Reproductive performance of crossbred dairy cows in Mekelle, Ethiopia

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ABSTRACT

The study was conducted on 252 Holstein-Friesian (HF) crossbred cows maintained under farmer’s management system in and around Mekelle (Ethiopia). A total of 72 small-scale dairy farm owners were randomly selected and interviewed with structured questionnaire to obtain information on the reproductive performance of crossbred cows. The results of the study showed that the mean age at first service (AFS) was 25.2±1.1 months, the mean age at first calving (AFC) was 36.4±1.7 months, number of services per conception (NSC) was 1.5±0.2, the mean of days open (DO) was 137.52±36.27 days, the mean of calving interval (CI) was 469.45±88.78 days for crossbred cows.

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1. Introduction

Ethiopia is known for its huge cattle population and livestock sector has a significant contribution to the Ethiopian economy but production per animal is extremely low. In 2009 average cow milk production was estimated at only 1.54 litres/cow per day (CSA, 2009), and the per capita milk consumption was only about 16 kg/year, which is much lower than African and world per capita averages of 27 kg/year and 100 kg/year, respectively (FAOSTAT, 2009). Although a little improvement is noted in recent report indicated that the total production of cow milk is about 4.06 billion litres, and this translates to an average daily milk production/cow of 1.86 litres/day (CSA, 2010/11). Some improvement also reported in per capita consumption of milk and estimated it at 19.2 kg (MoA, 2012) but still production is lagging far behind the demand. The average lactation milk production of the indigenous cow ranges from 494–850 kg under optimum management (EARO, 1999; Haile et al.,
This low per capita milk consumption is mainly emanated from poor genetic potential of local cattle for dairy traits. To meet the ever-increasing demand for milk and milk products genetic improvement of the indigenous cattle has been proposed as one of the options. Genetic improvement of the indigenous cattle, basically focusing on crossbreeding, has been practiced in many developing countries.

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. Reproductive traits are crucial factors determining the profitability of dairy production (Lobago et al., 2007). Reproductive traits describe the animal’s ability to conceive, calve down and suckle the calf to weaning successfully (Davis, 1993). These traits are important since they affect the herd size and off take. Reproductive performance is commonly evaluated by analyzing female reproductive traits. The traits regularly considered include age at first service, age at first calving, number of service per conception, days open and calving interval.

The success of dairy production in general and crossbreeding programmes in particular needs to be monitored regularly by assessing the productive and reproductive performance under the existing management system. However, information is limited about the productive and reproductive performance of dairy cows in smallholder urban and peri-urban dairy farms in the tropics, particularly in Ethiopia (Lobago et al., 2007). Information on reproductive performance of crossbred dairy cows in the Mekelle city, Tigray Region of Ethiopia is limited. The aim of the present study was, therefore, to investigate the reproductive performance of crossbred (Zebu x Holstein-Friesian) dairy cows in and around Mekelle, Ethiopia.

2. Materials and methods

2.1. Study area

The study was conducted in and 10 Km around Mekelle city of Tigray Region in the semi-arid highlands of northern. Mekelle is the capital city of Tigray Region and located in the northern extremes of Ethiopia extending from 33°25' to 39°38' north latitude and from 36°27' to 40°18' east longitude at an average altitude of 2000 to 2200 meters above sea level. The mean annual rain fall ranges from 11.3mm to 39.1mm and the temperature varies from 12°C (in November and December) to 27°C (in January and March). Mekelle enjoys humid and hot climate and 783 km from Addis Ababa (MoM, 1998).

2.2. Sampling procedure and data analysis

A total of 72 smallholder dairy farmers were interviewed randomly with scheduled questionnaire which was mainly based on the reproductive performance information of ungraded HF crossbred dairy cows. A total of 252 ungraded HF crossbred cows were included in this study were maintained under farmer’s managemental system, located in a radius of about 10 km in and around Mekelle (Ethiopia). The questionnaire was developed in accordance with the objectives of the study and designed in a simple manner to get accurate information from the dairy farm owners. Each respondent was given a brief description about the nature and purpose of the study and the responses were recorded directly on the survey schedule.

