academicJournals

Vol. 7(11), pp. 113-121, November 2016
DOI: 10.5897/IJLP2016.0315
Article Number: C792B6A61362
ISSN 2141-2448

http://www.academicjournals.org/IJLP

International Journal of Livestock Production

Full Length Research Paper

The husbandry practices of dairy cattle, feed resources, and dairy products processing and marketing in Sinana District of Bale Zone, Oromia Region, Ethiopia

Sheki Yasar, Tekleab S. Berhan, Ermias T.Tsadik*, Girma Defar and Temesgen Dessalegn

Department of Animal and Range Sciences, Madda Walabu University, Bale-Robe, Ethiopia.

Received 8 June, 2016; Accepted 8 September, 2016

The study was conducted to assess the husbandry practices of dairy cattle, feed resources, and dairy products processing and marketing systems. Stratified random sampling was applied to select 213 households from urban, peri-urban and rural areas. Structured questionnaire were used to collect primary information. Descriptive statistics was employed to analyze the collected data. The study found that 2.5(0.11) dairy cattle were owned per household (mean with SE). About 40.4% of the respondents owned crossbred dairy cattle and 92.0% preferred crossbred animals to expand their dairy farm. Extensive production system (mostly open grazing and without appropriate housing) was dominantly (70.0%) practiced. Grazing pasture, crop-residues and improved forages were the common feed resources. Most of the respondents (71.8%) offered the supplementary feeds for lactating cows. As overall, 6.9(38) kg of supplement feed was offered per animal/day. About 44.6% of the respondents gave priority to age for first mating of heifers (P<0.001).Heifers were allowed for mating at 35.3(0.84) months of age. Cows were kept in the production system for 8.3(0.16) years. Women took the higher share in milking and dairy products processing activities. About 81.3%, 65.4 and 50.8% of respondents in urban, rural and peri-urban, respectively owned (P<0.05) either improved or local dairy products processing equipment. About ½ of the respondents processed the raw milk into cottage cheese, butter and cottage yoghurt. There were no formal dairy products marketing and cooperatives. Overall, 85.1% of the respondents would like to start dairy cooperatives. In conclusion, the majority of the respondents preferred to have crossbred dairy cattle thus to improve the dairying practices in the study areas, crossbreeding of local cattle breeds with exotic breed dairy types with better feeding, proper healthcare and housing management systems , conservation of available feed resources, establishing of formal dairy products marketing system and dairy cooperatives are very essential.

Key words: Age of mating, dairy cattle, dairy products processing, feed resources, husbandry practices.

INTRODUCTION

Due to diverse topographic and climatic conditions, Ethiopia has estimate of 53.99 million cattle population

*Corresponding author. E-mail: t.termias@yahoo.com. Tel: +251912062251.

where about 6.7 million were dairy cows (CSA, 2013). The country has a huge potential for dairy development. Given the high potential for dairy development and the ongoing policy reforms and technological interventions, success has been realized. Over the last decades, the dairy sector has shown considerable progress. Total milk production grew at an estimated rate of 3% as compared to 1.8% during the period, 1975 to 1992 (Mohamed et al., 2004). The existing high demand for dairy products in Ethiopia is due to rapid population growth (estimated at 3% annually), increased urbanization and income growth. The urban and peri-urban dairying system has evolved in response to ever increasing demand for milk in urban areas, induced by expanding urbanization, rising per capita income and increasing cost of imported milk and milk products (Staal and Shapiro, 1996). With the shift towards a market economy and policy, private entrepreneurs are significantly responding to the increased demand of dairy products through investing on urban and peri-urban dairying and milk processing. Urban and peri-urban dairy production is one of the dairy production systems prevailing in Ethiopia (Geleti et al., 2014). Due to the availability of commercial feeds and veterinary services in urban and peri-urban areas of Ethiopia, it is usual to see high exotic blood level dairy animals and producers in these areas have better understanding of dairy husbandry and management (Land O'Lakes, 2010).So far, few studies were conducted on dairy cattle husbandry practices, feed resources and dairy products processing and marketing in different areas of Sinana district of Bale zone. Investigating the husbandry practices, limitations and constraints can be used as a benchmark for any development intervention. Hence, it is important to investigate the status of the dairy cattle husbandry practices and the overall related situations in the district. Therefore, this study was conducted to assess husbandry practices of dairy cattle, feed resources, and dairy products processing and marketing in Sinana district of Bale zone.

