Major Reproductive Health and Productive Problems of Dairy Cattle in Selected Dairy Farms in Bishoftu, Central Ethiopia

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Abstract: This study was conducted with the objectives of identifying major productive and reproductive problems of dairy cows in four farms in Bishoftu, Central Ethiopia. A total of 153 dairy cows were studied, out of which, 40.5% (n=62) were affected by at least one of productive and reproductive problems. Overall abortion, dystocia and retained foetal membrane were found with prevalence of 10.9%, 9.3%, and 48%, respectively. The prevalence of retained foetal membrane showed very highly significant difference among the farms studied (P<0.001) whereas the occurrence of abortion and dystocia showed no statistically significant association with farms (P>0.05). Milk yield per lactation ranges from 515 to 7210 litres at Almaz farm and at Genesis farms respectively. The difference in milk yield among the farms studied was very highly significant and the maximum yield at Almaz farm is lower than the minimum yield recorded at other farms. Similarly the mean number of service per conception, parity, mean number of calves per cow and the age of cows kept on the farms were found to vary significantly while the difference in calving interval was shown to be marginal (P=0.07). Linear regression analysis showed that only farms and retained foetal membrane are factors affecting milk yield. In general, there is great variation in reproductive and productive parameters among dairy cattle raised in different farms showing the need for further improvement.

Keywords: Dairy cattle, Reproductive problems, Productive Parameters, Bishoftu, Ethiopia

Introduction

Livestock are vital sources of economic and social support for millions of people in Ethiopia. However, their productivity is low due to a number of constraints. The major ones include diseases, nutrition, poor management and lower genetic potential of indigenous breeds. These constraints result in poor productive and reproductive performances particularly of dairy cattle (Lobago *et al*., 2006). Reproductive and production disorders (PD) of dairy cattle significantly reduce their productivity which is of great concern for dairy producers worldwide because most reproductive disorders (RD) adversely affect the future fertility. Ten to 30% of lactations may be affected by infertility and RD (Erb and Martin, 1980), and 3-6% of the herd is culled annually for these reasons.

The major problems that have direct impact on reproductive performance of dairy cattle are abortion, dystocia, retention of foetal membrane, mastitis, prolapses (uterine and/or vagina), anoestrus and repeat breeders (Shiferaw *et al*., 2005). These results in considerable economic loss to the dairy industry due to slower uterine involution, reduced reproductive rate, prolonged inter-conception and calving interval, negative effect on fertility, increased cost of medication, drop in milk production, reduced calf crop,/reduced survival of new born and early depreciation of potentially used cows (Lobago *et al*.,

2006). It has been also reported that reproductive disorders are responsible for remarkable economic losses to the dairy farmers (Gebremariam, 1996). In addition to abortion and other RD, the causes of infertility are many and can be complex. It is very difficult to diagnose the problem by one particular disorder or symptom because there is interrelation between predisposing factors (Gizaw *et al*., 2007) such as management at caving, hygiene and parity, stage of gestation, nutrition and environment (Tackacs *et al*., 1990; Msangi *et al*., 2005).

Although productive and reproductive disorders are known to cause great economic loss in dairy cows, the research undertaken on the occurrence, prevalence and relative importance of these problems are very few in Ethiopia. The Ethiopian government has designed livestock development master plans, focusing on increasing the off take of young stock and support the growth of market oriented smallholder dairy production (Mohammed *et al*., 2004). This needs large scale upgrading of the genetic potential of indigenous stock through cross-breeding for milk. The success of dairy improvement plan, particularly distribution of improved dairy cattle to smallholder farmers and transforming them to market oriented premises in addition to the large commercial farms could be set back due to productive and reproductive problems. An inventory and identification of the major reproductive and

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productive problems of dairy cattle is an important pre-requisite to understand their distribution and magnitude. So, this study was designed to investigate the magnitude of major reproductive disorders in dairy cattle in Bishoftu.