The farmers under the study areas maintained cows under intensive management system in back-yard operation utilizing whatever space was available in the residential compound. The cows are managed in closed houses with different types of floor structure throughout the day. Cows are hand milked with twice per day milking frequency. The feed on which the animals are fed include straw, hay, chopped green fodder, milling by-products, concentrate mix and none-conventional feeds. Data were recorded like age at first service (AFS), age at first calving (AFC), number of services per conception (NSC), Days open (DO) and calving interval (CI) were recorded as reproductive performance. Descriptive statistics such as means and standard deviations were used.

3. Results

The results of the study showed that the mean age at first service (AFS) was 25.2±1.1 months, the mean age at first calving (AFC) was 36.4 ±1.7 months, Number of services per conception (NSC) was 1.5±0.2, the mean of days open (DO) was 137.52±36.27 days, the mean of calving interval (CI) was 469.45±88.78 days for cross bred cows.
Table 1
Reproductive performance of crossbred dairy cows under smallholder condition in Mekelle Town.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean±S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at first service (months)</td>
<td>25.2±1.1</td>
</tr>
<tr>
<td>Age at first calving (months)</td>
<td>36.4±1.7</td>
</tr>
<tr>
<td>Number of services per conception</td>
<td>1.5±0.2</td>
</tr>
<tr>
<td>Days open (days)</td>
<td>137.52±36.27</td>
</tr>
<tr>
<td>Calving interval (days)</td>
<td>469.45±88.78</td>
</tr>
</tbody>
</table>

4. Discussion

The mean AFS in the present study is in accordance with 24.9±3.8 months reported in crossbred cows under smallholder conditions in Asella town, Oromia regional state, Ethiopia (Hunduma, 2012); 24.30±8.01 months reported in Zebu and Holstein- Friesian crossbred dairy cows in Jimma town, Ethiopia (Belay et al., 2012) and 25.6 months reported in crossbred and local cows in Dire Dawa, Eastern Lowlands of Ethiopia (Mureda and Mekuriaw, 2007). The mean AFS revealed in this study is shorter than the mean of 36.8 ± 0.8 months reported in Foger and Friesian crosses in Andassa ranch, Northwestern Ethiopia (Gebeyehu et al., 2005) and 29.6 months reported in central highlands of Ethiopia (Yoseph et al., 2003). Larger mean AFS is recorded as 15.4 months reported in Fogera and Friesian crosses in Andassa ranch, Northwestern Ethiopia (Gebeyehu et al., 2005) and 29.6 months reported in central highlands of Ethiopia (Yoseph et al., 2003) but it is larger than the mean of 32.4 months reported in Crossbred Dairy Cows under Small Holder Conditions in and Around Gondar, North Western Ethiopia (Nibret, 2012); 20.1 months reported in the Addis Ababa (Yoseph, 1999); 23.2 months reported in Gondar city of Ethiopia (Nuraddis et al., 2011) and 21.7 months reported in crossbred of Fulami and Holstein-Friesian breed in Nigeria (Knudsen and Sohael, 1970).

The mean AFC in the present study is in accordance with 3.05±0.65 yrs reported in Zebu and Holstein-Friesian crossbred dairy cows in Jimma (Belay et al., 2012). The mean AFC revealed in this study is shorter than the mean of 40.6 months reported in central highlands of Ethiopia (Yoseph et al., 2003) but it is larger than the mean of 32.4 months reported in Crossbred Dairy Cows under Small Holder Conditions in and Around Gondar, North Western Ethiopia (Nibret, 2012); 34.8±4 months reported in crossbred cows under smallholder conditions in Asella town (Hunduma, 2012) and 33.8 months reported for crosses of Friesian and Jersey sire breed with Zebu dams in Arsi region of Ethiopia (Kiwuwa et al., 1983).

The age of the animal at first calving is very important for high life time production. The desirable age at first calving in local breeds is 3 years and 2 years in cross breed cattle. Prolonged age at first calving will have high production in the first lactation but the life time production will be decreased due to less no of calving. If the age at first calving is below optimum, the calves born are weak, difficulty in calving and less milk production in first lactation. A substantial delay in the attainment of sexual maturity may mean a serious economic loss, due to an additional, non- lactating, unproductive period of the cow over several months (Mukasa-Mugerewa 1989). Different factors advance or delay AFS and AFC. Environmental factors, especially nutrition, determine pre-pubertal growth rates, reproductive organ development, and onset of puberty and subsequent fertility. Substantial evidence exists that dietary supplementation of heifers during their growth will reduce the interval from birth to first services and calving (Kayongo-Male et al., 1982; Azage, 1989), probably because heifers that grow faster cycle earlier and express overt estrus.

