

## Study on Reproductive Performance of Crossbred Dairy Cows under Small Holder Conditions in and Around Gondar, North Western Ethiopia

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**Abstract:** A study was conducted to assess reproductive performances of 384 crossbred (Holstein Friesian x Zebu) 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 north western Ethiopia from September 2011 to July 2012. Retrospective survey was conducted across the small holders and data was collected on the reproductive performance of dairy cows in the system. The mean age at first service (AFS) was  $15.4 \pm 5.1$  months, the mean age at first calving (AFC) was  $32.4 \pm 0.7$  months, Number of services per conception (NSPC) was  $1.3 \pm 0.6$ , the mean of days open till conception (DOC) was  $2.9 \pm 3.7$  months, gestation length (GL) was  $276.6 \pm 0.6$  days and calving interval (CI) was  $13.4 \pm 5.1$  months for cross bred cows. The present study suggest that the reproductive performance of Friesian zebu crosses under smallholder management condition is very poor and it is, so far, not possible to attain optimum values set for profitable dairying in Gondar town was very low. Thus, strong extension work is needed to educate farmers in the region and create awareness about the importance of developing the dairy sector.

**Key words:** Gondar % Dairy Cows % Smallholder % Reproductive Performance % Crossbred.

### INTRODUCTION

Ethiopia is known for its huge cattle population. However, the country's per capita milk consumption is estimated to be about 19.2kg per year, which is far below the average per capita consumption of Africa, 37.2kg per year [1]. This low per capita milk consumption is mainly emanated from poor genetic potential of local cattle for dairy traits. Accordingly, enormous efforts have been made to improve the genetic potential of local cattle through cross breeding with exotic breeds, mainly Holstein Friesian. The productivity of cattle depends largely on their reproductive performance.

In Ethiopia, crossbred cattle mainly cross of zebu with Holstein- Friesian cattle have been used for milk production for decades. Accurate evaluation of the performance of crossbreds contributes much to the development of appropriate breeding strategies. One measure of productivity is reproductive performance. Reproductive performance is vital for the profitability of

many animal production systems. Especially, the economics of dairy enterprise is based on an efficient reproductive performance of dairy animals [2].

Among the main traits related to reproductive performance, age at first service (AFS), age at first calving (AFC), the interval between successive calving (CI), days open till conception (DOC) and gestation length (GL) are the bases for profitable dairy farming [3].

Thus, the current study was initiated to assess reproductive performance of crossbred (Holstein Friesian X Zebu) cows kept in smallholder condition.

### MATERIALS AND METHODS

**Study Area:** The study was conduct in urban and peri urban areas of Gondar which is located North West part of Ethiopia in Amhara regional state. The area located at latitude, longitude and altitude of  $12.3-13.8^{\circ}\text{N}$ ,  $35.3-35.7^{\circ}\text{E}$  and 2220 m.a.s.l respectively with 1172mm mean annual rain fall and  $19.7^{\circ}\text{C}$  average annual temperature.

According to zonal agricultural office the livestock population of Gondar 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 (dairy cows) in smallholder dairy farms were selected randomly from Gondar town and the surrounding areas from September 2011 to July 2012. Cross sectional survey was carried out across the farms and data collection questionnaire format was developed and used. Each farm owned 1-2 crossbred dairy cows. The selected farms were visited and reproductive performances of 384 crossbred dairy cows were studied. A structured questionnaire and follow up formats 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 cross-sectional 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. All cross bred dairy cows in the selected farms taken as a sample. The sampling was determined by the formula given by Thursfield [5]. Since there was no similar study done previously on the study area the expected prevalence was 50% with the confidence interval of 95% and 5% desired level of precision.

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

n = Required sample size  
P<sub>exp</sub> = Expected prevalence  
d = Desired absolute precision.

**Data Management and Analysis:** Every data collected through questionnaire interviews as well as personal observation was recorded on Microsoft excel work sheet, data were analyzed using descriptive statistics and by using P<sup>2</sup> (Chi-square) technique. A probability of p<0.05 was set as the significant level and the confidence interval (CI) was set at 95%. In all cases, the SPSS version 18 was used.

## RESULTS

**Reproductive Performance:** The overall mean for AFS and AFC across urban and peri-urban was 15.4 months (n=207) and 32.4 months (n=177) and statistically no difference (P<sup>2</sup> =4,861; p=0.080), (P<sup>2</sup>=5,266;p=0.090), respectively (Table 1). Cows in the study area were giving calves on average (12.9 months) in urban, (13.9 months) in peri-urban and there was statistically significant (P<sup>2</sup> =13,894; p=0.000) (Table 1). Conceive on average (2.47 months) after calving in urban and (3.33 months) in peri-urban areas of the study and statistically significant (P<sup>2</sup>=10,470; p=0.010) (Table 1). The average number of services required for each conception was 1.3, 1.5 in urban and peri urban areas, respectively and statistically

Table 1: Reproductive performance parameters of smallholder crossbred dairy cows in Gondar and its surrounding, Ethiopia.