MATERIALS AND METHODS

Description of the study area

Sinana district is located in the Northwest part of the Bale Zone of Oromia Regional State, Southeast part of Ethiopia (Figure 1). The total area of the district is about 1168 km^2 which ranked the third smallest district (covered 1.67%) in the zone. The altitude of the district is extended from 1650 to 2950 m above sea level with topographic characteristics of plain land (73.5%), hills (3.7%), mountains (9.6%), rugged (12.3%) and gorge (0.9%). The mean annual temperature of the district is 16.5°C whereas the minimum and maximum are 9 and 23°C, respectively. The mean annual rainfall is 1105 mm whereas the minimum and maximum are 1060 and 1150 mm, respectively (SDFED, 2006). The study district has two rainy seasons where the main rainy season extends from July to October whereas, the short rainy season extends from February to April. Crop and livestock productions were interdependent framing systems in the district. The district has two crop growing seasons and is among the first four districts of the zone which has large cattle population (BZFED, 2007).

Sampling method and sample size

Stratified sampling method was used to select the study areas. The district farmer associations were stratified into urban, peri-urban and rural dairy cattle framings. Then, 63, 120 and 30 household farmers were selected (total 213 households) from peri-urban, rural and urban areas, respectively, based on their involvement on dairying activities.

Methods of data collection

Group and individual discussions were carried out with key informants and officials to investigate overview information on agricultural system and dairy cattle production sub-sector in particular. The information investigated was used for the preparation of the structured questionnaire for formal survey. Prior to the actual survey, the questionnaire was pre-tested on sample households to evaluate its appropriateness, clarity and time taken for interview. Seven enumerators with a minimum of diploma educational level were employed and trained how to administer the survey questionnaire and collect data. Primary data were collected from the selected households using face to face interview method in a single visit survey. The data collection focused on the socio-economic characteristics of the respondents, family members labour division for daring activities (herding, milking, dairy products processing and marketing), types dairy animals kept in the production system, preferred dairy animals, common feed resources, age of heifers for first mating, milk yield, types of dairy products processed and marketing systems. Secondary data was collected from Sinana district and Bale Zone of agriculture, finance and development bureau.

Statistical analysis

Descriptive statistics were used to analyze the collected data. Qualitative data was analyzed using frequency distribution. Quantitative data were analyzed using SAS (2002) JMP-5 statistical software packages. Cross-tabulation analysis was used to compare results between the study areas. To locate the significant difference between means and discrete variables, least significant difference (LSD) means comparison and chi-square (χ^2) tests were used, respectively.

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

About 89.8 and 10.3% of the respondents participated in this study were male and female household farmers, respectively. The overall average family size was found 5.6(0.24) persons per household with a significant difference ($P<0.05$) between the rural and urban areas (Table 1). As indicated in the table, there was no significant difference between the study areas in landholding. Households residing in urban and peri-urban areas had farmland to conduct mixed crop-livestock farming activities. This indicates households participated in the study were either live in rural areas before or they got the farmland in some means. In agreement, household

