Performance of Crossbred Dairy Cows under Farmers’ Management in and Around Debre Zeit, Ethiopia.

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ABSTRACT

The study was conducted on 181 crossbred cows, maintained by small scale dairy farmers in and around Debre Zeit. A total of 65 small-scale dairy farm owners were randomly selected and interviewed with structured questionnaire to obtain information on the productive and reproductive performance of indigenous cows. Amongst the production performance traits lactation length (LL) and lactation milk yield (LMY) while for reproduction performance, age at first calving (AFC), number of services per conception (NSC), days open (DO) and calving interval (CI) were studied. The overall means for LL, LMY, AFC, NSPC, DO and CI were estimated to be 309.1 ± 29.5 days, 2503.6 ± 76.8 liters, 26.5±2.5 months, 1.8±0.1, 154.2±33.1 days and 463.1±29.5 days, respectively. The crossbred cows in the study area had longer DO. The productive and reproductive efficiency is better as compared to indigenous dairy cows in the country.

Key words: Crossbred, Dairy Ethiopia, Production Traits, Reproduction Traits.

INTRODUCTION

Ethiopia is known for its huge cattle population and livestock sector contributes significantly to the National economy but unfortunately, production per animal is extremely low. The total cattle population of the country is estimated to be about 59.5 million. Around 98.20 percent of the total cattle are local breeds and remaining are crossbred and exotic breeds that account for about 1.62 percent and 0.18 percent, respectively. The average lactation length per cow at country level is estimated to be about six months, and average milk yield per cow per day is about 1.37 liters (CSA, 2016/17). This milk production is mainly due to 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 is 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.

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 pertaining to these traits of crossbred dairy cows in smallholder urban and peri-urban dairy farms is limited in the tropics, particularly in
Ethiopia (Lobago et al., 2007). The aim of the present study was, therefore, to investigate the productive and reproductive performance of crossbred (Zebu x Holstein-Friesian) dairy cows in and around Debre Zeit, Ethiopia.

MATERIALS AND METHODS

Study Area

The study was conducted in and around Debre Zeit (Ethiopia) located at 45 km south east from Addis Ababa; situated at 8°44'N latitude and 38°58'E longitude and at an altitude of 1900 meters above sea level in the central high lands of Ethiopia. It experiences a bimodal pattern of rainfall with the long rainy season extending from June to September; short rainy season from March to May and dry season from October to February with an average annual rainfall of 851mm. The mean annual minimum and maximum temperatures are 8.9°C and 28.3°C, respectively, with an overall average of 19°C. The mean relative humidity is 61.4%.

Study Population and Sampling Procedure

A total of 65 small dairy farmers were randomly interviewed with scheduled questionnaire; mainly based on the productive and reproductive performance of crossbred cows. A total of 181 crossbred cows included in this study were maintained under farmer’s management system, located in a radius of about 10 km in and around Debre Zeit. The questionnaire was developed in accordance with the objectives. A brief description about nature and purpose of the study besides the responses were recorded directly on the survey schedule. Data like lactation length (LL) and lactation milk yield (LMY) as productive performance and age at first calving (AFC), number of services per conception (NSC), age at first calving (AFC), days open (DO) and calving interval (CI) as measures of reproductive performance were recorded. Descriptive statistics such as means and standard deviations were used.

RESULTS AND DISCUSSION

Lactation Length

The mean LL in the present study was found to be 309.1 ± 29.5 days (table-1) which is in agreement with 10.1 months in smallholder dairy system and dairy cooperatives in Bahir Dar Zuria and Mecha Woredas, Northern Ethiopia (Asaminew and Eyassu, 2009). The mean LL in this study was higher than the mean of 8.63 months in Yerer watershed Adalibeb woreda, Oromia region, Ethiopia (Mulugeta, 2005) and 9.13±1.99 months reported in Zebu X Holstein-Friesian crossbred dairy cows in Jimma town, Oromia, Ethiopia (Belay et al., 2012). In this study, the estimate of average lactation length in crossbred cows were longer than the standard lactation period (305 days), it could be explained as the crossbred cows continued to yield 2-3 liters of milk even in their late gestation and the small dairy owners did not practice forced drying of their animals even beyond eight month of gestation to meet their sole objective of more milk. The mean LL of this study was lesser than the mean value of 333.9 days reported in crossbred cows in North Showa zone, Ethiopia (Mulugeta and Belayeneh, 2013); 334.64 ± 1.99 days in HF crossbred dairy cows maintained under farmers’ management system in India (Kumar, 2005); 350 days in local crossbred dairy cows in Arsi region of Ethiopia (Gabriel et al., 1983) and 11.7 months in smallholder milk production in Central Highland of Ethiopia (Zelalem, 1999).
Lactation Milk Yield

The mean LMY was found to be 2503.6 ± 76.8 litres (table-1) in the present study which was higher than the mean of 1508 litres reported in smallholder milk production system in Central Highlands of Ethiopia (Zelalem, 1999); 1511.5 litres reported in crossbred dairy cows in North Showa zone of Ethiopia (Mulugeta and Belayeneh, 2013); 2055 litres reported in crossbred cows (½ Friesian X ½ Baraca) in Ethiopia (Million and Tadelle, 2003); 2333.63 litres in Zebu X Holstein-Friesian crossbred dairy cows in Jimma Town, Oromia, Ethiopia (Belay et al., 2012) and 2352 litres reported in crossbred cows (½ Friesian X ½ Zebu) in Arsi region, Ethiopia (Gabriel et al., 1983). Production traits are influenced by general management, availability of quality and quantity of fodder throughout year and environmental conditions which could be the most probable reason for the variation in production level reported in different studies.

