

Study on Reproductive Performance of Indigenous Dairy Cows at Small Holder Farm Conditions in and Around Maksegnit Town

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Abstract: A study was conducted to assess reproductive performances of 384 indigenous dairy cows kept in small scale dairy production system; dairy farm owners were randomly selected and interviewed with structured questionnaire to obtain information on the reproductive performance of cows in and around Maksegnit town from October 2013 to April 2014. The mean age at first service (AFS) was 36.7 ± 3.8 months, the mean age at first calving (AFC) was 39.8 ± 5.6 months, number of services per conception (NSPC) was 2.0 ± 0.65 , the mean of days open (DO) was 86.5 ± 4.5 days and calving interval (CI) was 14.58 ± 0.56 months, age at puberty was 32.8 ± 4.5 months for indigenous dairy cows. The present study suggested that the reproductive performance of dairy cows under small holder management condition is very poor and it is, so far, not possible to attain optimum values set for profitable dairying in and around Maksegnit town. Thus, strong extension work is needed to educate farmers in the study area and create awareness about the importance of developing the dairy sector.

Key words: Dairy Cows • Indigenous • Maksegnit • Reproductive Performance

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. This livestock sector has been contributing considerable portion to the economy of the country and still promising to rally round the economic development of the country. The total cattle population for the country is estimated to be about 53.99 million. Out of this the female cattle constitute about 55.48% and the remaining 44.52% are male cattle and 98.95% of the total cattle in the country are local breeds and remaining are hybrid and exotic breeds that accounted for about 0.94% and 0.1%, respectively Central Statistical Agency [1].

Despite the largest cattle population, productive and reproductive performance is very low. Feed shortage (both in terms of quantity and quality), lack of access to land, disease prevalence, low level of management, lack of proper breeding management such as lack of accurate heat detection and timely insemination might have contributed considerably to long days open (postpartum anestrous), late age at first calving, long calving interval, short lactation length and low milk production [2].

The reproductive performance of the breeding female is probably the single most important factor that is a prerequisite for sustainable dairy production system and influencing the productivity. Number of services per conception, days opens till conception and calving interval are important reproductive traits which are crucial for determining the profitability of dairy production. Currently, a large number of smallholder dairy farms are operating in the study area. However, information on productive and reproductive performance of indigenous dairy cows in the study area is limited. Most of the research conducted has been for cross breed cows under relatively controlled conditions at research centers and government-owned institutions and thus has limited application to different production systems in Africa [3]. The present investigation was undertaken to study the effects of management factors on DO, CI, age at puberty, age at first calving, age at first service and NSPC in indigenous cattle maintained in small dairy units under farmer's management located in and around Maksegnit town with an objective to identify the effects of the management factors in optimizing their reproductive efficiency and thus, economic milk production. The objectives of this study are: To assess the

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reproductive performance of indigenous dairy cows at small holder condition in that particular area and to identify the risk factors involved in poor reproductive performance of indigenous dairy cows under small holder farm condition.

MATERIALS AND METHODS

Study Area: The study was conducted in and around Maksegnit town which is located North Gondar in Amhara regional state. The area located at latitude, longitude and altitude of 12.3-13.8°N, 35.3-35.7°E and 2220 m.a.s.l respectively with 1172mm mean annual rain fall and 19.7°C average annual temperature. According to zonal agricultural office the livestock Population is registered as cattle 78,123, sheep 20, 567, goat 21,515 and equine 9,821 [4].

Study Animals and Study Protocol: A total of 384 animals (indigenous dairy cows) in smallholder dairy farms were selected randomly from Maksegnit town and the surrounding areas from October 2013 to April 2014. A questionnaire survey was carried out across the farms and data collection questionnaire format was developed and used. The selected farms were visited and reproductive performances of 384 indigenous dairy cows were studied. A structured questionnaire were used to record data on general farm conditions, reproductive performance parameters like age at first service (AFS), age at first calving (AFC), calving interval (CI), days open (DO), number of services per conception (NSPC) and other related information. The data were obtained from records, farm owner interviews and personal observations.

Study Design and Sample Size Determination: A questionnaire survey was carried out across the farms and then pre-designed structured questionnaires were developed, tested and administered to farm owners and attendants of all farms considered for the study. The sampling was determined by the formula given by Thursfield [5].

$$n = \frac{1.96^2 \times P_{\text{exp}} (1 - P_{\text{exp}})}{d^2}$$

where

n = Required sample size
P_{exp} = Expected prevalence

d² = Desired absolute precision (0.05)

Therefore, sample size is 384.

Data Management and Analysis: Every data collected through questionnaire interviews as well as personal observation were recorded on Microsoft excel work sheet, data were analyzed using descriptive statistics.

RESULT

Management System: From management point of view housing system of the cows was average (47.8%). 19.3% of the cows in the study were stall feed and 37.2% and 42.7% were feed on stall/grazing land and on the pasture respectively.

