National Regional State. It is one of the consistently surplus producer districts of the Region. It is found 400 km northwest of Addis Ababa and 148km southwest of the Regional State capital, Bahir Dar. The district has 15 km asphalt road, 84km all weather gravel road and 103 km dry weather road**.** It is nearby and connected by all-weather road to East Wollega Zone of the Oromia Regional State and Metekel Zone of the Benishangul Gumez Regional State (Yigzaw and Kahsay, 2007).Therefore, *Bure* has good potential to sell its agricultural products in different regional states.

Population of the district is 169,609 of which 143,854 (85%) live in rural area. The total area of the district is 72,739 ha of which 46.6% is cultivated and average household cultivated land holding is about 1.6 ha. At present, the district is divided into 22 rural peasant associations (PAs) and two town associations. *Bure* and *Kuchie* are the two major towns in the district. The district has received 1386 to 1757 mm annual rainfall. Agro-ecologically, it is classified into moist and wet lowland (10%), wet *Woina-Dega* (82%) and wet *Dega* (8%). The altitude of the district ranges from

713 to 2604 meters above sea level. Long-term annual mean temperature of *Bure* ranges from 14 ^{o}C to 24 ^{o}C (Yigzaw and Kahsay 2007).

Sampling Technique

Multistage sampling design was used to select representative respondents. According to Adebabay (2009), the district has three milk production systems such as urban (inside *Bure* town), peri-urban (around *Bure* town) and rural (the rural parts of the *Bure* district) dairy productions. From each production system, 30 dairy producers were selected purposively because of the accessibility and willingness of the respondents. The rural dairy production system was further classified in to three agro-ecological zones; namely lowland, midland and highland, in order to address the differences that exist due to its agro-ecological variations. From these agro-ecologies, one peasant associations (PAs) were selected purposively because of its dairy production potential and accessibility. Finally, because of the accessibility and willingness of the farmers, 10 farmers were selected purposively from each respective PAs. Therefore, totally 90 dairy producers were selected from the three dairy production system. The lists of milk producer of those dairy production systems were obtained from the district agricultural and rural development office.

Source of Data and collection technique

Primary and secondary data were collected mainly from the dairy producers and annual reports of the district Agricultural and Rural Development office and other scientific reports. To collect primary data from dairy producers, semi-structure questionnaire were deployed. Pre-testing was conducted to ensure the validity of the questionnaire. Finally, well appropriate semi-structured questionnaire was developed and then conducted fieldwork interview.

Data Analysis

Descriptive statistical tools such as frequency tables, percentages, graph, mean and standard deviation were used to describe the data. To test difference among the sub-systems on a certain variable, t-test, F-test, Chi-square and one-way ANOVA statistical tools were used. To analysis the data, SPSS (version 20) software was deployed.

RESULT AND DISCUSSION

Characteristic and Type of Cattle Owned by Dairy Producers

Dairy Production System

The classification of dairy production system was varied place to place with varies criteria with different reasons (i.e. agro-ecology, crop productions system, livestock keeping system, location in reference to urban area). For instance, Sintayehu et al., (2008) tried to identify two major dairy production systems namely mixed crop–livestock production system in the rural areas and the urban dairy production system in cities or towns. Three dairy production systems were also identified in *Bure* district by Adebabay (2009) such as urban, peri-urban and rural dairy production systems based on reference to urban location. Thus, this study was conducted based on Adebabay's classifications. The urban dairy production system was found in *Bure* town, whereas peri-urban and rural dairy production systems were around *Bure* town and rural part of *Bure* district, respectively. This study has characterized dairy production system in study area based on their dairy production and management practices, consumption, marketing and breed type kept by the individual dairy producers.

Cattle Breed and Herd Structure

Breed Types

Breed type and number of cattle could have a significant effect on milk yield in dairy farm. Table 1 shows, in *Bure* district both local and crossbred cattle were kept by dairy producers. The average numbers of cattle per

household in the rural sub-system (9.97±0.77) was higher than that of urban (7.57±0.84) and peri-urban (6.40±0.69) dairy subsystems. The mean variation across the subsystems was highly significant at 1% probability level. Azage's et al. (2013) report on average number of cattle (7.3 cattle/hh) in Fogera district aligned in the average population ranges of this study. On the other hand, the overall means of this reports were much higher than that of Asrat et al. (2013) in Boditti in Southern part of Ethiopia (3.4 cattle) and of Sintayehu et al. (2008) in Shashemene (3.8±0.42) and Dilla (2.3±0.36) reports.

From the total herd size in urban dairy production, 3.53±0.85 and 4.03± 0.62 cattle were local and cross breeds, respectively. Whereas, in peri-urban, 6.10±0.64 cattle were local and 0.3±0.12 cattle were crossbred; in rural dairy production, 9.90± 0.76 cattle were local and 0.07± 0.05 cattle were crossbred dairy cattle. There were also a highly significant difference in means of local and cross breed cattle population across the three sub-systems (P<0.01).