| Parameters  | Production system | No  | Mean (SE)   | P <sup>2</sup> | p-value |
|-------------|-------------------|-----|-------------|----------------|---------|
| AFS, months | Urban             | 207 | 15.3(0.23)  | 4,861          | 0.080   |
|             | Peri-urban        | 177 | 15.5(0.24)  |                |         |
|             | Overall           | 384 | 15.4 (5.1)  |                |         |
| AFC, months | Urban             | 207 | 31.6(0.42)  | 5,266          | 0.090   |
|             | Peri-urban        | 177 | 33.2(0.71)  |                |         |
|             | Overall           | 384 | 32.4(0.16)  |                |         |
| DO, months  | Urban             | 207 | 2.47(0.9)   | 10,470         | 0.010   |
|             | Peri-urban        | 177 | 3.33(1.2)   |                |         |
|             | Overall           | 384 | 2.9(3.7)    |                |         |
| CI, months  | Urban             | 207 | 12.9(1.02)  | 13,894         | 0.000   |
|             | Peri-urban        | 177 | 13.9(1.17)  |                |         |
|             | Overall           | 384 | 13.4(5.1)   |                |         |
| GL,days     | Urban             | 207 | 276.6(0.08) | 4,977          | 0.097   |
|             | Peri-urban        | 177 | 276.6(0.07) |                |         |
|             | Overall           | 384 | 276.6(0.05) |                |         |
| NSPC        | Urban             | 207 | 1.3(0.02)   | 7,985          | 0.040   |
|             | Peri-urban        | 177 | 1.5(0.02)   |                |         |
|             | Overall           | 384 | 1.4(0.01)   |                |         |

No = number of observations, AFS= age at first service, AFC= age at first calving, DO= days open, CI= calving interval, GL= gestation length, NSPC= number of services per conception, SE=standard error, P<sup>2</sup>=Chi-square

significant ( $P^2=7,985$ ;  $p=0.040$ ) (Table 1). Cows in the study areas had an average gestation length of (276.6 days) both in urban and peri urban areas and statistically not significant ( $P^2=4,977$ ;  $p=0.097$ ) (Table 1).

## DISCUSSION

Results of the study revealed that the reproductive performance of crossbred cows was found to be low. Feed shortage, lack of access to land, disease prevalence, low level of management, poor breeding management such as lack of accurate heat detection and timely insemination might have contributed to poor reproductive performance.

Generally, the variation in reproductive performance among urban and peri-urban dairy cows may be due to management effects, including nutrition and health conditions. Small scale dairy cattle in and around Gondar, generally, were known to experience year round nutritional deficiencies.

The overall mean for AFS and AFC on reproductive performance of crossbred dairy cows under small scale dairy conditions in urban and peri-urban areas of Gondar was 15.4 months ( $n=384$ ) and 32.4 months ( $n=384$ ), respectively. These overall mean values for AFS and AFC obtained in this study were within the range reported by many authors on exotic and indigenous crosses. Estimates for AFC in Ethiopian cattle were reported to be longer for Zebu [6]. Similarly, in the work done in the central high lands and in Addis Ababa milk shed, the overall means for AFS and AFC were found to be 29.6 and 40.6 months Yoseph *et al.* [7] and 20.1 and 29.0 months by Yoseph [8], respectively. Kiwuwa *et al.* [9] reported mean AFC of 33.8 months with a range of 31.3 to 35.7 months for crosses of Friesian and Jersey sire breed with Zebu dams in the Arsi region of Ethiopia.

On the other hand, the finding of AFC in the present study was lower than 36.7 and 40.1 months estimated for crossbred dairy heifers in smallholder dairy farms in Malawi Agyemang and Nkhonjera [10] and 58.3 and 36.8 months reported for smallholder crossbred dairy heifers at two locations in Zimbabwe Masama *et al.* [11] and 40.6 months for crossbred dairy heifers in different dairy production systems in central highlands of Ethiopia [12].

In the present study DO was significantly shorter in cows kept in urban areas than in the peri-urban area. Similar finding was reported by Bekele *et al.* [13] and Shiferaw *et al.* [12]. This difference may be attributed to lack of feed supplementation in the peri-urban areas.

The significant difference of CI between urban and peri-urban areas obtained in the present study is in accordance with the previous reports Shiferaw *et al.* [12]; Obese *et al.* [14] but disagree with the report of Agyemang and Nkhonjera [10] who have reported no significant difference on the length of CI between smallholder crossbred dairy cows at different locations in Malawi, which may be due to management differences.

The overall mean value of NSPC was 1.4 ( $n=384$ ). Similar estimates were reported by other investigators in Ethiopia for crossbred cows, all in the range of 1.4 to 2.4 [15]. There was statistically significant difference in the NSPC; fewer NSPC was recorded in urban production system as compared to peri-urban production systems. This may be due to ease of close supervision and better heat detection by owners as the herd size is manageable. The mean age at first service was found to be  $24.30 \pm 8.01$  months [16].

## CONCLUSION

The dairy sector of the area is characterized by a small-scale subsistence milk production system and constrained mainly by low genetic potential of indigenous cows, disease prevalence and feed shortage. Thus, strategies designed to develop the dairy sector should take into account the existing production characteristics of the area and should focus on a systematic approach to alleviate the identified constraints by involving all stakeholders in the formulation and implementation of improvement strategies. Moreover, the emerging dairy cooperatives in the area should be encouraged and support should be provided to members of these cooperatives by the regional government or other concerned bodies.

Based on the above conclusion the following recommendations are forwarded:

- C The ongoing activities to improve and expand crossbred dairy cattle production at smallholder level in the study areas should be encouraged. Moreover, in line with this, a sustainable extension service to improve animal feed resources management and animal health care deserve due attention.

## ACKNOWLEDEMENTS

I would like to thank dairy farm owners for the great cooperation offered during the period of study.

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