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Dairy Cattle Husbandry Practices and Constraints Associated with Milk Production in Bishoftu and Akaki Towns of Oromia Region, Ethiopia

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Abstract: This study was carried out to investigate dairy husbandry practices and constraints faced to the stallholder dairy farmers in two towns (Bishoftu and Akaki). The study used structured questionnaire administered to the randomly selected 130 smallholder dairy farmers, from the study areas. Focus group discussions and observations were also used to consolidate the information obtained through questionnaire interview. Data were described using APSS statistical software (SPSS version 20). Results revealed that 74.6% of the respondents used stall feeding and 25.4% for stall feeding and with limited grazing. The housing system was permanent enclosure for 88.5% and 87% in Bishoftu and Akaki respectively. The type of dairy cows house was roofed kraal 78.7% and 100% cases in the respective towns. All respondents reported that cows are milked twice a day. For calf weaning, 68.8% of the respondents used bucket feeding, 24.2% used partial suckling and 7% used both methods. Major constraints for smallholder dairy production include shortage and high cost of dairy cattle feeds, inadequate water supply, disease prevalence and land limitation for dairying. The prevalent disease occurringin the areas were anthrax, liver fluke, external parasites, foot and mouth disease, abortion, mastitis, lumpy skin disease and black leg. In conclusion, smallholder dairy farming in the study areas contributes a great deal to the household welfare in terms of food security and income generation under current husbandry practices and livestock extension services.

Key words: Cattle · Constraints · Dairy · Farmers · Husbandry Practice · Smallholder

INTRODUCTION

Ethiopia has the largest livestock population in Africa. The total cattle population of the country in 2013 was estimated to be about 55.03 million [1]. Out of this total cattle population, the female cattle constitute about 55.38% and the remaining 44.62% were male cattle. From the total cattle population of the country, 98.71% were local breeds. The remaining was cross breed and exotic breeds that accounted for about 1.15 and 0.14%, respectively [1]. A total cow milk production for the country during 2013 was about 2.9 billion liters with the average lactation period of about six months and average daily milk yield per cow is about 1.37 liters. Cows are common sources of milk (83%). About 82.9% of the milk is consumed by the households, 10% of the milk is processed into other milk products to extend shelf life and the remaining amount is sold [2].

The large cattle population, favorable climate for improved high-yielding cattle breeds; and relatively animal disease-free environment make Ethiopia to hold a substantial potential for dairy development [3]. Despite of the existing dairy scenario with a potential for its subsequent development, productivity of cross breed dairy cattle in general is low. Thereby, impeding its direct contribution towards national economy and the per capita milk consumption is only about 19 kg/year, which is much lower than African and world per capita average of 40 kg/year and 105 kg/year, respectively [4]. Combinations of cultural and economic factors are main reasons of the low

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consumption level. Further, the annual rate of increase in milk yield (estimated to be 1.2%) lags behind the increment in human population (estimated to be about 2.7% per annum) [5].

Various authors indicated that lack of appropriate technology, training and finance services constraints to smallholder dairy farming in Eastern and Southern African countries [6-9]. In addition, farmers pointed out low milk price as a serious problem [10].

To put in place appropriate remedial interventions that would lead to enhanced productivity of the dairy subsector, understanding the prevailing overall dairy husbandry practices and understanding the major constraints of dairy production is very crucial. This entails the need for generating site specific database under specific production scenarios. In this regard, little research has been done so far to identity the overall smallholder dairy cattle husbandry practices in the selected areas. In this research, it is endeavored to fill this prevailing information gap. Hence, the objective of this study was to investigate the smallholder dairy husbandry practice, constraints and to suggest possible solutions for the identified constraints.