Regarding breed type kept, this finding clearly shows that dairy production in rural and peri-urban area has been relaying majorly on local dairy breed, whereas in the urban dairy production system crossbred cattle had equality significant role as local breed in dairy production. Therefore, efforts should be taken to increase the number of crossbred cattle particularly dairy cow in order to increase the volume of milk yield in the farm and raise availability of milk in the market.

Table 1: Breed type and average herd size

Breed	Dairy production subsystems						F-value	Sig.
	Urban		Peri-urban		Rural			
	Mean	Std. D	Mean	Std. D	Mean	Std. D		
Local	3.53	0.85	6.10	0.64	9.90	0.76	5.606	0.005
Cross	4.03	0.62	0.3	0.12	0.07	0.05	17.819	0.000
Total	**7.57**	**0.84**	**6.40**	**0.69**	**9.97**	**0.77**	**36.827**	**0.000**

Herd Structure

All types of cattle were kept in all dairy production system. As indicated in Table 2, in urban dairy subsystem, cow was the dominant cattle type in the herd, whereas in peri-urban subsystem ox was the predominant one. In the rural subsystem, both ox and cow were almost equally important in the herd. In urban dairy production, the herd consists in average 3.20±0.40 cow, 2.43±0.26 calf, 1.130.28 heifer, and 0.77±0.15 bull; with very insignificant number of ox. In the peri-urban dairy production, the herd was highly dominated by oxen (2±0.22 head/hh) and followed by cows (1.67±0.18head/hh). There was also equal number of bull, calf and heifer in the herd structure per the household. It was account for 0.9head/hh. In the rural dairy production system, the herd was composed of 2.67±0.24 oxen, 2.53±0.20 cows, 2±0.21 calf, and 1.77±0.21 heifer and 1±0.16 bull.

Table 2: Average number and composition of the herd

Cattle category	**Dairy subsystems**					
	Urban		**Peri-urban**		**Rural**	
	Mean	**Std. D**	**Mean**	**Std. D**	**Mean**	**Std. D**
Oxen	0.03	0.03	2.00	0.22	2.67	0.24
Cows	3.20	0.40	1.67	0.18	2.53	0.20
Heifer	1.13	0.28	0.90	0.19	1.77	0.21
Bull	0.77	0.15	0.93	0.20	1.00	0.16
Calf	2.43	0.26	0.90	0.17	2.00	0.21

Number of Lactating Cows and Breed Type

In Ethiopia, milk can be produced from cattle, goat and camel depends on the agro-ecology and farming system of location. Table 3shows that cow was the only source of milk in the study area. Though dairy producers hold small number of milking cows, both local and crossbred cows were used to produce milk and milk products in their farms. The average numbers of lactating cows per household in urban, peri-urban and rural dairy production system were 2.23±1.45, 1±0.83 and 1.87±1.01 cows, respectively. The average numbers of lactating cow which reported by Asrat et al.(2013) in Bodditti(1.1 cows) and Abebe et al. (2014) in Ezha Districts (2014), both from southern Ethiopia, was almost equal to the average number of milking cow in peri-urban and rural dairy production system and lower than that of urban dairy production system of this study.

Regarding breed type, in urban dairy production, both breeds were found (one local and one crossbred cow), whereas in peri-urban and rural dairy production system only local breed is found. The average numbers of milking cows in rural and peri-urban dairy production system were 2±1 and 1±1 cows, respectively. This small number of milking cows combined with local breed cows in the study districts lead to less milk production and supply to the market. Thus, efforts should be done to improve the genetic potential of the breed and hold reasonable number of milking cow in the households.

Table 3: Number of lactating cows

Cow genotype	Dairy subsystems					
	Urban		Peri-urban		Rural	
	Mean	Std. D	Mean	Std.D	Mean	Std. D
Local	1	1	1	1	2	1
Crossbred	1	1	0	0	0	0
Total	**2.23**	**1.45**	**1**	**0.83**	**1.87**	**1.01**

Purpose of Cattle Rearing

In Ethiopia, cattle rearing are carried out for different purposes. The most significance of cattle is that they are an asset that can readily be converted into cash needed to purchase of farm inputs, source of protein rich food, manure for fertilizer and household fuel and draught power (Asrat et al., 2013). However, the purposes are varying place to place based on socioeconomic status, agro-ecology, cultures of the society and the likes.

Table 4 shows, in the study area, the purpose cattle rearing were also varying across the dairy subsystems. In Urban dairy subsystem, produce milk for household consumption (42.6%) was the primary reason for dairy producers why they engaged in dairy production and followed by selling milk (36.1%) and live animals (21.3%) for source of income. In peri-urban subsystem, produce milk for household consumption (39.7%) was also the prior reason for keeping cattle by smallholders dairy producers. Unlike urban dairy production systems, obtaining ox for draught power (35.3%) was the second important reason for engaging in dairy production. Very few dairy producers mentioned that selling animals (22.1%) and milk (2.9%) for income source was the major reason for engaging in dairy production. Like peri-urban dairy production system, milk consumption (42.4%) and obtaining ox (37.9%) for draught power were the major reasons for smallholder dairy producers engaged in dairy production. Other dairy producers (19.7%) involved in dairy production to generate income by selling live animals. No dairy producers in rural dairy production system engaged in dairy production to sell milk. The primary objective of cattle rearing in all dairy production system of this research aligned with the reports of Kibru, et al. (2015) in *Aleta Chukko* district, Southern Ethiopia i.e. produce milk for household consumption.