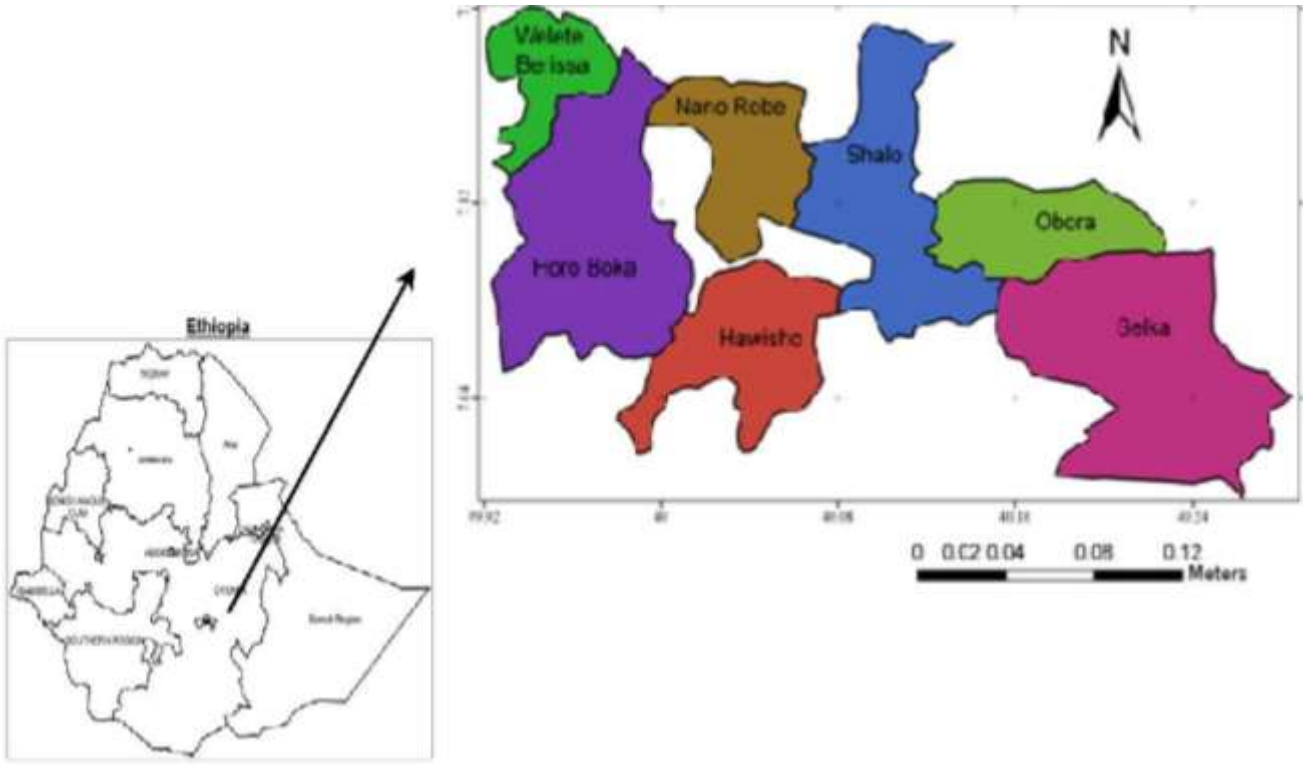

Figure 1. Location of the study area.

Table 1. Average family size, landholding and number of dairy cattle per household.

Parameter	Study area				SL
	Peri-urban	Rural	Urban	Overall	
Average family size	6.0(0.37)^{ab}	5.1(0.34)^{b}	6.8(0.57)^{a}	5.6(0.24)	*
Average landholding	3.6(0.27)	3.6(0.24)	4.1(0.55)	3.7(0.18)	NS
Average dairy cattle	3.2(0.21)^{a}	2.3(0.13)^{b}	1.8(0.25)^{b}	2.5(0.11)	***

*,P≤0.05; ***, P≤0.001; NS, not significant; SL, significant level; Figures outside and inside parenthesis represent mean and standard error, respectively; Means in the row having the same superscript are not significant.

households in rural area of Agarfa district (Bale Zone) own 4.07 ha of land per household (Serekeberhan, 2009). About 25 and 75% of the farmers in peri-urban areas of western part of Ethiopia own land and are engaged in crop-livestock mixed farming (Geleti et al., 2014). In the current study, an average of 15.9(0.61) cattle were owned per household. In comparable, an average of 13.7cattle is owned per household in Burji Woreda of southern Ethiopia (Guyo and Tamir, 2014). In the current study, most (91.1%) of the households kept dairy cattle for family use and income source. As shown in Table 1, households residing in the peri-urban area owned (P<0.001) more number of dairy cattle as compared to rural and urban areas. This could be due to the awareness level of the respondents, suitability of the area for dairying, financial capacity to buy dairy animals and milk demand.

Family members labour division

The study found that family members shared different duties and responsibilities in the husbandry practices of dairy animals. Accordingly, herding was significantly different (P<0.05) in the study areas. Boys took the higher responsibilities (48.8%) on dairy cattle herding followed by father (16.0%) and girls (12.7%). Cattle are an integral part of the household economy and utilize of family labour (Mottram et al., 2005). Even though women took more responsibilities (82.9%) for milking of dairy cows, there was a significant difference (P<0.001) between the study areas. In the western area of Ethiopia,

Table 2. Type of dairy animals kept per household in the study areas.

Types dairy animal	Study area				SL
	Peri-Urban (N=63)	Rural (N=120)	Urban (N=30)	Overall (N=213)	
Kept only crossbred	26 (41.3)[b]	32 (26.7)[c]	28 (93.3)[a]	86 (40.4)	***
Kept both local and crossbred	2 (3.2)[b]	11 (9.2)[a]	0 (0.00)[b]	13 (6.1)	***
Kept only local breed	33 (52.4)[b]	75 (62.5)[a]	2 (6.7)[c]	110 (51.6)	***

***, P≤0.001; SL, significant level; Figures outside and inside parenthesis represent respondent number and percentage, respectively; Figures in the row having the same superscript are not significant.

labour is the key input in peri-urban dairying activities where milking and milk processing are primarily done by women where barn cleaning is mainly carried out by hired labour, women and children (Geleti et al., 2014). In the current study, father in the urban area showed relatively better participation (6.7%) in milking as compared to rural and peri-urban respondents. This might be due to better literacy rate, awareness level and modernization.

There was a significant difference (P<0.001) in participation of household members on milk processing activities. There was a significant difference in the distribution of labour in milk processing among the family members. About 67.7, 92.4 and 76.7% of milk processing duties were left for women in peri-urban, rural and urban areas, respectively. There was a high significant difference (P<0.001) among family members and study areas in participation of dairy products selling where the majority of the activity was done by adult females particularly in rural areas (95%). In the urban and peri-urban areas, there was better participation of family members in selling of dairy products. This could be due the suitable of market opportunities for dairy products selling in the areas.