MATERIALS AND METHODS

Location: The study dealt with smallholder dairy farms in Bishoftu and Akaki Towns. Bishoftu is located in 45 km along South East of Addis Ababa. The area is located at 9°N latitude and 40°E longitude at altitude of 1850 m.a.s.l. with annual rain fall of 866 mm of which 84% is in the long rainy season from June to September [12]. Cattle, small ruminant, poultry and equines are the major livestock species kept with fast growing smallholder dairy production [13]. Akaki district is located 25km away from Addis Ababa at 9°-10°24' North latitude and 37°56'-40° 35' East longitude with an altitude range of 1500-3100 meter above sea level. Its annual temperature ranges from 15°C-27°C. The mean annual rainfall of the district is 800-900 mm and the short rain occurs during February, March and April and the long rain extends from June up to August (Unpublished data of 2010/11). The livestock raised in the District, cattle population takes the first rank with 91,040, followed by 39,055 goats, 39,048 sheep, 22,676 donkeys,6,136 horses and 2,015 mules.

The population in Addis Ababa, Adama, Mojo and Bisheftu create a large market for most agricultural commodities. Moreover, large quantities of agro-industrial by-products (Flour-mills, oil mills, sugar factories) are produced from industries that are located close to the areas. This facilitates targeted towards optimal use of the by-products that are disposed from these industries. The areas are thus demonstration sites that show the direction to other national dairy producing areas for the commercialization of the sector.

Sampling Method: Smallholder farmers were selected from the list using a stratified random sampling procedure based on the information of city agricultural desk. Sample size was determined using the formula given by Arsham [14] for survey studies:

$$N=0.25/SE^2$$

Where, N = sample size
SE= Standard error of the population.

Accordingly, a total of 130 (61 in Bishoftu and 69 from Akaki) smallholder farmers were selected by random sampling method.

Data Collection Method: Structured questionnaire was prepared and used to collect information from crossbred dairy cow owners. The questionnaire was pre-tested on non-random households and adjustments were made on important suggestions from key informants and the enumerators. Accordingly, information about the dairy husbandry practices like breeding, milking routines, calve rearing, major feeds and feeding systems, water provisions, housing, disease prevalence, healthcare and recording keeping were collected. The last part of the survey addressed questions related to major constraints encountered by the smallholder farmers and to the prospects of the dairying activity as seen by the farmers. In addition to interview, field observation was made to enrich the data on dairy husbandry practices; feeding, housing types, watering, calf rearing, breeding and health care of the cattle and any events pertaining to investigations were observed to strengthen the information obtained. A focused group discussion was also carried out with four groups of smallholder dairy farmers and stakeholders composed of different age and sex groups. Besides the primary data, secondary data was collected from both published and unpublished documents obtained from relevant regional bureaus, city agricultural desk, districts dairy cooperatives and other development offices and personal communications. Available literature and web pages was also searched to consolidate the document.

Data Management and Analysis: The raw data obtained from cross-sectional survey was coded and entered on a Microsoft Excel (2007) data spreadsheet for management. Done was analyzed using Statistical Package for Social Sciences version 20 using descriptive statistics and the results presented using mean, standard deviation, percent, in tables and graphs.

RESULTS AND DISCUSSION

Dairy Cattle Husbandry Practices

Breeding System: The common breeding method in the study areas is mixed, AI and natural mating by bull. Results in Table 1 showed that 50.8% and 46.4% of the interviewed dairy cattle farmers applied artificial insemination (AI) in Bishoftu and Akaki respectively. 47.8% and 42.6% of the respondents use both AI and bull services in Bishoftu and Akaki respectively. This finding is supported by Mulisa *et al.* [15] who reported 46.4 percent smallholder dairy farmers using AI service compared to 20.3 percent of them who use using natural service. This may imply that smallholder dairy farmers are not satisfied on the AI service. Few respondents use only natural breeding (bull) services to their cross breed cows. The higher use of the artificial insemination service is observed because rearing bull is costly and on the other hand the farmers want to upgrade their dairy cattle via introduction of exotic blood. Although the cattle showed typical signs of estrus, 78.9% of owners in Bishoftu and 60% in Akaki were faced with the failure of artificial insemination. Major causes of failure reported by the respondents were heat detection problem (11.1%), distance to AI centre (31.1%) and absence of AI technician (15.6%), AI technician inefficiency (28.9%) and others (13.3%) in Bishoftu. Major problem for the failure of artificial insemination were heat detection problem (6.5%), distance of AI centre (26.1%), absence of AI technician (17.4%), AI technician inefficiency (37%) and other (13%) in Akaki.

