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Research Article

Survey on Dairy Farm Management and Infertility Problems in Small, Medium and Large Scale Dairy Farms in and Around Gondar, North West Ethiopia

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Abstract: A detailed and organized questionnaire format was designed and an attempt was made to generate base line information with particular emphasis on infertility problems of indigenous and crossbred dairy cows in smallholder, medium and large scale dairy farms in and around Gondar, North Western Ethiopia from January 2012 to September 2013. The questionnaire was framed in such a way that dairy producers could give information that were recent and easy to recall, and it was filled directly by interviewing randomly selected small, medium and large scale dairy farms in and around Gondar. A total of 243 owners and/or attendants were interviewed using structured questionnaire of 650 cows were examined of which 352 (54.15%) had at least one of the infertility problems.

Keywords: Dairy cows, Gondar, infertility, questionnaire survey, scale

INTRODUCTION

Ethiopia is one of the sub-Saharan Africa's developing countries with a large potential in livestock population, being 1st among African countries and the 9th in the world. However, meat and milk production are very low, estimated to be 246,000 tones, and 960,000 tones, respectively, with per capital consumption of 17.1 kg milk and 5.6 kg meat per year in 1983-1985 (ESAP, 1995). The cattle population in Ethiopia is estimated to be 41.5 million heads comprising 99.4% indigenous (Zebu), 0.5% crossbreeds and 0.1% exotic breeds which are mainly kept under smallholder subsistence farming (MOA, 2004). Livestock production in Ethiopia has been mainly smallholder subsistence farming, with animals having multipurpose use and being managed in a traditional way. In and around Gondar is having total population of 72,979 cattle heads of which 25, 935 are accounted for dairy cows (CSA, 2008).

Agriculture (mainly crop and livestock production) is the mainstay of the Ethiopian economy, employing approximately 85% of the total population. Livestock production accounts for approximately 30% of the total agricultural GDP and 16% of national foreign currency earnings (IBC, 2004). Moreover, Ethiopia has diverse animal genetic resources and its relatively large livestock population (approximately 100 million) is well adapted to and distributed among diverse ecological conditions and management systems (Lobago *et al*., 2006). In Ethiopia as many developing countries, livestock play multiple roles. Despite the huge number of cattle and their economic importance, the productivity is low due to the constraints of disease, nutrition, poor management and poor performance of indigenous breeds.

The goal of every dairy management team should be to maximize the efficiency of high producing dairy cows so that profitability will increase. Dairying as a component of livestock production is an important economic activity in sub-Saharan Africa. In order to improve the low productivity of local cattle, selection of the most promising breeds and crossbreeding of these indigenous breed with high producing exotic cattle has been considered as a practical solution. The productivity of dairy cattle breeds depends mainly on their reproductive performance and efficiency of service per conception (Tadesse, 2002).

The aim of the study was made to generate base line information with particular emphasis on infertility problems of indigenous and crossbred dairy cows in smallholder, medium and large scale dairy farms in and around Gondar, North Western Ethiopia.

MATERIALS AND METHODS

Study area: The study was conducted in urban and peri urban areas of Gondar town dairy farms which are located North West part of Ethiopia in Amhara regional state. Gondar town is found about 727 km from the capital city Addis Ababa. It is located at latitude, longitude, altitude of 12.3-13.8°N, 35.3-35.7°E and 2200 m.s.l, respectively. The annual mean minimum and maximum temperature of the area vary between 12-17°C and 22-30°C, respectively. The area is located under woyna dega, agro-climatic zone and receives a bimodal rainfall the average annual precipitation rate being 1000 mm that comes from the long and short

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rainy seasons. The short rainy season occur during the months of March, April and May while the long ones extend from June through September (CSA, 2008).

Sample size: A sampling frame i.e. the list of the dairy farms was acquired from the urban agricultural development office at the beginning of the study. Dairy farms/cows were selected from this list using a stratified sampling procedure to ensure the selection of proportional and representative sampling of dairy farms and cows. Sampling stratification was done based on number of cows as described by (ILRI, 1996). Farms owning (n = 1-2), (n = 3-10) and (n = 11 and above) cows were taken as to small, medium and large dairy farms, respectively.