Materials and Methods
Study Area
This study was conducted in Bishoftu town which is located 47 km South East of Addis Ababa, Ethiopia (figure 1). The town lies between 9°N latitude and 40°E longitudes and has an altitude of 1950 m above sea level. The rainfall of the area is bimodal with an annual rainfall of 1151.6 mm of which 84% falls during the long rainy season spanning from June to September and the remaining in the short rainy season extending from March to May. The dry season extended from October to February. The mean maximum and minimum temperature of the area are 34.7 and 8.5°C, respectively, and mean relative humidity is 61.3%. Mixed farming system is widely practiced in the area, crop and livestock production are an integral part of agriculture in the area. Bishoftu is one of the dairy sheds of the Capital, Addis Ababa.

Figure 1: Map of Ethiopia showing the location of study area.

Study Design and Study Animals
In this study no predetermined sample size determination was done since the study design employed was retrospective study. Those dairy farms whose owners were voluntary to provide recorded data were selected and included in this study to identify the major reproductive and productive problems of cows. Four dairy farms were conveniently selected for this study. These include Almaz dairy farm, Bishoftu Agricultural Research Center dairy farm (BARC), Genesis dairy farm and GGK dairy farms. Both Holstein-Friesian and cross breed dairy cows which are kept on the selected farms were included. Calves and heifers were not included in this study. Data were collected on individual cow level about the major reproductive and productive problems from farm records. A total of 153 dairy cows (38 from GGK farm, 30 from BARC, 64 from Genesis and 21 from Almaz farms) were included in the study. Even though all the four farms are commercial type, the animals are raised under different management levels.

Data Analysis
The data were entered into MS Excel for storage and analysis the data was carried out using R version 3.0.2 (2013-09-25) and STATA version 11 statistical packages. Both descriptive and analytical statistical techniques were used during the analysis. The association among categorical variables such as farms and reproductive parameters like dystocia, RFM and calf mortality were analysed by using descriptive statistics such as χ^2 (Chi-square). The occurrence of association among continuous variables was analysed by using one way analysis of variance (ANOVA). The effect of a number of factors on milk yield was assessed using linear regression analysis. In all cases, P-value < 0.05 was considered to be statistically significant.

Results
Overall milk yield per lactation ranges from 515 to 7210 litres at Almaz and Genesis farms respectively, with mean value of 2972 litres. The median milk yield per lactation in was found to be 2978 litres. The milk yield was observed to vary among the farms significantly (P=0.0000). The maximum milk yield per lactation at Almaz farm was significantly lower than the minimum milk yield per lactation at all other farms (Table 1). On average the number of service per conception in present studies among farms was oscillated from 1.15 -2.87 with overall mean of 2.1. It was lower at BARC and Genesis and higher at Almaz and GKK farms and this difference was very highly significant (P<0.001). The parity of the studied cows was lowest at BARC and Almaz but higher at Genesis and GGK farms showing very highly significant variation among farms (P<0.001). The number calves per cow was low at Almaz and BARC while it was higher at Genesis and GGK farms showing highly significant difference (P=0.0039). On the other hand, the cows at Almaz farm were significantly younger (P<0.001) than cows at other farms. Cows raised at Genesis were significantly older than cows kept on other farms while the age of cows on BARC and GGK farms was similar. With regards to calving interval (CI), the deference among the farms was only marginally significant (P=0.0700). Like the other productive parameters, Genesis and GGK farms had better record for CI than Almaz and BARC farms.

Out of the 153 dairy cattle included in this study, 62 (40.5%) had either one or more of reproductive

problems such as dystocia, RFM and abortion. There was no statistically significant difference in the prevalence of dystocia and abortion. The prevalence of RFM on the other hand was shown to be very highly significant ($P<0.001$). Higher proportion of animals raised at Genesis and GGK farms had history of RFM than cows raised on Almaz and BRC farms (Table 1).

The results of linear regression showed that farms and RFM were important factors that affect milk yield. Being at BARC was shown to increase milk yield per lactation by 1258.518 litres on average while being at Genesis and GGK farms will increase the milk yield by 2633.653 and 2396.046 litres, respectively (Table 2). The results of the regression output showed that the occurrence of RFM increases milk yield but this could be due to multi co-linearity among the risk factors.