This finding implies that in the study district, majority of the dairy producers has been engaging in dairy production to produce milk for household consumption and to obtain ox for draught power. Only in urban dairy subsystem milk was sold to generate money, whereas in peri-urban and rural dairy producers involved in dairy production for seeking ox for a purpose of draught power.

Table 4: Reasons of respondents engaging in dairy production

Reasons	Dairy subsystems					
	Urban		Peri-urban		Rural	
	N	%	N	%	N	%
Milk consumption	26	42.6%	27	39.7%	28	42.4%
Animal selling	13	21.3%	15	22.1%	13	19.7%
Obtaining ox	0	0.0%	24	35.3%	25	37.9%
Milk selling	22	36.1%	2	2.9%	0	0.0%
Total	**61**	**100%**	**68**	**100%**	**66**	**100%**

Productivity

Productivity of a cow can be varied depending on its breed, parity level, and environment and management practices. As the result, the amount of milk produce and sale to the market can also be affected. Table 5 shows, productivity of both local and cross breed cow in *Bure* district at different lactation stages. The average daily milk yields from local cow across the lactation periods were1.57± 0.87 litters at early, 1.13±0.70 litter at middle and 0.48± 0.37litter at later lactation. This finding has similar result with Dehinenet's (2014) report in selected districts of Amhara and Oromia regions.

The average daily milk yields of a crossbred cow in the study district were also 7.74±5.01 litter at early, 4.75±3.82 litter at middle and 2.84±4.64 litter lactation. Unlike local breed, the average daily milk yield of a crossbred cow across the lactation periods was lower than that of Dehinenet's (2014) reports in the aforementioned study districts. He reported that, in selected districts of Amhara and Oromia regions, the average daily milk yield per local cow at early, middle and late lactation periods were 2.34±0.12 lit, 1.92±0.13 lit and 0.91±0.05l lit, respectively. Whereas, crossbred gives in average 11.44±1.02 lit, 6.79±0.27 and 4.19±0.31 lit of milk at early, middle and late lactation period, respectively.

Table5: Milk productivity pre milking cow across at different lactation period

Breed	Early lactation		Middle		Late	
	Mean	Std. D	Mean	Std. D	Mean	Std. D
Local	1.57	0.87	1.13	0.70	0.48	0.37
Improved	7.74	5.01	5.75	3.82	2.84	2.64

Milk Yield and Utilization

As indicated in Table 6, average daily milk yield per household (9.35±1.79 litter) in urban dairy production system was much higher than that of peri-urban (1.22± 0.20 litter) and rural dairy production systems (1.96±0.34 litter). The finding of this study in peri-urban and rural dairy production aligned with that of Abebe's et al. (2014) study in Ezha Districts of Gurage Zone (1.4 liters). Sintayehu et al., (2008) also reported similar results in Shashemene and Dilla districts. He reported that the average dairy milk yield per household in the mixed crop–livestock system ranged from 1.97±0.24litto 2.84±0.28lit, while in the urban system it ranged from10.21±1.59lit to 15.90±2.36 lit.

From the total milk production in urban dairy production, about 7.72±1.63liter milk was sold for income generation and only 1.6±0.35 lit of milk was used for household consumption. In rural and peri-urban dairy production system, milk was not sold rather it was totally used for household consumption. Disagreement, Dehinenet (2014) reported that in selected districts of Amhara and Oromia regions, the average dairy milk produced, consumed and sold per household were 6.83±0.55 litter, 0.40± 0.029 litter and 6.10±0.55 litter of milk, respectively. The finding of this study implies that produced milk was used for both selling and household consumption in only urban dairy production while in both peri-urban and rural dairy production it was only used for household consumption. Therefore, efforts should be made on rural and peri-urban dairy production system to bring their produced milk into the market and able to get benefit out of it.

Table 6: Average daily milk yield per household and utilization /litter

Production and utilization category	Dairy subsystems						F-value	Sig. value
	Urban		Peri-urban		Rural			
	Mean	Std. D	Mean	Std. D	Mean	Std. D		
Milk produced	9.35	1.79	1.22	0.20	1.96	0.34	18.00	0.00
Consumed	1.60	0.35	1.22	0.20	1.96	0.34	1.79	0.18
Sold	7.72	1.63	0.00	0.00	0.00	0.00	22.38	0.00

Cattle Management

Feed Source and Fodder Development

Dairy Feed Sources

Animal feed represents the major input in any dairy operation (Asrat et al., 2013).Dairy producers in *Bur* district used different feed sources for their dairy cattle. As table 7 shows, a*ttela* (26.2%), hay (24.3%) and crop residue (22.3%) were primary feed sources for dairy production in urban dairy subsystem. About 13.6%, 6.8% and 6.8% of dairy producers also used natural pasture, improved forage and *birnt*, respectively, as the main feed sources for their dairy cattle. Only few dairy producers (6.8%) reported that they produced improved forage for their dairy animals.