Urban and peri-urban dairy farm scale : The dairy farms considered for this study were categorized into defined strata based on cow herd size; these were small Scale Dairy Farm (SSDF), Medium Scale Dairy Farm (MSDF) and large scale dairy farm (LSDF) having 1or 2, 3 to 10 and 11 to above as described by ILRI(1996) respectively.

Questionnaire survey: A systematic question was designed and instituted to obtain relevant and reliable information about their animals. The questionnaire were checked for clarity of the questions prior the interview, respondents were briefed to the objective of the study. Following that, the actual questionnaires were presented. Accordingly, a total of 138 SSDF, 98 MSDF and 7 LSDF dairy owners and attenders were interviewed for the investigation of infertility problems of dairy herds and recorded.

Data collection, management and statistical methods: The study constituted questionnaire survey on the randomly selected dairy cows. The investigator personally visited all the selected dairy farms, in order to get co-operation of the dairy owners and obtain reliable information about their animals, thorough explanation on the objectives of the study before the start of the interview. The questions were asked about major infertility problems like abortion, dystocia, retained fetal membrane, endometritis, anestrous, repeat breeder, management systems. Data collected from the cross-sectional questionnaire survey was entered in Microsoft excel. Descriptive statistics were used to describe the study dairy farms with respect to farm management and infertility problems. For analysis of the data Statistical Package for Social Science (SPSS) (version 18) was used.

SURVEY RESULTS

Out of the total interviewed dairy cattle producers (n = 243), 165 (67.91%) were male and the rest 78 (32.09%) were female household members of different

Table 1: Proportion of dairy cows in three different dairy farm scales in and around Gondar

[Category	Total no. of farms	[[[Cross bred cows	Indigenous cows	Total no. of cows
SSDF	138	86	107	193
MSDF	98	196	132	328
LSDF	7	102	27	129
Total	243	384	266	650

SSDF = Small scale dairy farm; MSDF = Medium scale dairy farm LSDF = Large scale dairy farm

Table 2: Demographic characteristics of sampled households in the study area

	Dairy farm scale					
Variables	SSDF (n = 138)	%	MSDF (n = 98)	%	LSDF (n = 7)	%
Sex						
• Male	95	68.84	63	64.29	7	100
• Female	43	31.16	35	35.71	---	-----
Educational status						
• Illiterate	39	28.26	17	17.35		
• Adult education	32	23.19	41	41.84		
• Primary school	19	13.77	13	13.27		
• Secondary school	7	5.07	6	6.12		
• Above secondary	3	2.17	4	4.08	7	100
• Religious education	38	27.54	17	17.34		
Family size						
• <18 years	37	26.81	16	16.33		
• >18 years	101	73.19	82	83.67	7	100
Major occupation						
• Dairy producer	24	17.39	26	26.53	4	57.14
• Civil servant	10	7.25	9	9.18		
• House wife	42	30.43	5	5.10		
• Pensioner	12	8.7	23	23.47		
• Student	23	16.67	---	---		
• merchant	11	7.97	12	12.24	2	28.57
• Farmer	12	8.7	23	23.48		
• Others	4	2.8	---	---	1	14.29

SSDF = Small scale dairy farm; MSDF = Medium scale dairy farm; LSDF = Large scale dairy farm

age and educational status. Most 165 (67.91%) of the respondents were household heads while the rest were other family members (mainly wives).

The overall proportion of illiterate dairy producers was 39 (28.26%), 17 (17.35%) from SSDF, MSDF respectively, while 32 (23.19%), 41(41.84 %) had adult education from SSDF and MSDF, respectively. On the other hand, 38(27.54%), 17(17.34%) had religious education from SSDF, MSDF respectively, and 7(100%) in LSDF dairy farms had above secondary school. With respect to educational status of the household head, the majority of in Gondar dairy producers were literate beyond elementary school. The average family size composition by age group indicated that the majority of household members were within productive age group categories <18 years in SSDF 37 (26.81%), MSDF 16 (16.33%) and >8 years in SSDF 101 (73.19%), MSDF 82 (83.67%) and in LSDF 7(100%). The major occupations of various dairy farm systems were presented in Table 1 and 2.