Types of dairy cattle kept in the production systems

About 98.6% of the respondents had dairy animals. As shown in Table 2, the types of dairy animals kept were significant (P<0.001) in between the study areas. Households residing in the peri-urban and rural areas owned relatively more (P<0.001) number of local breeds (Arsi-Bale or Boran cattle breed) but in the urban area, more than 93% of the respondents owned (P<0.001) crossbred dairy animals. This could be associated with crossbred can give a better milk yield and the existence of better milk demand in the urban area. Most of households in Ade'a and Lume districts (the central part of Oromia Region, Ethiopia) started their dairying using crossbreds (Melesse et al., 2013). In the western part of Ethiopia, both local and crossbred animals are kept for dairying (Geleti et al., 2014). Distance to the source of technologies has a significant effect on the adoption of dairy technologies (Mwamuye, 2013).

There was a significant difference (P<0.001) in the types of crossbreds of dairy animals kept in the production system across the study areas. Accordingly, 53.6 and 46.4% of respondents residing in urban area kept a crossbred of Arsi-Bale cattle breed with Boran cattle breed and a crossbred of Arsi-Bale cattle breed with the Holstein Friesian cattle breed, respectively. But 85.7% of the respondents residing in the peri-urban area kept a crossbred of Arsi-Bale cattle breed with Jersey dairy cattle breed. About 44.2, 25.6 and 20.9% of respondent residing in the rural area kept a crossbred of Arsi-Bale cattle breed with Jersey cattle breed, Arsi-Bale cattle breed crossed with Holstein Friesian cattle breed and Borna cattle breed crossed with Jersey dairy cattle, respectively. These might be true according to Quddus (2012) who reported that most of farmer semi-urban areas use crossbred cows and rural farmers are reluctant to use improved dairy technologies and higher demand for milk in markets is also an important reason to acquire crossbred dairy cattle.

Dairy cattle production systems

As indicated in Table 3, there was a significant difference in dairy production systems across the study areas. Extensive dairy production system (mostly practiced open grazing and without appropriate housing) was the dominantly practiced by most farmers 149(70.0%). In peri-urban areas, most practiced extensive dairy production system followed by urban and rural respondents. Producers in urban and peri-urban areas of Ethiopia have better understanding of dairy husbandry and management (Land O'Lakes, 2010). In rural areas of Amhara and Oromia zones of Ethiopia, 20.8% and 25.8% of the households practiced intensive and semi-intensive dairy production systems (limited open grazing, better feed supplementation, healthcare and appropriate housing), respectively. Intensification of smallholder dairy production involves the adoption of improved genetic potential cattle breeds for milk production and other complementary inputs (Dehinenet et al., 2014).

Preferred dairy cattle breeds

For dairy farm expansion, there was no significance difference in the preference of dairy animal across the

Table 3. Dairy production systems in the study areas.

Production system	Study area				SL
	Peri-urban (N=63)	Rural (N=120)	Urban (N=30)	Overall (N=213)	
Extensive	59 (93.7)[a]	64 (53.3)[b]	26 (86.7)[a]	149 (70.0)	***
Intensive	0(0.0)[b]	25 (20.8)[a]	0 (0.0)[b]	25 (11.7)	***
Semi-intensive	3 (4.7)[c]	31 (25.8)[a]	3 (10.3)[b]	37 (17.4)	***

***, P≤0.001; SL, Significant level; Figures outside and inside parenthesis represent respondent number and percentage, respectively; Figures in the row having the same superscript are not significant.

Table 4. Reason of preferences dairy animal types in the study areas.

Preference reason	Study area				SL
	Peri-urban (N=63)	Rural (N=120)	Urban (N=30)	Overall (N=213)	
Availability + better milk yield	0 (0.0)	2 (1.7)	0 (0.0)	2 (0.9)	NS
Availability	2 (3.2)[b]	32 (26.7)[a]	1 (3.3)[b]	35 (16.4)	***
Easy management	5 (7.9)[a]	4 (3.3)[a]	0 (0.0)[b]	9 (4.2)	***
Better milk yield	56(88.9)[b]	82 (68.3)[c]	29 (96.7)[a]	167 (78.4)	***

***, P≤0.001; NS, not significant; SL, Significant level; Figures outside and inside parenthesis represent respondent number and percentage, respectively; Figures in the row having the same superscript are not significant.

study areas. Overall, most of the respondents (92.0%) to own crossbreed dairy animals to expand their dairy farm. This could be due to the higher milk productivity of the crossbreeds as compared to local breeds, however, there was a significant difference (P<0.001) in the preference of the types of dairy animals. Overall, 26.8% of the respondents preferred to own pure Jersey dairy cattle breed. With this regard, 29.2% of the respondents residing in peri-urban and 38.1% of the respondents residing in rural areas preferred first to have a Holstein Friesian and Jersey dairy cattle breeds, respectively to expand their dairy farm. However, most of the respondents (56.7% in urban area preferred first to own a crossbred of Boran cattle breed with Jersey or Holstein Friesian breed. Second preferences were Jersey dairy cattle breed in rural (26.7%) and Holstein Friesian dairy cattle in urban (40.0%) and in the peri-urban (7.9%) areas. As shown in Table 4, reasons for preferences of such type of dairy animals were due to for their better milk productivity (78.4%) followed by the availability of these breeds in the study areas (16.4%) and their easiness for management (4.2%). Overall, Arsi-Bale cattle crossbred were the least preferred dairy animals by the respondents for dairy farming expansion.