Table 1: Method of dairy cattle breeding practices

		District		
Breeding system	Category	Bishoftu (N=61)	Akaki (N=69)	Overall (N=130)
Breeding system	Natural breeding	6.6	5.8	6.2
	Artificial insemination	50.8	46.4	48.5
	Both	42.6	47.8	45.4
Starting time of cross breed	One years ago	5.4	13.0	10.4
	Two years ago	13.5	42.0	32.1
	Six months ago	10.8	0.0	3.8
	Three years ago	67.6	29.0	42.5
	Four years ago	2.7	15.9	11.3
Access of AI services	Yes	96.7	97.0	96.9
	No	3.3	3.0	3.1
Distance to the AI center	<1Km	10.2	4.6	7.3
	2-4Km	37.3	89.2	64.5
	5-7Km	25.4	6.2	15.3
	>7Km	27.1	0.0	12.9
Failure of AI	Yes	78.9	60.0	68.9
	No	21.1	40.0	31.1
Reason for the AI failure	Heat detection problem	11.1	6.5	8.8
	AI technician fficiency	31.1	26.1	28.6
	Distance of AI centre	15.6	17.4	16.5
	Absence of AI technician	28.9	37.0	33.0
	Other	13.3	13.0	13.2
Alternative taken for the AI failures	Privet exotic bull	54.5	38.1	46.5
	Home bred exotic bull	4.5	11.9	8.1
	Using own local bull	9.1	0.0	4.7
	Using exotic bull at communal	11.4	4.8	8.1
	Using local bull at communal grazing area	4.5	0.0	2.3
	Extending the mating time	15.9	45.2	30.2
Source of bull for natural mating	Own local breed bull	32.6	0.0	19.4
	Own cross bred bull	11.6	6.9	9.7
	Neighboring farmer's local breed bull	11.6	10.3	11.1
	Neighboring farmer's cross breed bull	2.3	82.8	34.7
	Community owned cross bred bull	41.9	0.0	25.0

N=numbers of smallholder

Table 2: Dairy cattle housing conditions under smallholder farmers (% of respondents)

		District	
Housing condition	Category	Bishoftu (N=61)	Akaki (N=69)
Housing system of dairy farms	Permanent enclosure/house	88.5	87
	Temporary house	11.5	13
Type of house	Roofless kraal	9.8	0
	Roofed kraal	78.7	100
	I tethered at the yard	11.5	-
Material used for housing	Wood + Iron sheet	72.1	66.7
	Bricks+Iron sheet	4.9	33.3
	Wood +plastic	23.0	-
Material used for the floor	Earthen/mud floor	26.2	8.7
	Concrete	54.1	87
	Stones	19.7	4.3
Frequency of removal waste material	Every day	93.4	89.9
	Two times per a week	3.3	5.8
	Three times per a week	3.3	5.8

Insemination charges were also varied based on the areas. In the site of Bishoftu, the farmers were charged 39.3 birr per a single insemination. Akaki had the lowest insemination charges as farmers paid a mean birr 26.2 per single insemination.

Dairy Cattle Housing and Cleaning: In the study areas, it is observed that types of the dairy cattle housing commonly used depend on the ability of the farmers and their farming activities. Table 2 shows the percentage of farmers used housing system, types of house and material used for the floor among the two study areas. The majority of milk producers in Bishoftu and Akaki reported that they fellow the housing system of permanent enclosure 88.5% and 87%, respectively.