In peri-urban dairy production system, crop residual (28.8%), *attela* (26.0%) and grazing (22.1%) were the primary feed sources for dairy cattle. About 11.5% of dairy producers used hay as a major feed source to their dairy animals. Few dairy produces reported that *Birnt* (6.7%) and improved forage (4.8%) were the major feed sources for their dairy cattle. Similar to peri-urban subsystem, crop residue (25.6%), *attela* (23.9%) and grazing (18.8%) were the major feed sources in rural dairy production system. In addition, hay (16.2%) and *birnt* (11.1%) were also considerably important feed sources in the subsystem. Only 4.3% of dairy producers used improved forage for their dairy animals.

The three dairy subsystems in *Bure* district show highly significant difference in some of their main cattle feed sources at 1% and 5% probability level. Hay and crop residue had highly statistical significant difference at 1% probability level, while natural pasture as a source of cattle feed were statistically significant difference across subsystems at 5% probability level. The rest feed sources did not statistically different across the subsystems.

This figure clearly show that in urban dairy production system, *atela* and hay were the major feed source for dairy animals while crop residue and *attela* were in both peri-urban and rural dairy production systems. The finding of this study agreed with the result of Abebe's et al. (2014) study in Ezha Districts of the Gurage Zone and Asrat'set al., (2013) study in Bodittidistrict in Southern part of Ethiopia. They reported that crop residue and grazing were the primary feed source for dairy animals in their respective studying areas. Asaminew (2007) also reported that, in Bahir Dar Zuria district, the major cattle feed source is common grazing (24.45%).Disagreement, in the study area *Attela* play a great role as to be the primary feed sources to dairy production but it was not common in the study areas of the aforementioned researchers.

Table 7: Mainanimal feed sources

Types of feed sources	Subsystems						Test value (X^2)	Sig.
	Urban		Peri-urban		Rural			
	N	%	N	%	N	%		
Grazing/natural pasture	14	13.6%	23	22.1%	22	18.8%	7.18	**
Improved forage	7	6.8%	5	4.8%	5	4.3%	0.58	NS
Hay	25	24.3%	12	11.5%	19	16.2%	12.01	***
Crop residue	23	22.3%	30	28.8%	30	25.6%	15.18	***
Attela	27	26.2%	27	26.0%	28	23.9%	0.27	NS
Birnt	7	6.8%	7	6.7%	13	11.1%	3.8	NS

Note: *** and ** represents statistical significant at 1% and 5% probability level, respectively.
NS= not statistically significant

Attela, byproduct of local brewer, is the most common animal feed in all dairy production systems. Therefore, further study should be done on its nutrition value and why dairy producers like more to give it to their dairy animals. On the other hand, the result of this study had a negative implication on improved forage development in the study area. Only few respondents developed improved forage to feed their milking cows. This also lead to leas milk production in dairy farm and minimal benefits obtained from their dairy operation since quality and adequacy of animal feed (i.e. improved fodders) is crucial in dairy production practices.

Grazing Land and Improved Forage Development

Land is one of the important prerequisites for any farming activity (Sintayehu et al., 2008). In the study area, farm land size was not evenly distributed across the three dairy production systems. Table 8shows, dairy producers in urban subsystem did not have any farm land, whereas in peri-urban and rural subsystems dairy producers had 1.06±0.12 ha and 1.8±015 ha of farm land which used for different agricultural activities, respectively. The result of this study, in urban dairy subsystem, agreed with Sintayehu's et al. (2008) report on Shashemene and Dilla areas. He reported that because of rapid urbanization in the area, farmers do not have extra land to develop improved animal feeds or do not have access to communal grazing land.

Table 8: Size of grazing land and improved forage development

Type of usage	Dairy subsystems					
	Urban		Peri-urban		Rural	
	Mean	Std. Error of Mean	Mean	Std. Error of Mean	Mean	Std. Error of Mean
Improved forage	0.00	0.00	0.02	0.01	0.00	0.00
Grazing land	0.00	0.00	0.05	0.02	0.05	0.02
Total farm land	0.00	0.00	1.06	0.12	1.80	0.15

Even from available farm land in peri-urban and rural dairy production system, the allocation of land for their animals was very small. For example, in peri-urban dairy production system, 0.05±0.02 ha and 0.02±0.01ha of land was allocated for grazing and improved forage development, respectively. In the rural subsystem, 0.05±0.02 ha of land was allocated for grazing land and no piece of land was used for improved forage development. This finding implies that even though improved forage is very important for dairy production development, in the study district improved forage development was very scarce and not expanded. As the result dairy production in all dairy subsystems rely on less nutritive value feed types like crop residue and hay. In turn, it has a great negative effect on volume of milk production and brings to market.