Inadequate space, reproductive/ infertility problem, feed shortage and health problems were stated as the major reasons for culling of cows in SSDF, MSDF and LSDF. In general, in SSDF and MSDF it was common to maintain unproductive animals, especially cows with poor reproductive performance. These probably could be due to lack of external source of replacement animals to maintain or expand herd size (Table 3 and 4).

The feeds were of natural pasture, purchased concentrates, beer brewery and roughages conventional and non conventional feeds. The majority 64 (46.38%) of the households in SSDF used grazing on communal grazing and stall feeding, 52 (37.68%) used only

Table 3: Purpose and sources of establishment of cows

	Dairy farm scale					
Variables	SSDF (n =138)	%	[MSDF (n = 98)	%	LSDF (n = 7)	%
Purpose						
• Milk	82	59.42	98	100	6	85.71
• Draught	56	40.58				
• Milk/meat						
• Milk/teaching					1	14.29
Source of establishment						
• Purchase	34	24.63	31	31.63		
• Gift from family	47	34.06	18	18.37		
• Farm bred	36	26.09	39	39.80	7	100
• Farm bred and Purchase	21	15.22	10	10.20		

Table 4: Culling reasons of cows in different dairy farm scales

	Dairy farm scale					
{	SSDF (n = 138)	%	MSDF (n = 98)	%	LSDF (n = 7)	%
Culling reasons						
• Inadequate space	39	28.26	16	16.33	4	57.13
• Feed shortage	32	23.19	25	25.51	1	14.29
• Reprod./Infertility problems	36	26.09	22	22.45	1	14.29
• Old age	4	2.90	2	2.04		
• Health problems	11	7.97	18	18.37	1	14.29
• Poor production	8	5.80	11	11.22		
• Financial requirement	6	4.35	4	4.08		
• Others	2	1.44				

SSDF = Small scale dairy farm; MSDF = Medium scale dairy farm; LSDF = Large scale dairy farm

Table 5: Feeding systems practiced and proportional utilization of feed resources in dairy farms

	Dairy farm scale					
Variables	SSDF (n = 138)	%	MSDF (n = 98)	%	LSDF (n = 7)	%
Feeding practice						
• Only grazing	52	37.68	19	19.39		
• Stall feeding	22	15.94	8	8.16	1	14.29
• Grazing and stall feeding	64	46.38	71	72.45	6	85.71
Main feed types						
• Natural pasture	80	57.97				
• Hay	18	13.04	68	69.39	2	28.57
• Crop residue	15	10.87				
• Oil seed cakes	17	12.32	13	13.27	2	28.57
• Beer brewery	8	5.80	8	8.16	1	14.29
• Concentrates			9	9.18	2	28.57

SSDF = Small scale dairy farm; MSDF = Medium scale dairy farm; LSDF = Large scale dairy farm

Table 6: Interviewed dairy owners the relative occurrence of major infertility problems

Type of infertility	Questionnaire survey result	%
Post partum anoestrus		
• Cross	29	8.73
• Local	54	16.27
Abortion		
• Cross	16	4.82
• Local	27	8.13
Dystocia		
• Cross	32	9.63
• Local	20	6.02
Clinical endometritis		
• Cross	13	3.91
• Local	7	2.10
Repeat breeder		
• Cross	26	7.83
• Local	47	14.15
Retained fetal membrane		
• Cross	46	13.85
• Local	15	4.51
Still birth		
• Cross	11	3.13
• Local	8	2.28

grazing and about 22 (15.94%) other sources. In MSDF 71 (72.45%) dairy farms were used grazing and stall feeding and 19 (19.39%) used only grazing. In LSDF 1 (14.29%) were used stall feeding and 6(85.71%) dairy farms were used grazing and stall feeding. In contrary to this, 18(13.04%), 68(69.39%) and 2(28.57%) of dairy producers in SSDF, MSDF and LSDF used hay respectively. In addition, 30(30.61%), 5(71.43%) MSDF and LSDF respectively purchased feeds from different sources. The rest use road side grazing and own feed resources (Table 5).