Common feed resources

As indicated in Table 5, grazing pasture, crop-residues and improved forages were the common feed resources in the study areas, however, these feed resources very scarce from February to May. The availability of grazing pasture and hay was significantly different (P<0.001) in the study areas but there was insignificance difference in the availability of crop-residues and improved forage. In rural area 87.9% of the respondent utilized improved forages for animal feeding compared to 100% utilization of improved forages in urban and peri-urban areas. This indicates rural farmers have better opportunities for alternative feed resources as compared to farmers residing in urban and peri-urban areas. The other reason might be farmers residing in urban and peri-urban areas might better aware of about the importance of improved forages for their animals. Improved forage crops produce high amount of quality forage for ruminant livestock (Geleti and Tolera, 2012), however, the adoption of improved forages by livestock keepers in rural areas of Ethiopia only is 0.15% (Tesfaye et al., 2010). A small land area and communal grazing lands do not encourage cultivation of forage crops (Benin et al., 2003). Lack of effective extension systems in forage development is also an important factor (Geleti and Tolera, 2012).

In agreement with this study, Seré and Steinfeld (1996) reported that in mixed crop-livestock farming systems higher than 90% livestock feed dry matter comes from rangelands, pastures and annual forages, and less than 10% of the dry matter comes from crop by-products and/or stubble. Serekeberhan (2009) reported that natural pasture of communal grazing land, fallow land, crop-residue and crop aftermath are the most common feed resources in Agarfa district of Bale zone. Similarly, natural pasture is the major and crop-residues the second major feed resources for livestock in Burji Woreda of South Ethiopia (Guyo and Tamir, 2014) where they are adequate from September to half of January but they are inadequate from half of January to half of April.

Table 5. Grazing pasture, crop-residue, hay/silage, and improved forages availability.

Feed type	Availability or scarcity	Study area				SL
		Peri-urban (N=63)	Rural (N=120)	Urban (N=30)	Overall (N=213)	
Grazing pasture	Available	63(100)[b]	84 (70.0)[a]	21 (70.0)[c]	168 (78.9)	***
	Scarce	0 (0.0)b	25 (20.8)[a]	0 (0.0)[b]	25 (11.7)	***
Crop residues	Available	62 (98.4)	112 (93.3)	29 (96.7)	203 (95.3)	NS
	Scarce	0 (0.0)	1 (0.8)	0 (0.0)	1 (0.5)	NS
Hay	Available	27 (42.9)[a]	30 (25.0)[a]	8 (26.7)[b]	65 (30.5)	***
	Scarce	0 (0.0)[b]	57 (47.5)[a]	0 (0.0)[b]	57 (26.8)	***
Improved forages	Available	19 (30.2)	80(66.7)	8 (26.7)	107 (50.2)	NS
	Scarce	0 (0.0)	11 (9.2)	0 (0.0)	11 (5.2)	NS

***, P≤0.001; NS, not significant; SL, Significant level; Figures outside and inside parenthesis represent respondent number and percentage, respectively; Figures in the row having the same superscript are not significant.

Crop-residues are becoming increasingly important as sources of roughage feeds for ruminants in Ethiopia but the quantities available for livestock feeding can fall due to costs associated with collection, transport, storage and processing (Geleti and Tolera, 2012). Seasonal availability, other feed alternatives and wastage can also contribute to the loss of crop-residue feed resources.

Supplementary feeds

Wheat bran and linseed meal were dominantly used as feed supplements in urban and peri-urban areas. Flour mill by-products, oilseed cakes, brewery by-products and molasses are the main constituents of concentrate feeds mainly for peri-urban dairying in Ethiopia while, wheat bran is the most common milling by-product used for commercial oriented livestock feeding in Ethiopia (Geleti and Tolera, 2012). In the current study, irrespective of the study areas, most of the respondents (74.2%) offered (P<0.001) table salt for dairy animals followed by offering of salty soil called *Bole* (11.7%) and table salt plus salty soil (8.9%) as mineral supplements. In agreement, Guyo and Tamir (2014) reported common salt and Bole are used mineral supplements in Burji Woreda of South Ethiopia. Similarly, farmers in the western part of Ethiopia use common salt as a mineral supplement (Geleti et al., 2014). Non-conventional feed resources do play an important role in peri-urban dairy production system (Mekasha et al., 1999). In the current study, overall, 77.9% of the respondents offered the supplement feeds to their dairy animals by mixing them. Only 1.4% offered supplement feeds and mineral supplements solely without mixing with basal diet or other supplement feeds.