Housing System

Dairy animals are often housed at night and the type of housing provided varied depending upon the classes of dairy animals, agro-ecology, production system, physiological stage of dairy animals (Azage et al., 2013).The purposes of cattle housing in *Bure* district were to protect cattle from theft and extreme weather conditions (Adebabay, 2009). Table 9 shows that there were three types of animal housing such as independent housing, open paddock and partition housing from the family. In urban dairy production system, independent housing (93.3%) was the major housing system and followed by housing together with family (6.7%). No open paddock housing system was found. In peri-urban dairy production, the three housing types were found. The percentages of independent housing, dependent housing and open paddock were 50.0%, 15.6% and 34.4%, respectively. In rural dairy production system, 80.0% of dairy producers used independent house and the rest 20.0% of dairy producers used partition housing together with their family. No open paddock housing system was found in the subsystem. Agreement, Asrat et al. (2013) reported that 80% of dairy producers in *Boditti* district in southern part of Ethiopia used independent housing for their dairy animal.

Table 9: Dairy cattle housing system

Housing types	**Dairy subsystems**					
	Urban		**Peri-urban**		**Rural**	
Independent housing	N	%	N	%	N	%
	28	93.3%	16	50.0%	24	80.0%
Open paddock	0	0.0%	5	15.6%	0	0.0%
Partition housing from family	2	6.7%	11	34.4%	6	20.0%
Total	**30**	**100.0%**	**32**	**100.0%**	**30**	**100.0%**

Heath Management

Animal health problem has a great effect on milk production and productivity in dairy production practices. As indicated in Table 10, various mechanisms were used by dairy producers to manage the health condition of their dairy cattle. Taking sick cattle to clinic (74.3%) was the major mechanism to manage animal health problem in urban dairy production system. The second mechanism was treating the animal using conventional drugs by their own (11.4%). Clean the barn (8.6%) and treat the animal using traditional drug (5.7%) were the least health manage mechanism.

In peri-urban dairy production system, taking sick animals to clinic (69.8%) was also the prior mechanism in cattle health management. Unlike urban dairy production, treating sick animal using traditional medicine (20.9%) was the second most important health management mechanism in peri-urban dairy production. Treating using conventional drug (4.7%) and clean barn (4.7%) were less but equally important animal health mechanisms.

Like others dairy subsystems, taking sick animals to clinic (57.1%) was the most important health management mechanism in rural dairy production system. Treating sick animals using traditional medicine (57.1%) and conventional drug (19.0%) were other mechanisms for animal health management. Very few dairy producers (7.1%) believed that keeping the clean barn can be good a health management practice for dairy farm.

This finding clearly shows that in all dairy subsystem, taking sick animals to clinic was the primary animal health management mechanism. In urban dairy production, treating sick animal using conventional drug by themselves was the second mechanism in animal health management while treating sick animals using traditional medicine in peri-urban and rural dairy production. The primary mechanism of dairy health management mechanism of this study agreed with Dehinent (2014) report in selected districts of Amhara and Oromia regions.

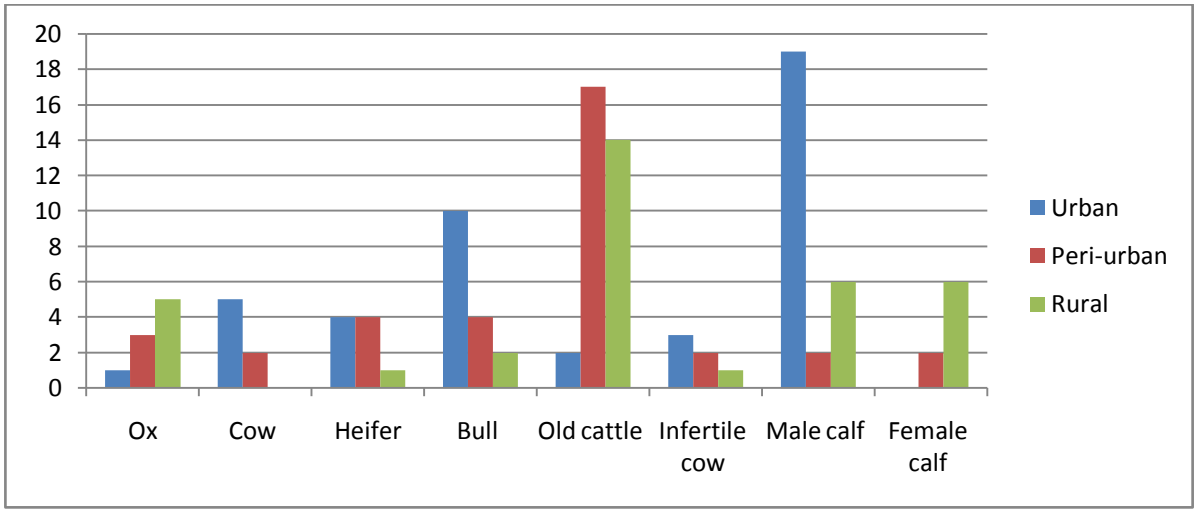
Table10: mechanisms used for dairy producers to keeping their animal health condition