The housing type of dairy cows was roofed kraal, 78.7% and 100% in Bishoftu and Khaki, respectively. The material used for wall construction was wood and iron sheet for the roof. While comparing the farmers in both areas, it is seen that the farmers from Akaki uses the highest concrete floor 87% followed by 54.1% in Bishoftu. Due to easy to cleaning, the concrete floor is preferable over the mud floor. It is difficult to clean the mud floor. The economic ability of the farmers plays a key role whether they use concrete or mud floor. Removal of manure and cleaning of the cow housing floors was done at least once per day in 93.4% and 89.9% of the farmers in Bishoftu and Akaki, respectively. In the remaining of the farmers, it was done only occasionally, either once per week two times per a week or three times per a week. The general dairy cattle housing and hygiene conditions of this study is in line with research reported by Mulisa *et al.* [15] and Hunduma [16], in pre-urban and Urban Areas of the country.

Table 3: Calf weaning practice in the study areas

Activities of calf rearing	Percent
Calf milk feeding crossbreed	
Bucket feeding	68.5
Partial suckling	24.2
Both	6.9
Male calf cross breed	
Sell	82.9
Fatten them	10.9
Sell as sire	3.9
Daught/draft	2.3

Milking and Calf Rearing Management: All of the respondents reported that cows are milked twice a day. This result was in agreement with Asaminew and Eyassu [17] who reported that cows are milk twice a day. Management practices for crossbred calves in the study areas are given in Table 3. In the current study, 68.5 % of the respondents used bucket feeding, 24.2 % use partial suckling and 7 % used both methods. The overall mean weaning age 2.68±1.05 reported for cross calves in the present study is lower than that reported by Ike *et al.* [18] 10.5 and 8.9 months for cross calves in the urban and peri-urban area of Awassa. Male calves are not economical to kept and farmers sold them cheaply or culled them from stock as soon as possible. About 82.9 % farmers sell the calf, 10.9 % fatten them and 3.9 % sell as sire. and 2.3% of the farmers used as draught propose. Calves are weaned when they are 2.68±1.05 monthsold.

Dairy Cattle Disease Prevalence and Health Care Services: The major diseases that affect dairy production and productivity in Akaki includes anthrax (2.9%), liver fluke (7.2%), external parasites (26.1%), foot and mouth disease (24.6%), mastitis (17.4%), abortion (13%) and lumpy skin disease (2.9%) and black leg (5.8%) under

Table 4: Sources and distance of veterinary services in the woredas (% of households)

	Woreda		
Variables	Bishoftu	Akaki	Overall
who provide vet services			
Government actors	54.1	50.7	52.3
Private actors	45.9	49.3	47.7
Distance to veterinary Service			
<1km	37.7	24.6	30.8
1-5km	57.4	47.8	52.3
6-10km	4.9	27.5	16.9

smallholder management system. The disease prevalence occurred in Bishoftu reported by the farmers were anthrax (3.3%), liver fluke (6.6%), external parasites (6.6%), foot and mouth disease (6.6%), abortion (11.5%), mastitis (9.8%) and lumpy skin disease (24.6%) and black leg (6.6%) under smallholder management system. Total of 52.3% the respondents got the medicines from local veterinary extension services and 47.7% bought medicine from the private veterinary clinic (Table 4).

Feed Resources and Feeding Strategies: Maintaining access to adequate quantity and quality of feed resource is crucial for milk production in dairy cattle. Stall (intensive) feeding and combinations of feeding systems were mainly the characteristics of the study areas. About 74.6% of the respondents use stall (intensive) feeding and 25.4% practice a combination of feeding system. This result agrees with the report by Ike *et al.* [18] where 95% of dairy farms in the urban and 92.1% percent of peri-urban farms use zero grazing and semi-grazing in and around Awassa town. This shows that there is shortage of land in around the towns for the production of forages. The farmers also indicated that the major sources of feed for cattle in the study areas were natural pasture, crop residue, conserved hay, industrial byproducts and forages (Table 5). The investigated householders provide other supplement; Salt licks (30.8%), mineral licks (1.5%), concentrates (2.3%), mixture of above (33.8%) and (31.5%) no provide supplements. It was observed in the study areas, about 60% of the respondents use purchased feed and 36.9% used from own farm produced and purchased feeds and 3.1% produce from their own farm. Few farmers (2.3%) provide concentrates to their dairy cows irrespective of the physiological status of the animal. Even though they give feeding priority for dairy cow (64.6%), the survey revealed that householders in the study area were not applying specific feeding plans. This could be due to the rise up of feed (concentrates) prices.