Number of service per conception (NSC) depends largely on the breeding system used. It is higher under uncontrolled natural breeding than hand-mating and artificial insemination (Gabriel et al., 1983). NSC higher than 2 should be considered as poor (Mukasa-Mugerewa, 1989). The NSC revealed in the present study was 1.5±0.2 which is close to 1.52 from Assela town of Oromia region of Ethiopia (Hunduma, 2012); 1.56 reported from Jimma town of Oromia region of Ethiopia (Belay et al., 2012); 1.62 as reported from central highlands of Ethiopia (Bekele et al., 1991; Shiferaw et al., 2003) and 1.67 reported from mid Rift valley of Ethiopia (Yifat et al., 2009). Mean value for NSC in presented study was lower than 2.0 as reported for cows at Asella Livestock farm (Negussie et al., 1998); 1.8 for crossbred cows (Tadesse et al., 2010) and 1.7 reported in the highlands of Ethiopia (Lobago et al., 2007). Mean value for NSC in presented study was higher than 1.3 as reported for crossbred cows in Gondar city of...
Ethiopia (Nibret 2012) and 1.3 for crossbred cows for tropical conditions (Rahman et al., 1998). The differences could be attributed to differences in management practices and agro-ecology of the respective areas. Appropriate and in time heat detection and insemination could be attributed to lower or higher number of service of per conception (Yifat et al., 2009).

The averages DO and CI in this study is higher than the optimum values desirable for profitable milk production. This result of estimated DO was higher that of 85.6±5.6 days in Asella town, Oromia regional state (Hunduma, 2012), Ethiopia and 2.9 ±3.7 months in crossbred cattle in and Around Gondar, North Western Ethiopia (Nibret, 2012). This estimated DO was in lower than the mean of 197 days reported in Central Ethiopia (Bekele et al., 1991), 5.19±1.72 months reported in Jimma, Ethiopia (Belay et al., 2012) and 148±1.72 days reported in Holeta, Ethiopia in crossbred cattle (Tadesse et al., 2010). DO of about 60 days is considered optimum. If the DO is too short, the animals suffer from stress and in next lactation, the milk production drops substantially and also it gives weak calves. On the other hand if the DO is too high, it may not have that much effect on increasing milk yield in the next lactation, but it decrease the production in the present lactation. Feed shortage, silent estrus and lack of proper heat detection might have other contributory factors for long DO reported in this study.

The average CI estimate was more or less in agreement with 475 days in central Ethiopia (Bekele et al., 1991). The mean value was higher than the 372.8 days (Hunduma, 2012) and 13.4 ±5.1 months (Nibret, 2012). The mean value was lower than 21.36±3.84 months recorded at Jimma, Ethiopia (Belay et al., 2012), 487 days in the central Highlands of Ethiopia (Shiferaw et al., 2003) and 552 days recorded at Abernossa Ranch, Ethiopia (Khan et al., 1992). The differences could be attributed to differences in management practices and agro-ecology of the respective areas.

CI of 365 days is usually considered ideal (Khan et al., 1992). It is more, profitable to have one calf yearly in cattle. If the calving interval is more, the total number of carvings in her life time will be decreased and also total life production of milk decrease. Therefore, the CI, as seen in this study, suggest a large need for future improvement. The length of gestation and service period are the two main constituents of CI out of which the former cannot be expected to change much for physiological reasons. In one study, 97 and 98% variation in CI due to service period in Hariana and Tharparkar cattle was reported (Kumar, 1982). Since service period constitutes nearly all of the variation in CI, the important way to reduce the CI in cows would be through an early conception within biological limits. Among the factors contributing for long CI age of cows, breed of cows, calving season and forage availability in any particular year have to be considered as other impact factors (Yifat et al., 2012).

5. Conclusion

The crossbred 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 cause of poor reproductive performance. Thus, strategies should be 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 formulation and implementation of appropriate plan.

References