There was a significance difference (P<0.05) in feeding supplement feeds for dairy animals. Overall, 71.8% of the respondents (P<0.001) offered the supplement feeds priority to lactating cows followed by offering to bulls (25.4%) and heifers (0.5%). Respondents residing in the peri-urban (88.9%) area significantly gave more priority to the lactating cows compared to rural (65.8%) and urban (60.0%). The quantity of supplement feed offered per dairy animal per day in rural area was higher (P<0.001) as compared to the amount offered in urban and peri-urban areas. A mean of 3.8(0.21), 9.0(0.57) and 4.5(0.23) kg with overall mean of 6.9(38) kg supplement feeds were offered per animal dairy per day in peri-urban, rural and urban areas, respectively. This indicates, farmers were not offering the supplement feeds based on the requirement of the animals.

Age for first mating

Overall, 44.6% of the respondents significantly (P<0.001) allowed heifers for first mating based on age as best criteria followed by based on age plus body weight of the heifer (40.4%) and only based on body weight of the heifer (2.3%), respectively (Table 6). Heifers were allowed for first mating at 38.6(0.83), 33.9(1.16) and 33.6(3.19) months with age overall mean of 35.3(0.84) months age in peri-urban, urban and rural areas, respectively. The age for first mating of heifer was no significant difference in across the study areas. By contrast, age at first calving of indigenous cattle in Agarfa district of Bale zone is 45.49 months (Serekeberhan, 2009). Alberro (1983) reported that the estimated of age at first calving for Ethiopian zebu cattle ranges from 35 to 53 months and for crossbreds it ranges from 29 to 42 months, however, under traditional production system, cattle are delayed age for first calving ranging from 33.4 to 62.5 months. Similarly, Eshete (2002) reported that the average age at first calving of 50.6 month of East African short horn zebu managed under farmer's management level in Ginchi western part of Ethiopia. Proper and better breeding helps in developing good dairy herd and getting good returns (Quddus, 2012).

Milk production

Overall, respondents in the study area could be kept

Table 6. First mating criteria of heifers in the study areas.

Mating criteria	Study area				SL
	Peri-urban (N=63)	Rural (N=120)	Urban (N=30)	Overall (N=213)	
Age	29(46.0)[a]	65(54.2)[a]	1 (3.3)[b]	95 (44.6)	***
Age + body weight	32 (50.8)	27 (22.5)	27 (90.0)	86 (40.4)	NS
Body weight	1 (1.6)	2 (1.7)	2 (6.7)	5 (2.3)	NS

***, P≤0.001; NS, not significant; SL, significant level; Figures outside and inside parenthesis represent respondent number and percentage, respectively; Figures in the row having the same superscript are not significant.

Table 7. Age of a cow kept for milk production (years), milk yield per milking (litres) and milk yield/animal/lactation (litres).

Description	Study area				SL
	Peri-urban	Rural	Urban	Overall	
Average age of cows kept in the production system	7.6(0.21)[b]	8.9(0.23)[a]	7.6(0.33)[b]	8.3(0.16)	***
Average milk yield/milking	5.0(0.47)	4.5(0.39)	5.18(0.65)	4.7(0.28)	NS
Average milk yield/lactation	819.0(73.7)	1021.9(123.9)	898.8(143.7)	920.9(65.93)	NS

***P≤0.001; NS, not significant; SL, significant level; Figures outside and inside parenthesis represent means and standard error, respectively; Figures in the row having the same superscript are not significant.

cows for 8.3(0.16) years in the production system if they were productive (Table 7). In the rural area, cows were kept for more years (P<0.001) in the production system compared to they were kept in urban and peri-urban areas. The average milk yield per cow per day was no significant difference in the study areas. Respondents collected a mean of 4.7 L of milk per cow per day. On average 920.9 L of milk was collected per cow per lactation which was no significant difference in the study areas. By contrast, indigenous cows in Agarfa district of Bale zone give 1.72, 1.04 and 0.54 L of milk yield per daily at early, mid and late lactation stages, respectively (Serekeberhan, 2009). In Ginchi, western part of Ethiopia, the average milk yield per cow per day and per cow per lactation of east Africa short horn zebu cattle kept under farmer's management system give 1.76 and 473.1 L, respectively (Eshete, 2002) which are very much lower than the current findings. Similarly, in the western part of Ethiopia, mean daily milk yield of local cattle breeds being 1.79 and 1.78 L per cow per day at Bako and at Nekemte peri-urban areas, respectively, while, 6.54 and 9.79 L of milk yield per crossbred cow per day at Bako and Nekemte peri-urban areas, respectively (Geleti et al., 2014). These differences were due to breed difference, husbandry systems and the of exotic blood level of the dairy animals.

