

*Full Length Research Paper*

# A study of level of reproduction of crossbred dairy cows under smallholder condition in Ethiopia

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A study was carried out to assess the reproductive performance of crossbred dairy cows under smallholder conditions in Asella town, Oromia regional state, Ethiopia. A total of sixty crossbred dairy cow farmers that owned 3 to 5 cows were interviewed using a structured questionnaire to collect information on age at first service, age at first calving, days open and calving interval. Simultaneously, reproductive performances of 250 crossbred dairy cows of the selected farmers were studied. The overall estimated mean values for age at first service, age at first calving, calving interval, days open, and number of service per conception were  $24.9 \pm 3.8$  months,  $34.8 \pm 4$  months,  $372.8 \pm 5.9$  days,  $85.6 \pm 5.6$  days and  $1.52 \pm 0.9$ , respectively. In this study, 35% of the respondents' came across return rate after the first service in their crossbred dairy cows. In general, the overall observed reproductive performance of crossbred dairy cows was found to be promising considering the management situation and limited supplemental feed utilized in the area. Thus, 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.

**Key words:** Ethiopia, cattle, production, reproduction.

## 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, dairy industry is not developed as that of other east African countries such as Kenya, Uganda and Tanzania. 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 (EASE, 2003). Zebu (*Bos indicus*) cattle are multipurpose animals with low potential for meat and milk production which is estimated to meet only 35% of the human requirements (Landiver et al., 1985; Mukasa-Mugerewa, 1989).

In order to improve the low productivity of local cattle, selection of the most promising breeds and cross-breeding of these indigenous breed with high producing exotic cattle has been considered as a practical solution (Tadesse, 2002). The productivity of dairy cattle breeds

depends mainly on their reproductive performance and efficiency of service per conception. Reproductive performance is a characteristic of outstanding importance in dairy cattle business (Gabriel et al., 1983). Among reproductive performance traits: age at first service, number of service per-conception, calving interval, age at first calving, days open, first service per conception, gestation length, calving rate, non returning and returning rate of service are the bases of profitable production for dairy farm (Mukasa-Mugerewa, 1989). Crossbred dairy cattle (Arsi x Jersey) or (Arsi x Holstein-Friesian) is the most common breed in Arsi of Oromia region, Ethiopia, and are important sources of food and income, especially in urban area such as in Asella town.

Despite to this fact, their reproductive performances are not well documented and are relatively unknown. Therefore, the objective of this study was to determine the reproductive performance of crossbred dairy cows under smallholder condition in Asella town.

**Table 1.** Reproductive performance of crossbred dairy cows under smallholder condition in Asella Town.

Parameter	Over all mean (N=250)
Number of service per conception	1.52±0.9
Calving Interval (days)	372.8±5.9
Days open	85.6±5.6
Age at first calving (months)	34.8±4
Age at first service (months)	24.9±3.8

## MATERIALS AND METHODS

### Study area

This study was conducted in Asella town located in the Arsi zone of the Oromia region, Ethiopia. Asella town is characterized by mild sub-tropical weather with the maximum and minimum temperature ranging from 18 and 5°C, respectively around the year (Karc, 2008).

### Method of data collection and sources

#### Questionnaires survey method

Structured questionnaire was prepared and used to collect information from crossbred dairy cow owners (each of them having three to five crossbred cows) under smallholder condition in one visit interview and reproductive performance of their crossbred dairy cows were studied. The questionnaires were checked for clarity of the questions prior the interview. Prior the interview, respondents were briefed to the objective of the study. Following that, the actual questions and questionnaires were presented. Accordingly, information about the age at first calving, age at first service, days open, calving interval and number of service per conception were collected.

#### Sampling method

Among the total of seven "kebele's" (equivalent to Peasant Association) in the study area, four "kebele's" (Kombolcha, Burkett, Chilalo, and Areda) were selected based on their crossbred dairy cattle population, ease of access, feeds and feeding systems and other characteristics of herd management. Hence, a total of 60 (15 from each kebele) crossbred dairy cow owners under smallholder condition were randomly selected and addressed. Simultaneously, reproductive performances of 250 crossbred dairy cows of the selected farmers were studied.

### Data analysis

Descriptive statistics such as percentages, averages, frequency and standard deviations were used to summarize and present the results.