Table 1: Occurrence of various productive and reproductive problems in dairy cows in four farms in Bishoftu, Central Ethiopia

Variables	Farms				F/x^2	$P>F$
	ALMAZ	**BARC**	**GENESIS**	**GGK**		
Min. milk yield/lactation	515	1564	1495	2310	-	-
Mean milk yield/lactation	935.9	2124	3828	3379	**76.79**	**0.0000**
Max. Milk yield/lactation	1470	2955	7210	5465	-	-
Mean N^0 service/conception	2.772727	1.152333	1.603906	2.868	**53.22**	**0.0000**
Mean N^0 calves/cow	1.772727	1.700000	2.531250	2.026	**4.65**	**0.0039**
Average parity	1.772727	1.700000	2.718750	2.053	**8.06**	**0.0001**
Mean age	4.181818	4.766667	6.171875	4.711	**12.67**	**0.0000**
Calf mortality (%)	0.045	0.10	0.17	0.079	-	-
Mean CI in months	14.92	14.79	12.77	11.64	2.40	0.0700
Abortion%	0.045	0.067	0.109	0.079	1.085	0.781
RFM%	0.091	0.067	0.48	0.13	**29.12**	**0.000**
Dystocia%	0.045	0.033	0.093	0.052	1.601	0.659

Table 2: Results of linear regression analysis of milk yield over the risk factors

Parameters	Estimate	Std. Error	t value	Pr (>|t|)
(Intercept)	678.299	456.987	1.484	0.14001
Farm BARC	1258.518	553.107	2.275	0.02443 *
Farm GENESIS	2633.653	251.672	10.465	< 2e-16 ***
FarmGGK	2396.046	220.561	10.863	< 2e-16 ***
CI	1.042	14.265	0.073	0.94189
Breed	27.966	307.515	0.091	0.92767
Parity	103.102	91.180	1.131	0.26012
AverageNSPC	34.814	101.543	0.343	0.73224
Abortion	-404.584	258.021	-1.568	0.11916 Dystocia
	-171.255	279.353	-0.613	0.54086
RFM	599.890	189.329	3.169	0.00189 **
Mastitis	-168.195	159.163	-1.057	0.29247
Lameness	-451.223	242.479	-1.861	0.06489
MF	179.817	306.864	0.586	0.55884
Acidosis	367.228	267.710	-1.372	0.17237
NumDead	58.798	83.687	0.703	0.48349

***=very highly significant, **=highly significant, *=significant

Discussion
Overall the milk yield ranges from 515litres per lactation to 7210litres with mean of 2972 litres. The milk yield was highest at Genesis farm and lowest at Almaz farm. The mean milk yield recorded in this study is higher than the results of (Moges, 2011) who

had reported milk yield of 382.86 L per cow per month but it is lower than the reports of Sutradhar *et al*. (2008) which was 4384 litres of per lactation in Zimbabwe, Ajili *et al*. (2007) who reported milk yield of 5905 L per cow per lactation in Tunisia. However when taken separately, the total milk yield

recorded at Genesis in this study is higher than the milk yield reported by those authors. Similarly the total milk yield recorded at GGK farm is higher those reports but the milk yield per cow per lactation at Almaz and BARC is lower than the milk yield published in literature. This tells that there is better management at Genesis and GGK farms compared to the other farms. The significant difference obtained by both univariable and multivariable analysis supports this notion. There is lack of standard management practices across the farms and this had contributed to the variation in the total milk yield obtained per cow per lactation. This was clearly shown by the linear regression analysis in which Farm was found to be the most important factor affecting milk yield notwithstanding the effect of multi co-linearity among the factors included.

The results of our study showed that the mean calving interval was longest (14.92 months) at Almaz farm followed by BARC (14.79 months) while it was shorter at GGK (11.64 months) and Genesis (12.77 months) farms. This variation was marginally significant ($F=2.40$, $P= 0.07$). This result agrees with the reports of (Moges, 2011) who had observed mean CI of 447.77 days (14.92 months) and the reports of Tadesse *et al.*(2010)who recorded mean CI of 445 days. The average calving interval recorded at GGK and Genesis farms is in agreement with the calving interval that was considered economically profitable (12.17months)(Jaindudeen and Hafeez, 2001).On the other hand the CI recorded at Almaz and BARC farms was longer than the acceptable level indicating the need to improve. The length of calving interval has been shown to directly influence the average months in milk and total milk production. It has been shown to correlate with milk yield and as calving intervals increase, the average milk yield of the herd decreases (Senger, 1994).