Mechanisms used for animal health management	dairy subsystems					
	Urban		Peri-urban		Rural	
	N	%	N	%	N	%
Take the animal to clinic	26	74.3%	30	69.8%	24	57.1%
Treat using traditional medicine by themselves	2	5.7%	9	20.9%	8	19.0%
Treat using conventional drugs by themselves	4	11.4%	2	4.7%	7	16.7%
Keep the barn clean	3	8.6%	2	4.7%	3	7.1%
Total	**35**	**100%**	**43**	**100%**	**42**	**100%**

Cattle Marketing Participation

Dairy producers could sell all cattle types for various purposes. As graph 1 show, the type of dairy cattle sold by dairy producers was varied across the subsystems. In urban dairy production, male calf and bull were the major sold animals by dairy keepers. Small proportion of milking cows and infertile cows were also sold. No female calf was sold by dairy producers because dairy producers used them for replacing old milking cows. In peri-urban and rural dairy production systems, old cattle type was the major sold animal by dairy producers. Heifer and bull were the

second sold cattle types in peri-urban subsystem whereas infertile cow, male calf and female calf were in rural dairy production system.

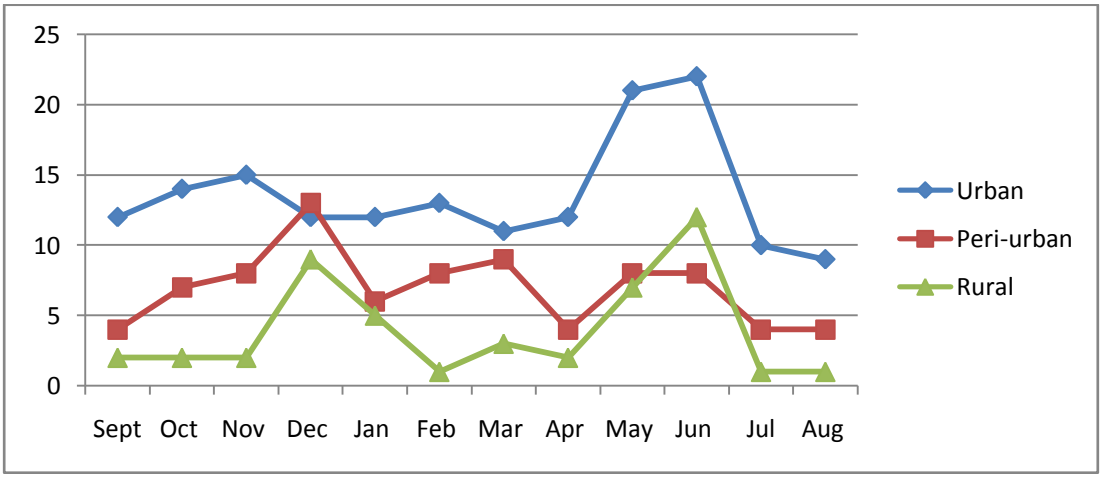


Graph 1. Type of cattle sold

Period of Cattle Sold

Dairy producers sold their cattle across the whole months of the year but with various magnitudes. In urban dairy production system, as indicated in graph 2, majority of dairy producers sold their cattle in May and Jun. A significant number of dairy producers also sold their cattle in October and November. In peri-urban dairy subsystem, December was the most important period for dairy producers to sell their cattle. October, February, March, May and Jun were the other important periods to sell their cattle. In rural dairy subsystem, Jun and December were the most important months to sell their cattle. The other important months for rural dairy producers to sell their cattle were January and May.

Urban dairy production system had a better participation in cattle marketing by providing relatively large number of cattle into the market in the whole months of a year. It is due to shortage of land for grazing and space for keeping the animals. Besides, to minimize feed competition in the farm, male calves and bulls were also sold whenever they reach for marketing. As compared to rural dairy production, large numbers of cattle were sold in peri-urban dairy production system across all mother of the year.



Graph 2. Time of cattle sold

In urban and peri-urban dairy production systems, dairy producers had mainly mono-modal marketing practice: such as May and Jun months for urban subsystem and December for peri-urban dairy subsystem. Around May and Jun, there was higher marketing demand of cattle in general and male cattle in particular because in the summer period there is a need of oxen power for plowing. In addition to this, male cattle were also bought in these months to fatten them and reach to September for Ethiopian new-year and *Meskel* festivities. After plowing their land, majority of the dairy producers in all subsystem sold their oxen to the market on November, December and January because within these months there are many festivals for both Orthodox and Muslim religion followers. Therefore, dairy producers sold their cattle on May and June to meet the need of oxen for plowing; and on November and December to the need of fattening in the study area.