## RESULTS AND DISCUSSION

### Age at first service and age at first calving

As presented in Table 1, the mean age of heifers at first

service was 24.9 months (range 18 to 36 months) with the mean age at first calving of 34.8 months (range 27 to 46 months). Presented results are in concordance to the previous findings of Nuraddis et al. (2011), with 23.2 months in Gonder town, Mureda and Mekuriaw (2007) with 25.6 months of age at first service in Dire Dawa for other crossbreeds of exotic and local cattle, and Knudesen and Sohael (1970) with 21.7 months of age at first service for the Crossbreeds of Fulami and Holstein-Friesian breed in Nigeria. In addition, our results (34.8 months) for the age at first calving are in agreement with the report of Haile-mariam et al. (1993) and Yifat et al. (2009) who reported 32.7 and 31.9 months, respectively. On the contrary, this finding was slightly higher than 28.5 and 29.2 months of age as reported for crossbreeds of Jersey and Arsi and Friesian and Arsi, respectively, at Asella Livestock farm, Ethiopia (Negussie et al., 1998). On the other hand, the finding of age at first calving in the present study was lower than 36.7 and 40.1 months as reported by Agyemang and Nkhonjera (1990) for crossbred dairy heifers in Malawi, 58.3 and 36.8 months as reported by Masama et al. (2003) at two locations in Zimbabwe and 40.6 months as reported by Shiferaw et al. (2003) for crossbred dairy heifers in different dairy production systems in central highlands of Ethiopia.

### Calving interval and days open

As presented in Table 1, the mean calving interval and days open were 372.8 and 85.6 days, respectively. The mean value for calving interval of 372.8 days in presented study was lower than 475 days as reported by Bekele et al. (1991) for smallholder crossbred dairy cows in the central highland of Ethiopia. On the other hand, this study results, concerning the calving interval are supported by previous report of Negussie et al. (1998) from Asela Livestock farm with calving interval of 351 to 398 days. Data obtained from the questionnaire survey in this study resulted with calving interval of 344 to 432 days. Involved herd owners also presented rather new information with calving interval being influenced with calf's sex with male calves having 10 to 15 days longer gestation period if compared to the female calves. Obtained mean values for calving interval in presented study (372.8 days) were lower if compared to 488 days as

reported by Agyemang and Nkhonjera (1990) in Malawi, 487 days as reported by Haile-mariam et al. (1993) in Abernosa Ranch, and 552 days as reported by Shiferaw et al. (2003) for the central highlands of Ethiopia. Our study results showed mean value for days open to be 85.6 days and are lower if compared to those of Negussie et al. (1998) in Assela livestock farm, and 197 days as presented by Bekele et al. (1991) in Abernosa Ranch.

The differences could be attributed to differences in management practices and agro-ecology of the respective areas.

### Number of service per conception

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 (Gabriel et al., 1983). Number of service per conception higher than 2 should be considered as poor (Mukassa-Mugrewa, 1989). The number of service per conception revealed in the present study was 1.52 which is closely to 1.62 as reported from central highlands of Ethiopia (Bekele et al., 1991; Shiferaw et al., 2003), 1.67 as reported from mid Rift valley of Ethiopia (Yifat et al., 2009) and 1.61 as reported from Abernossa Ranch (Haile-mariam et al., 1993). At the same time, our results were slightly lower than 2.0 service per conception as reported for cows at Asella Livestock farm (Negussie et al., 1998). Furthermore, according to more than 90% of the respondents in the study area number of service per conception is significantly affected by age of the individual householders, 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.

### Return rate after first service

In the present study, 35% of the respondents' came across return rate after first service in spite to good management practice including proper heat detection and on time artificial insemination system. A recent retrospective study in Arsi Negelle obtained 13.4% return rate after first service (Mekonnen et al., 2010). Time of insemination, feeding management, efficiency of heat detection, proper insemination of cows and early embryonic mortality were known to be factors that negatively affect fertility in dairy cows (Barrett and Larkin, 1974). In this study, 65% of dairy cows conceived after the 1st service, 25% after the 2nd service, 5% following the 3rd and 2.5% after 4th and 5th service. This study results are higher if compared to those reported by Mekonnen et al. (2010) with 86.6% cows conceived following the 1st service, and 13.1, 2.4 and 0.07% cows conceived after the 2nd, 3rd, and 4th artificial insemination, respectively. In conclusion, the

reproductive performance of crossbred dairy cows owned by smallholder dairy producers in Asella town was found to be promising considering the management situation and limited supplemental feed utilized in the area. Thus, 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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