The number of service per conception was observed to vary significantly among the farms studied. The minimum was recorded at Genesis while highest value was recorded at Almaz and GGK farms. The number of service per conception observed at Almaz and GGK is higher than the reports of Alberro (1993) and that of Tadesse *et al.* (2010) in Ethiopia. However, the number of service per conception observed at BARC and Genesis is comparable to the earlier reports (Bekana *et al.,* 1994) and that of (Tesfaye, 2012).The number of service per conception is one of the indicators of economic profitability in dairy farms. The higher variation in these parameters among the farms reveals the lack of standard in management of dairy cattle and the need for improvement. In agreement with this observation we noted that the number of calves per cows was low

in farms with higher number of service per conception as shown in Table 1.

From 153 dairy cattle studied, 40.5% (n=62) were found with at least one or more of reproductive problems. This is significant for countries like Ethiopia in which the people depend on livestock for their livelihood. In consent to this observation, Dawit and Ahmed (2013) reported similar proportion of dairy cattle having reproductive problems at Kombolcha. This implies that reproductive problems are prevalent among dairy cattle across the country. The prevalence of reproductive problems reported in this study was, however, higher than that of a Gizaw *et al*. (2007) and Bitew and Prased (2011) who reported an overall prevalence of 31.76%and 26.5%, respectively. This variation in prevalence may be due to environmental factor, breeds of the animals and variation in management system that is applied in different dairy farms.

Nevertheless, reproductive problems in dairy cattle seem to be wide spread and profitability and productivity of diary sector can be hampered if these problems were not controlled (Nelson *et al*., 2000). It has been shown that the level of reproductive performance is affected by reproductive disorders that often lead to premature culling, which could cause increased replacement rates (Lobago *et al.*, 2006). In this study the number of parity and average age of cows on Almaz farm is significantly lower than the other farms. The number of calves per cows was also lower on this farm. This shows high turnover of cows due to culling and replacement. This might have ultimately contributed to the lower milk yield observed on this farm and in general it conforms to the previous observations made in Ethiopia and elsewhere.

The occurrence of abortion, RFM and dystocia recorded on Genesis and GGK farm was higher than that is observed on Almaz and BARC farms. This could be due to the cumulative effects of age and parity. Animals raised on Genesis and GGK farms had higher age and parity than animals kept on Almaz and BARC farms. This might have increased the incidence of the reproductive problems during the life time of the animals. The prevalence of abortion observed in this study is higher than the prevalence reported by Tesfaye (2012), Gadisa (2008) and Asamenew (2005). Forar *et al.*(1995) had reported the occurrence of abortion ranging from 0.4-10.6% in consent to our finding, suggesting breed, geographic and study population differences as a source of differences. The abortion observed in our study is higher than the acceptable level published for dairy cattle, which is 2-5% showing the seriousness of the problem in the study area. The higher prevalence of

abortion warrant further investigation for diseases that cause abortion in the area.

Similarly the prevalence of RFM documented in this study is variable and agrees well with the reports of various authors in different parts of Ethiopia (Gashaw, *et al.*, 2011; Haile *et al.*, 2010; Dufera, 2006; Gizaw, 2005; Tesfaye, 2012). According to Paisely *et al.* (1986) the incidence of RFM is quite variable ranging from 1.96 - 55%. The variability observed in the prevalence of RFM in this study is in support of the published data and falls within the published range. Various factors have been incriminated for the variability in the occurrence of RFM among dairy cattle. These include dystocia, abortion, nutritional deficiencies, management system, season of the year and geographic areas (Markusfeld, 1993). In this study the occurrence of both RFM and factors such as abortion and dystocia shown to vary even though the variation in the occurrence of abortion and dystocia was not statistically significant. The proportion of animals experiencing dystocia reported in this study agrees with the reports of Tesfaye (2012) and Worku (2004).

In conclusion the results of this study showed that there are variations in the occurrence of productive problems among the farms studied indicating the existence of variable level of management among them. This clearly shows the lack of standard dairy management practices.

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