Table-1: Productive and reproductive performance of crossbred cows under smallholder conditions in Debre Zeit

Number of Service per Conception

The NSC revealed in the present study was 1.8 which is in agreement with 1.8 for crossbred cows (Tadesse et al., 2010) and 1.7 reported in the highlands of Ethiopia (Lobago et al., 2007). 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). NSC higher than 2 should be considered as poor (Mukasa-Mugerewa, 1989). Lower mean value than current study was reported to be 1.3 as reported for crossbred cows in Gondar city of Ethiopia (Nibret, 2012) and in crossbred cows for tropical conditions (Rahman et al., 1998); 1.52 in crossbred dairy cows under smallholder condition Assela town of Oromia region of Ethiopia (Hunduma, 2012); 1.56 reported in Zebu X Holstein-Friesian crossbred dairy cows in Jimma town of Oromia region of Ethiopia (Belay et al., 2012); 1.62 in crossbred Dairy cows in different production systems in the central Highlands of Ethiopia (Shiferaw et al., 2003) and 1.67 in crossbred dairy cattle under smallholder conditions in and around Zeway, Ethiopia (Yifat et al., 2009). Higher mean value around 2.0 was reported for cows at Asella livestock farm, Arsi. Ethiopia (Negussie et al., 1998). The differences could be attributed to differences in management practices and agro-ecology of the respective areas. Appropriate and timely heat detection and insemination are also among major factors to lower or higher number of service of per conception (Yifat et al., 2009).

Age at First Calving

The mean AFC in the present study was 26.5±2.5 months which is higher than that reported in crossbred dairy cows under small holder conditions in and around Gondar by Nibret, 2012 (32.4 months); 33.8 months reported for crosses of Friesian and Jersey sire breed with Zebu dams in Arsi region of Ethiopia (Gabriel et al., 1983); 34.8±4 months reported in crossbred cows under smallholder conditions in Asella town (Hunduma, 2012); 3.05±0.65 yrs reported in Zebu and Holstein- Friesian crossbred dairy cows in Jimma (Belay et al., 2012) and 40.6 months reported in crossbred dairy cows managed under different production systems in central highlands of Ethiopia (Shiferaw et al., 2003). 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.
Different factors advance or delay AFC. Factors, especially nutrition, determine pre-pubertal growth rates, reproductive organ development, and onset of puberty besides subsequent fertility. Substantial evidence exists that dietary supplementation of heifers during their growth period will reduce the interval from birth to first services and calving (Azage, 1989), probably because heifers that grow faster cycle earlier and express overt estrus.

**Days Open**

The average DO in this study were 154.2±33.1 which is higher than the optimum values desirable for profitable milk production. Similar findings (5.19±1.72 months) were also reported in Jimma, Ethiopia by Belay et al., 2012 and 148±1.72 days in Holeta, Ethiopia in crossbred cattle by Tadesse et al., 2010. Higher mean DO (2.9 ±3.7 months) was recorded in crossbred cattle in and Around Gondar, North Western Ethiopia by Nibret, (2012) and 85.6±5.6 days in Asella town, Oromia regional state of Ethiopia (Hunduma, 2012). This estimated DO was in lower than the mean of 197 days reported in Central Ethiopia (Bekele et al., 1991). 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 birth to 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, rather it decreases the production in the current lactation. Feed shortage, silent estrus and lack of proper heat detection might be other contributory factors for long DO reported in this study.

**Calving Interval**

The mean CI in the present study was 463.1±29.5 days, which is in agreement with 475 days in in crossbred cattle in central Ethiopia reported by Bekele et al., 1991. Higher mean CI was reported to be 487 days in crossbred dairy cows in different production systems in the central Highlands of Ethiopia (Shiferaw et al., 2003); 552 days recorded at Abernossa Ranch, Ethiopia (Haile-mariam et al., 1993) and 21.36±3.84 months in Zebu X Holstein-Friesian crossbred dairy cows in Jimma town, Oromia, Ethiopia (Belay et al., 2012). The present finding was higher than that reported by Hunduma, 2012 (372.8 days) in crossbred dairy cows under smallholder condition in Ethiopia and 13.4 ±5.1 months in crossbred dairy cows under smallholder conditions in and around Gondar, North Western Ethiopia (Nibret, 2012). 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 calvings and also total life time milk production will be low in cow’s life time. Therefore, the CI, as observed in this study, suggests a large need for future improvement. The major factors contributing for long CI are age of cow, its breed, calving season and forage availability in any that year (Yifat et al., 2012). The crossbred cows in the study area had longer DO. The productive and reproductive efficiency is better as compared to indigenous dairy cows in the country. DO can be reduced, with proper feeding management, accurate heat detection and timely insemination. Thus, strategies should be designed to develop the dairy sector by appropriate crossbreeding program taking into consideration the existing production characteristics of the area.

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**Table 1:** Productive and reproductive performance of crossbred cows under smallholder conditions in Debre Zeit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean ± S.E.</th>
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<tbody>
<tr>
<td>Lactation length (days)</td>
<td>309.1 ± 29.5</td>
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<tr>
<td>Lactation milk yield (liters)</td>
<td>2503.6 ± 76.8</td>
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<tr>
<td>Number of services per conception</td>
<td>1.8±0.1</td>
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<tr>
<td>Age at first calving (months)</td>
<td>26.5±2.5</td>
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