Purpose of Selling Cattle

In addition to milk, dairy producer sold their cattle to fulfill the needs in their house. As indicated in Table 11, shortage of animal feed (25.7%) was the primary reason for selling cattle in urban dairy production subsystem and followed by house spacing problem (20.0%) and earning money to purchase items for household consumption and to send their children to school (20.0%). Getting better marketing price (17.1%) and animals get older (14.3%) were also mentioned as an important reason for selling their cattle. In peri-urban dairy production, the major reasons for selling their cattle were getting better marketing price to their cattle (31.6%) and replacing the herd by young animals (31.6%).In the same subsystem, about 15.8% of dairy producers sold their cattle to earn money to purchase items for household consumption and to send their children to school. In rural dairy production system, getting good market to their cattle (30.0%) and replacing the herd (30.0%) were the major reason for selling their cattle. Housing space problem (12.5%) was also the other important reason for selling their cattle.

Table 11: Reasons for selling their cattle

Reasons	**Dairy subsystems**					
	Urban		**Peri-urban**		**Rural**	
	N	**%**	**N**	**%**	**N**	**%**
Getting good marketing price	6	17.1%	12	31.6%	12	30.0%
Animal gets older	5	14.3%	3	7.9%	3	7.5%
Housing space problem	7	20.0%	3	7.9%	5	12.5%
Shortage of animal feed	9	25.7%	2	5.3%	4	10.0%
HH consumption purchase and sending children to school	7	20.0%	6	15.8%	4	10.0%
Replace herd	1	2.9%	12	31.6%	12	30.0%
Total	**35**	**100%**	**38**	**100%**	**40**	**100%**

CONCLUSION AND RECOMMENDATION

In the study districts, three dairy production systems were identified such as urban, peri-urban and rural dairy production systems. Both local and crossbred cattle were kept by dairy producers. Larger cattle population per household was found in rural dairy production (9.97±0.77 cattle) than that of urban (7.57±0.84 cattle) and peri-urban (6.40±0.69 cattle) dairy subsystems. Out of which, more crossbred cattle were found in urban dairy subsystem (4.03±0.62) than peri-urban (0.3±0.12 cattle) and rural (0.07± 0.05 cattle) dairy production systems. The dominant cattle type from the herd structure in urban dairy production system was cows, whereas oxen in peri-urban; and oxen and cows in rural dairy production system.

In urban dairy production system, dairy farmers kept dairy cattle for the purpose of both producing milk for their HH consumption and earning money by selling produced milk. In peri-urban and rural dairy production system, dairy producers kept them to produce milk for their own HH consumption and to obtain oxen for draught power.

In Urban dairy subsystem, both local and crossbred cows were used for milk production, while in peri-urban and rural dairy production system local breed cow was the only breed used for milk production. Relatively more milk (9.35±1.79 lit) was produced in a day in urban dairy production system than peri-urban (1.22±0.20 lit) and rural (1.96±0.34 lit) dairy subsystems. Milk was only sold in urban dairy production system. In peri-urban and rural dairy subsystems, it was only used for household consumption.

Attela and hay were the primary feed sources in urban dairy subsystem whereas crop residues and *attela* were in peri-urban and rural dairy production systems. Across the three subsystems, independent housing practice was the predominant housing system. They also used taking animal to clinic as the major animal health management practices in the whole dairy subsystems. Dairy producers also participated in cattle marketing. In urban subsystem, male calf and bull were the major sellable cattle types while in both peri-urban and rural dairy subsystems; old cattle were the major sellable cattle types. Urban dairy producers usually sold their cattle on May and Jun whereas peri-urban dairy producers on December and rural dairy producers on January, May, Jun and December sold their cattle.

Milk production and marketing system was so fragile in the study district in general; and in peri-urban and rural dairy production systems in particular. In order to enhance smallholder dairy production, effective and competitive dairy production and marketing system should be developed and also provided intensive extension supports to dairy producers. To improve milk production, good quality and adequate AI service should be given to dairy producers to increase number of crossbred milking cows. Besides, improved fodder development should be expanded by creating awareness about the importance and utilization of improved forages and availing their seed/planting materials. Further study should also be done to know the nutritive value of *attela* feed since it is primary animal feed type for milking cattle in the whole dairy production system.

Milk marketing would also be improved by making a mind setup change in rural and peri-urban dairy producers to think engaging in dairy farming is for the purpose of producing milk to sell rather than to obtaining ox for plowing. Market linkage and infrastructure development in milk processing and marketing is also very important to encourage dairy farmers to produce more milk and bring it to the market. Consequently, milk production and volume milk sold will be increased to meet increasingly expanding milk demand in urban areas.

Since large number of male calves, bulls and old cattle were sold in all dairy subsystem, efforts should be done on cattle fattening and marketing practices to add value on the sold animals in order to maximize their profit from their dairy farming.