According to the study 19.0% of the cows get water once a day and 64.8% of the cows have access to water twice a day, the remaining 16.1% fulfill the water requirement from the river. Farmers in the study have used different method of service for their dairy cows. 18.8% of the farmers used artificial insemination as method of service and 69.0% of the farmers used bull. The remaining 12.2% have used both artificial insemination and bull (natural mating) as a method of service for their cows.

The study showed that only 19.8% of the farmers have practiced regular deworming, the remaining 79.8% had not practiced regular deworming for their cows. Only 18.2% of the famers had kept record of their cows. However, most of the farmers (81.8%) in the study had no any record keeping practice about their cows. As the present study showed most of the farmers (86.2%) managed their cattle health problem by taking to local clinic. However, few of the farmers (13.8%) managed their cattle health problem by taking to traditional healer. Regarding the culling practice the study showed that only 1.6% off the farmers had practiced culling of their dairy cows for a variety of reasons. But, the large number of the farmers (98.4%) in this study had not practiced culling of their dairy cattle.

Day's Open and Calving Interval: The overall Least Squares Means for DO in indigenous dairy cows included in this study was 86.5±4.5 estimated to be days. The overall Least Squares Means for CI in indigenous cows, included in this study was estimated to be 14.58±0.56.

Age at First Calving and NSPC: The overall least squares means for age at fist calving in indigenous dairy cows was estimated to be 39.8±5.6. The overall Least Squares Means for NSPC in the present study was 2.0±0.65.

Table 1: Summary of the general management practices observed under the study.

Management systems	Evaluations	Percentage
Housing system	Poor	20.3%
	Average	47.7%
	Good	32.0%
Feeding system	Stall	19.3%
	Grazing land	37.2%
	Stall/grazing land	42.7%
Watering system	Once a day	19.0%
	Twice a day	64.8%
	Drinking from the river	16.1%
Method of service	AI	18.8%
	Bull	69.0%
	Both	12.2%
Regular deworming	Yes	19.8%
	No	79.9%
Record about the cow	Yes	18.2%
	No	81.8%
Management of cattle health problem	Taking to Vet. Clinic	86.2%
	Taking to traditional healer	13.8%
Culling practice	Yes	1.6%
	No	98.4%

Table 2: Summary of least square means of the reproductive traits

Parameters	Over all mean (N=384)
Number of services per conception	2.0±0.65
Calving interval(months)	14.58±0.56
Days open(days)	86.5±4.5
Age at first calving(months)	39.8±5.6
Age at first service(months)	36.7±3.8
Age at puberty(months)	32.8±4.5

Age at First Service and Age at Puberty: The overall Least Squares Means for AFS in indigenous cows, included in this study was estimated to be 36.7±3.8. The overall least squares means for age at puberty in indigenous dairy cows was estimated to be 32.8±4.5.

DISCUSSIONS

The findings of estimated DO was higher than 85.6±5.6 days reported in Asella town, Oromia regional state, Ethiopia and 2.9±3.7 months reported in crossbred cattle in and around Gondar, North Western Ethiopia [6]. Shorter DO of 68±1.72 days reported in dairy cows in urban and peri-urban dairy production system of Addis Ababa milk-shade Bekele *et al.* [7] and 19±1.72 months in Zebu X Holstein-Friesian crossbred dairy cows in Jimma Town, Oromia, Ethiopia [8]. Feed shortage, silent estrus and lack of proper heat detection might be contributory factors for long DO reported in this study. As reported by Belay *et al.* [9] in North, Gondar Zone Amhara regional state the overall Least Squares Means for DO in indigenous cows was estimated to be 86.4 which was smaller from the present study.

The overall Least Squares Means for CI in indigenous dairy cows was estimated to be 400.03±6.34 days Belay *et al.* [9] in North, Gondar Zone Amhara regional state. The present study was higher than this report. The estimate of CI was higher than the optimum values desirable for profitable milk production. CI of 12 months is usually considered ideal for profitable milk production. Therefore, the CI, as seen in this study (14.58±0.56), suggested a large need for future improvement. Higher CI of 372.8 days reported in Asella town, Oromia regional state, Ethiopia Bekele *et al.* [10]; Shiferaw *et al.* [11] and 13.4±5.1 months in crossbred cattle in and around Gondar, North Western Ethiopia [6]. This estimated CI in this study was less than 21.36±3.84 months in Zebu X Holstein-Friesian (HF) crossbred dairy cows in Jimma Town, Oromia, Ethiopia [10, 11]. 487 days in crossbred dairy cows in different production systems in the central Highlands of Ethiopia ; 552 Hunduma [8] days in Boran cattle and their Friesian crosses at Abernossa Ranch, Ethiopia Haile-mariam *et al.* [12] and 475 days in crossbred cattle in Central Ethiopia [10, 11]. Feed shortage, silent estrus and lack of proper heat detection might have been contributory factors for long CI reported in this study.