Table 5: Reported feed resources and feeding system of smallholder dairy practices (%)

	Woreda			
	Bishoftu (N-61)		Akaki (N-69)	
Major feeds and feeding practices	Wet Season	Dry season	Wet Season	Dry Season
Natural pasture	26.2	-	26.1	20.3
Crop residues/straw	16.4	-	31.9	44.9
Hay	13.1	24.6	20.3	15.9
Fodder trees/forages	-	-	2.9	8.7
Industrial by product	44.3	54.1	13	7.2
Formulating feeds	-	21.3	5.8	2.9
Dairy feeding system	Bishoftu		Akaki	Overall
Stall feeding	65.6		82.6	74.6
Stall feeding with limited grazing	34.4		17.4	25.4
Major feed supply for dairy cattle				
Own farm produced	1.6		4.3	3.1
Purchased	26.2		89.9	60.0
Both farm produced and purchasing	72.1		5.8	36.9
Feeding priority for dairy cow				
Yes	93.4		39.1	64.6
No	6.6		60.9	35.4
Other supplement provide				
Salt licks	57.4		7.2	30.8
Mineral licks	-		2.9	1.5
Concentrates	1.6		2.9	2.3
Mixture of above	9.8		55.1	33.8
No supplements provide	31.1		31.9	31.5

N= number of smallholders

Table 6: Sources and distance of water at different seasons (% of respondents)

	District			
	Bishoftu (N=61)		Akaki (N=69)	
Categories	Wet season	Dry season	Wet season	Dry season
Source of water				
River	4.9	3.3	27.5	24.6
Borehole	6.6	6.6	0	2.9
Pipe water	65.6	4167.2	50(72.5)	72.5
Borehole and spring water	11.5	-	-	-
Pipe water and spring water	11.5	-	-	
River and pipe water	-	23	-	-
Distance for water				
watered at home	55.7	55.7	100	100
<1km	37.7	11.5	-	-
1-5 km	6.6	32.8	-	-

The availability of feed resources in the area depends on seasons. However, concentrate feeds, crop residues (teff straw, wheat straw and barley straw) and conserved forage (hay), were used in both wet and dry seasons. Few farmers used concentrate, salt licks and mineral licks as a supplement for dairy cows. No concentrate was supplemented to local cattle in the study areas.

Sources and Distance of Water for Cattle: Farmers had diverse methods of collecting water to provide their dairy cattle from different sources. The different water sources were; rivers, rainwater tank, borehole, ponds and piped water (Table 6). The major source of water in dry season in the Bishoftu and Akaki were 66.4% and 72.5% in rainy season respectively. Gebrekidan *et al.* [19] in central Tigray reported that, 61.25% of the urban producers in dry season and 58.125% in wet season obtained water from pipe water. The distance to water tended to affect the frequency of watering cattle, as 55.7 % of the households watered at home, 37.7% <1km away from the source of water, while 6.6 % lived between 1-5 km away from the water sources. The households who lived far from the source of water reported that they drove the animals to drink water once day or the water was carried to their home using water carts.

Record Keeping Practices: Recording system in dairy farms is a basis for proper dairy husbandry practices, considered as a tool of effective management and help to make important decisions at all times. According to the present study, majority of the households (60%) kept records relating milk sales. Mainly because they want to be sure they are getting a correct payment at the end of the half month and AI services whereas (40%) of the households didn't kept any records (Figure 1). This is in line the report of Tadele and Nibret [20], who recorded only 18.2% of the famers, had kept record of their cows and most of the (81.8%) had no any record keeping practice about their cows in and Around Maksegnit Town. Simple recording tools can be developed and the farmers can be trained in utilization of this information to make decision for better dairy cattle management and thereby optimize the utilization of the available resources in the study areas.