Dairy products processing and marketing

In the current study, 95.3% of the respondents had taken training on dairy products processing. About 81.3, 65.4 and 50.8% of respondents residing in urban, rural and peri-urban, respectively owned either improved or local dairy products processing equipment with significant (P<0.05) differences in the study areas. Overall, 52.1% of the respondents mostly processed milk into cottage cheese, butter and cottage yoghurt at home level (Table 8). Respondents residing in urban area processed milk more (P<0.001) into cottage cheese, butter and cottage yoghurt as compared to peri-urban and rural areas. The reason might be, respondents residing in urban area aware better about dairy products processing and value adding effect of processed dairy products. Most of the milk (85%) produced by dairy farmers in Ethiopia is used for household family consumption (Land O'Lakes, 2010) most of the surplus milk produced in the rural area is processed into cottage cheese and butter.

In dairy products marketing, most (48.8%) of respondents made money by selling raw milk around their homestead followed by butter selling (26.3%) at local market. In agreement, there is no formal fluid milk value chains are found in peri-urban areas of western Ethiopia (Geleti et al., 2014). Dairy products market process can be affected by different factors including market outlets, their accessibility and frequency of operation, infrastructure (Andualem, 2004). There is poor trend of dairy and dairy products marketing in Agarfa district of Bale zone and they may be sold informally after household satisfaction (Serekeberhan, 2009).

This study identified that there were no milk collection and processing centres in any of the study areas. Approximately 98.4, 85.8 and 70.0% of the respondent in peri-urban, rural and urban areas, respectively wanted (P<0.001) to start dairy cooperative for milk collection and processing. Regarding to the type of cooperative, 85.1% of the respondents wanted dairy cooperative, 14.4% wanted dairy processing plant and only 0.6% of

Table 8. Type of dairy product processing at home level in the study areas.

Dairy product	Study area				SL
	Peri-urban (N=63)	Rural (N=120)	Urban (N=30)	Overall (N=213)	
Butter	7 (11.1)[a]	20 (16.7)[a]	0 (0.0)[b]	27 (12.7)	***
Butter and cottage yogurt	8 (12.7)[a]	16 (13.3)[a]	0 (0.0)[b]	24(11.3)	***
Cottage cheese	0 (0.0)[b]	5(4.2)[a]	0 (0.0)[b]	5 (2.3)	***
Cottage cheese and butter	1 (1.5)[b]	18 (15.0)[a]	1 (3.3)[b]	20 (9.4)	***
Cottage cheese, butter and cottage yogurt	41(65.1)[b]	43(35.8)[c]	27(90.0)[a]	111(52.1)	***
Cottage cheese and cottage yogurt	0 (0.0)[b]	5 (4.2)[a]	0 (0.0)[b]	5 (2.3)	***
Cottage cheese	0 (0.0)[b]	7 (5.8)[a]	0 (0.0)[b]	7 (3.3)	***

***, P≤0.001; SL, Significant level; Figures outside and inside parenthesis represent respondent number and percentage, respectively; Figures in the row having the same superscript are not significant.

respondents wanted to have both the dairy cooperative and dairy processing plant. In agreement, there is no formal milk collection and processing activities in peri-urban areas of western Ethiopia; milk processing refers to the act of traditionally processing milk into milk products at home (Geleti et al., 2014).

CONCLUSION AND RECOMMENDATIONS

To expand and sustain the dairy framings, crossbred of Arsi or Boran cattle breed crossbreed with Holstein Friesian and Jersey were the most preferred dairy animals in the study area. Feed resources were inadequate from half of January to half of April. The dairy products production and marketing in the study areas mainly depend on feed resources and availability of dairy product consumers. Feed scarcity and limited access to formal market were the major constraints. There were no dairy cooperatives and dairy product processing plants established in the study areas. Most of the respondents need the establishment of diary cooperatives and dairy products processing plants. Therefore, to improve the husbandry practices of dairying, feed resources conservation, selective dairy cattle crossbreeding with better feeding, healthcare and housing management systems should be practiced. Moreover, implementation appropriate rangeland management systems and conservation of available nature pasture in the form of quality hay with establishing of dairy cooperatives and development of market linkage between dairy products producers and consumers are very essential.

Conflict of Interests

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The authors would like to thank Madda Walabu University for giving us this chance to conduct study and for financing the research. Also we would like to thank Sinana district livestock office, its staff members and farmers for their information and cooperation.

Abbreviations

BZFED, Bale Zone Finance and Economy Development; **CSA**, Central Statistics Agency; **LSD**, least significant difference; **SDFED**, Sinana District Finance and Economy Development Office.