The infertility problems of interviewed dairy owners a total of 384 cross breed and 266 indigenous dairy cows were examined for infertility problems by classifying the method of study as questionnaire survey. In the questionnaire survey 178 (50.71%) and 173 (49.29%) of infertility problems in indigenous & crossbred cows respectively were recorded.

Owner of 384 cross breed cows were questioned for major infertility problems and found 29 (8.73%) post partum anoestrus, 46 (13.85%) retained fetal membrane, 16 (4.82%) abortion, 32 (9.63%) dystocia, 13 (3.91%) clinical endometritis and 26 (7.83%) repeat breeder. In addition 266 indigenous dairy cows owners were questioned for infertility problems by classifying the method of study as questionnaire survey and found 54 (16.27%) post partum anoestrus, 15 (4.51%) retained fetal membrane, 27 (8.13%) abortion, 20 (6.02%) dystocia, 7 (2.10%) clinical endometritis and 47 (14.15%) repeat breeder (Table 6).

DISCUSSION

Infertility in indigenous and crossbred cows was the major cause of economic loss for dairy farming. Out of 650 cows during this study 351 (54%) cows were found with one of the infertility problems. The result agrees with Desalegn (2000) reported in Ada district zone 56.5%, 62% (Ebrahim, 2003) and 43.7%, (Molalegene and Shiv, 2011) around in district Bedelle, similar incidence were reported (Shiferaw *et al*., 2005) 39% in central highlands of Ethiopia which have the same environmental condition with that of Gondar. On the contrary Gebremariam (1996) in Mekelle reported 29.1%. Emebet and Zeleke (2008) in Dire Dawa 30.8%, 26.7% in Kombolcha, Haftu and Gashaw (2009) 21.6% in Yimer (2005) which is 39.9% in Woliso which were lower than in the present study this could be probably due to environmental conditions which was different from that of Gondar.

The significantly higher incidence of infertility problems encountered in crossbred cows 59.6% than in indigenous zebu52.6% which may be due to the fact that European cross breeds are less adapted to tropical conditions, diseases and low feed quality than zebu cattle Mugerwa (1989) making them more susceptible than indigenous zebu. Another reason may also be due to the fact that, cross breeds require more elaborated management, feeding and better health care than the indigenous zebu to get better fertility and productivity in the tropics (Takele *et al*., 2005).

Detailed research has illustrated that some of the pathophysiological pathways explaining the association between the increase in milk production and the decrease infertility. It has been reported that production levels go along with a deeper and more prolonged negative energy balance as can be measured by lowered levels of glucose, insulin growth factor 1 and insulin, and elevated levels of metabolites like ketone bodies and urea. As most of these metabolites are able to reach the ovaries and affect several cell types and hence negatively influence fertility (Sheldon, 2004).

Contrary to the widely accepted profile of declining fertility, Wischral *et al*. (2001) suggested that declining herd fertility has been happening only in some farms but not in all. The latter reflects a significant herd variation in the occurrence of risk factors for reduced fertility, and proves that acceptable fertility performances are still feasible even in herds with very high productions.

In the present study, multiparous cows 60.15% emaciated cows 60.00% and cows above 6 years of age 62.73% were the most affected by infertility problems which is higher than the previous finding by Takele *et al*. (2005)that were recorded 19.23% in and around Nazareth town. This could be due to the repeated exposure of the genital tract of multiparous cows to environmental pathogenic microorganisms then causing gradual decrease in the efficiency of immune mechanism due to ageing.

CONCLUSION

Most of the dairy farms from in SSDF, MSDF and LSDF, had fallen below satisfactory or poor farm

hygiene. This was due to lack of sufficient space in the compound and inadequate knowledge about hygienic management. Across all the dairy farm scale there is a problem of infertility, therefore it has a critical influence on dairy cattle production in the area.

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