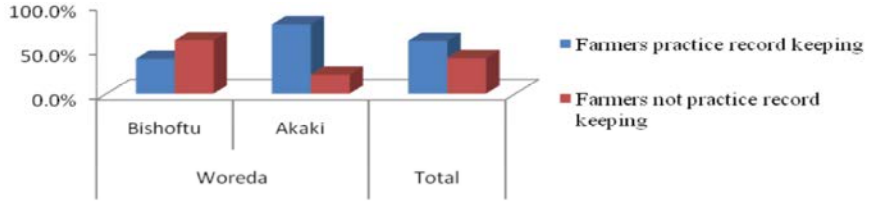

Fig. 1: Percent of record keeping practices by the respondents

Table 7: Production constraints in Bishoftu and Akaki areas

	District			
Constraints	Bishoftu (%)	Akaki (%)	Total (%)	P-value
Inadequate water supply	24.6	17.4	20.8	0.00
Lack of grazing land	3.3	-	1.5	
High cost of animal feeds	-	7.2	3.8	
Shortage of quality feed supply	32.8	69.6	52.3	
Space limitation for dairying	4.9	4.3	4.6	
Poor veterinary services	0	1.4	0.8	
Improved dairy cattle procurement	8.2	-	3.8	
Prevalence of diseases	4.9	-	2.3	
Lack of AI/breeding service	11.5	-	5.4	
Manure handling/disposal	9.8	-	4.6	

Constraints of Dairy Cattle Production: The main production constraints as perceived by farmers included high cost of dairy cattle feed, shortage of high yielding dairy cattle, diseases, poor veterinary services and inadequate water supply (Table 7). Each respondents involved in the study was requested to prioritize the constraints of dairy husbandry practice. Lack of dairy cattle quality feed supply was mentioned as the most important constraint by most of the dairy cattle owners 32.8% in Bishoftu and 69.6% in Akakai. The present result is in agreement with the finding of Fayo [21] who reported feed shortage as the major problem that contributed to the low production and productivity of cattle in and around Dire-Dawa town. Inadequate water supply was the second important constraint in both areas. Improved dairy cattle procurement, prevalence and space limitation for dairying and high cost of animal feeds reported as constraints in both areas. This is similar with Zemenu *et al*. [22], Haile *et al*. [23] and Ketema [24] who reported on feed shortage lack of space and water shortage of dairy production in different areas of Ethiopia. The chi-square test indicates that there is statistical significant difference between the two areas in the major constraints at 5% level of significant. This needs involvement of concerned stakeholders through provision of credit, veterinary service and distribution of crossbred heifers to alleviate the problems.

CONCLUSIONS AND RECOMMENDATIONS

It can be concluded that smallholder dairy farming in Bishoftu and Akaki contributes a great deal to the household welfare in terms income generation. Feed availability in quantity and quality was reported by the respondents as the most important constraints of dairy production and productivities followed by shortage of land and inadequate water supply. And the other main constraints of dairy production were low conception rate to artificial insemination, unimproved husbandry practices and poor livestock extension services. Moreover, trypanosomosis, lumpy skin disease, black leg; foot and mouth disease, abortion, anthrax and mastitis were the most prevalent diseases occurred in the study areas.

Based on the results of this study, the following recommendations are forwarded for improving smallholder dairy farming activities in the study areas.

- Training extension linkage should be strengthened for improved dairy husbandry practices taught to dairy farmers by Government and stakeholders.
- Smallholder dairy farmers should be trained up with the concept of feeding intervention; this includes feed conservation practices, such as the making of silage and hay, as well as improving the quality of crop residues, especially during the dry season to solve the feed shortage.
- In addition, a need also exists to improve farmers' knowledge on the use and benefits of alternative feed sources and by-product.
- Smallholder dairy farmers should be trained up with the concept of, record keeping, breeding, milking and milk handling and health care of dairy cattle.

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