REFERENCE

Abebe Kebie (2007). Agricultural Product Marketing: Challenges towards a Commercial Approach with Particular Reference to Cereal Crops (A Case Study in Bahir Dar ZuriaWoreda). Addis Ababa University. M.A. Thesis.

Abebe Bereda, Zelalem Yilma and Ajebu Nurfeta (2014).Dairy Production System and Constraints in Ezha Districts of the Gurage Zone, Southern Ethiopia. Journal of Global Veterinarian, Vol. 12 (2): Pp181-186, 2014.

Adebabay Kebede(2009). Characterization of Milk Production Systems, Marketing and On-Farm Evaluation of the Effect of Feed Supplementation on Milk Yield and Milk Composition of Cows at Bure District. Bahir Dar University. Master thesis.

Aklilu Woldu (2004). Agricultural Commodity Marketing System Study Project. In: Agricultural Commodity Marketing System Study Project.Amhara National Regional State Head of Government Office, Bahir Dar.

Asaminew Tassew (2007). Production, Handling, Traditional Processing Practices And Quality Of Milk In Bahir Dar Milk Shed Area, Ethiopia. M.Sc. Thesis. Haramaya University, Ethiopia.

Asaminew Tassew and Eyassu Seifu (2009).Smallholder Dairy Production System and Emergence of Dairy Cooperatives in Bahir Dar Zuria and MechaWoredas, Northwestern Ethiopia**.** World Journal of Dairy & Food Sciences 4 (2): 185-192.

Asrat Ayza, Zelalem Yilma and Ajebu Nurfeta (2013).Characterization of milk production systems in and around Boditti, South Ethiopia. Journal of Livestock Research for Rural Development, Vol. 15(10).

Awol Zeberga (2010). Analysis of poultry market chain: the case of dale and alaba 'special' woredas of snnprs, Ethiopia. Unpublished M.Sc. Thesis, Haramaya University.

Azage Tegegne, Gebremedhin, B., Hoekstra, D., Belay, B. and Mekasha, Y. (2013).Smallholder dairy production and marketing systems in Ethiopia: IPMS experiences and opportunities for market-oriented development. IPMS (Improving Productivityand Market Success) of Ethiopian Farmers Project Working Paper 31. Nairobi: ILRI.

Belay Kassa and AbebawDegnet (2004). Challenges Facing Agricultural ExtensionAgents:A Case Study from South-western Ethiopia. Blackwell. UK and Malden. USA.

CSA (Central Statistical Agency) (2011). Agricultural sample survey. Report on livestock and livestock characteristics (private peasant holdings). Addis Ababa, Ethiopia, pp: 9-26.

Dehinenet Gezie (2014). Analyses of Impact of Improved Dairy Technology Adoption on Smallholder Household Livelihoods and Milk Value Chain in Selected Zones Of Oromia And Amhara National Regional States, Ethiopia. PhD Dissertation, Addis Ababa University, Bishoftu.

Duncan A. J, Teufel N., Mekonnen K., Singh V. K., Bitew A., and Gebremedh B. (2013). Dairy intensification in developing countries: effects of market quality on farm-level feeding and breeding practices. Cambridge University press, Vol. 7(12): pp. 2054-2062.

Kelay Belihu (2002). Analyses of Dairy Cattle Breeding Practices in Selected Areas of Ethiopia. PhD Dissertation, Humboldt-Universitätzu Berlin.

Ketema, H. and Tsehay, R. (1995).Dairy production system in Ethiopia.Food and Agriculture Organisation of the United Nations Rome Sokoine University of Agriculture. Proceedings of a Workshop Held at Morogoro Hotel, Morogoro, Tanzania, 20 - 24th March, 1995.

Kibru Beriso, Berihan Tamir and Teka Feyera (2015).Characterization of Smallholder Cattle Milk Production System in AletaChukko District, Southern Ethiopia.J Adv Dairy Res, vol. 3(1). doi:10.4172/2329-888X.1000132.

Land O'Lakes (2010). Dairy Value Chains, End Markets and Food Security. In: The Next Stage in Dairy Development for Ethiopia. Land O'Lakes, Inc. Addis Ababa, Ethiopia.

Mulugeta Ayalew and Belayeneh Asefa (2013).Reproductive and lactation performances of dairy cows in Chacha Town and nearby selected kebeles, North Shoa Zone, Amhara Region, Ethiopia. World Journal of Agricultural Sciences Vol. 1(1), pp. 008-017, February 2013**.**

SintayehuYigrem, FekaduBeyene, AzageTegegne and BerhanuGebremedhin (2008).Dairy production, processing and marketing systems of Shashemene–Dilla area, South Ethiopia.IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 9. ILRI (International Livestock Research Institute), Nairobi, Kenya. 62 pp.

Yigzaw Desalegne and KahsayBerhe (2007). Bure Pilot Learning District Diagnosis and Program Design.Unpublished.