REFERENCES

Alberro M (1983). Comparative performance of F1 Friesian x zebu heifers in Ethiopia. Anim. Prod. 37:247-252.
Andualem D (2004). Preliminary survey of livestock production system in ziquala Woreda, Wagihimra Zone of Amhara Regional state. MSc. Thesis, Alemeya University.
Benin S, Ehui S, Pender J (2003). Policies for livestock development in the Ethiopian highlands. Envir., Dev. Sust. 5(3-4):491-510.
BZFED (2007). Bale Zone Finance and Economy Development: Department of Planning and Budget: Physical and socio-Economic profile of Sinana district, Bale-Robe (Unpublished).
CSA (2013). The Federal Democratic Republic of Ethiopia Central Statistics Agency. Agricultural sample survey 2012/13 [2005 E.C].Vol. II. Report on livestock and livestock characteristics. Addis Ababa, Ethiopia.
Dehinenet G, Mekonnen H, Kidoido M, Ashenafi M, Bleich EG (2014). Factors influencing adoption of dairy technology on small holder dairy farmers in selected zones of Amhara and Oromia National Regional States, Ethiopia. Disclose J. Agric. Food Sci. 2(5):126-135.
Eshete G (2002). An Assessment of Feed Resources, Their Management and Impact on Livestock Productivity in the Ginchi Watershed Area; MSc Thesis. Alemaya University.
Geleti D, Hailemariam M, Mengistu A, Tolera A (2014). Analysis of Fluid Milk Value Chains at two Peri-Urban Sites in Western Oromia, Ethiopia: Current Status and Suggestions on How They Might Evolve. Glob. Vet. 12(1):104-120.
Geleti D, Tolera A (2012). Forage for smallholder farmers, Ethiopia: A collection of selected studies. Lambert Academic Publishing.
Guyo S, Tamir B (2014). Assessment of Cattle Husbandry Practices in Burji Woreda, Segen Zuria Zone of SNNPRS, Ethiopia. Int. J. Technol. Enh. Emer. Eng. Res. 2(4):11-26.
Mekasha Y, Tegegne A, Yami A, Umunna NN (1999). Feed resources and nutritional management of dairy herds in urban and peri-urban

dairy production systems. Proceedings of the 7th National Conference of the Ethiopian Society of Animal Production (ESAP), May 14-15, 1999, Addis Ababa, Ethiopia.
Melesse K, Jemal J, Melesse A (2013). Factors affecting the level of adoption of dairy technologies in Ada'a and Lume Districts, East Shoa Ethiopia. Agric. Sci. Res. J. 3(8):237-243.
Mohamed A, Ahmed M, Ehui S, Assefa Y (2004). Dairy development in Ethiopia. EPTD discussion paper no 123.
Mottram A, James D P, Robinson W I, Zekaria S, Taddesse G (2005). The Ethiopian Agricultural Sample Enumeration In-depth Analysis: Proceedings of a Workshop 6th June 2005, Addis Ababa, Ethiopia. Centre for Arid Zone Studies (CAZS), Central Statistical Authority (CSA).
Mwamuye MK (2013). Factors influencing adoption of dairy technologies in Coast Province, Kenya. Int. J. Bus. Comm. 2(7):01-36
O'Lakes L (2010). Ethiopian Dairy Value Chains, USAID CA No. 663-A-00-05-00431-00 Land O'Lakes, Inc. IDD. Addis Ababa, Ethiopia.
Quddus MA (2012). Adoption of dairy farming technologies by small farm holders: practices and constraints. Bangladesh J. Anim. Sci. 41(2):124-135.
SAS (2002). SAS Institute Inc., Cary, NC, USA JMP Design of Experiments, Version 5.
SDFED (2006). Socio Economic Profile of Sinana District, Bale-Robe, Ethiopia (unpublished).
Seré C, Steinfeld S (1996). World livestock production systems: current status issues and trends. FAO Animal Production and Health Paper 127. Food and Agriculture Organization, Rome.
Serekeberhan T (2009). Characterization of Cattle Production and Marketing Systems in Agarfa District, South East Ethiopia. Msc Thesis, Mekelle University.
Staal SJ, Shapiro BI (1996). The economic impacts of public policy on smallholder peri urban dairy producers in and around Addis Ababa. Ethiopian Society of Animal Production (ESAP) Publication No. 2, Addis Ababa, Ethiopia. Tegegne A, Tadesse M, Yami A, Mekasha Y (2000). Market-oriented urban and peri-urban dairy systems. Urban Agric. Mag. 1(2):23-24.
Tesfaye L, Puskur R, Hoekstra D, Tegegne A (2010). Commercialization of dairy and forage systems in Ethiopia: An innovation systems perspective. Working Paper 17. ILRI (International Livestock Research Institute), Nairobi, Kenya.