Number of service per conception depends largely on the breeding system used. It is higher under uncontrolled natural breeding than hand-mating and artificial insemination [6]. The overall Least Squares Means for NSPC in North, Gondar Zone was 1.8±0.3 Belay *et al.* [9]. Number of services per conception higher than 2.0 should be considered as poor [13] The number of service per conception revealed in the present study was (2.0±0.65) which is far from 1.62 as reported from central highlands of Ethiopia Bekele *et al.* [10]; Shiferaw *et al.* [11], 1.67 as reported from mid Rift valley of Ethiopia Yifat *et al.* [14] and 1.61 as reported from Abernossa Ranch [12]. At the same time, the result was slightly higher than 2.0 numbers of services per conception as reported for cows at Asella Livestock farm [10, 11]. In the study area number of service per conception may be affected by time of insemination, lactation length, proper heat detection and milk yield's which could be probably due to the level of knowledge of owners in managing their dairy cows.

The beginning of productive life of the heifer is called age at first calving. The overall estimated average age at first calving was found to be 39.8±5.6 months. The age at first calving in the study area was smaller from studies on Boran cattle type which was 45.5 months according to [15].

The mean AFS in the present study was 36.7 ± 3.8 months. It was reported in crossbred cows under smallholder conditions in Asella town, Oromia regional state, Ethiopia Hunduma, [8]; 24.30 ± 8.01 months reported in Zebu and Holstein- Friesian crossbred dairy cows in Jimma town, Ethiopia Belay *et al.* [9] and 25.6 months reported in crossbred and local cows in Dire Dawa, Eastern Lowlands of Ethiopia [16]. The mean AFS revealed in this study is shorter than the mean of 36.8 ± 0.8 months reported in Fogera and Friesian crosses in Andassa ranch, Northwestern Ethiopia Gebeyehu *et al.* [17] and 29.6 months reported in central highlands of Ethiopia [18]. Larger mean AFS is recorded as 39.4 months reported in Crossbred Dairy Cows under Small Holder Conditions in and Around Gondar, North Western Ethiopia Moges [6]; 20.1 months reported in the Addis Ababa Yoseph [18]; 23.2 months reported in Gondar city of Ethiopia Nuraddis *et al.* [19] and 21.7 months reported in crossbred of Fulami and Holstein-Friesian breed in Nigeria [20].

Age at puberty of the indigenous dairy cows in this study (32.8 ± 4.5 months) was comparatively higher than the age at puberty of Shahiwal and Holstein which was 25.9 ± 1.1 , 18.0 ± 0.0 , months, as reported by Mohiuddin [21] respectively. These findings were agreed with Kollalpituya *et al.* [22] who found the age at puberty ranging from 24 months to over 2 years.

CONCLUSION AND RECOMMENDATIONS

Reproductive performance of dairy cows in the recent study was found to be less than the optimum values desirable for profitable milk production. Reproductive performance of indigenous dairy cows owned by smallholder dairy producers in and around Maksegnit town was not found to be promising considering the management situation and limited supplemental feed utilized in the area. On the basis of the finding management system was very limited. The recent study showed that the management practices of the farmers in the study area such as, feeding, deworming and method of services used were almost poor. Most of the cows in that study area were reared extensively on grazing pasture land without any supplementary nutrition. Even though most of the cows in the study area get water twice a day, they had no access to clean water. Farmers in this recent study had poor record keeping and culling practice. The indigenous dairy cows in the study area had longer DO and CI compared to other reports in the country. Feed shortage, poor management, lack of accurate heat detection and timely insemination, lack of proper breeding

strategies are the most probable causes of poor reproductive performance. As the study showed indigenous dairy cows had larger AFS, AFC, NSPC and age at puberty than other reports in the country. This was mainly due to poor management practice of farmers in the study area. Generally, poor management practices, such as lack of access to clean water, poor record keeping, poor ability to deworm and lack of supplementary nutrition may be contributory factors for larger AFS, AFC, DO, CI and age at puberty. Among the management practices extensive grazing system in which cows are allowed to graze on pasture land had a great devastating effect for poor reproductive performance of dairy cows in the recent study area. The large number of NSPC is an indication of repeat breeding problem in that area. Based on the above conclusion the following recommendations were forwarded.

- ▶ Strategies should be designed to develop the dairy sector by taking into account the existing production characteristics of the area and should focus on a systematic approach to formulation and implementation of appropriate plan.
- ▶ Training and awareness creation should be given particularly to the farmers to increase the reproductive performance of the dairy cattle and livelihood of the dairy farmers through improved management practices and farmers should be given training by experts, how to keep record of their cows, how to deworm their cattle and how to cull their dairy cows.
- ▶ Governmental, non-governmental and livestock rearing community should work together to increase reproductive performance and productivity of livestock.
- ▶ Strong extension service and training of farmers in breeding, feeding, health care, forage development and housing should be given.
- ▶ A sustainable extension service should be established in order to improve animal feed resources management, efficient artificial insemination service and animal health care to bridge the existing gaps.

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