

Productive and Reproductive Performance of Zebu X Holstein-Friesian Crossbred Dairy Cows in Jimma Town, Oromia, Ethiopia

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Abstract: The aim of the study was to assess productive and reproductive performance of crossbred (Zebu x Holstein-Friesian) dairy cows and factors affecting their performance in Jimma town, Oromia State, Ethiopia. A total of 54 small-scale dairy farm owners were randomly selected and interviewed with pre-tested structured questionnaire to obtain information on the productive and reproductive performance of cows. A follow-up study was also conducted to obtain milk production based on lactation stages. The results of the study showed that from the follow-up study, the mean daily milk yield for the first, second and third stage of lactations was 7.01 ± 2.73 , 5.55 ± 2.83 and 3.50 ± 1.64 liters per cow, respectively. The milk yield was decreased significantly in the third stage of lactation than that of first and second ($P < 0.01$). The milk yield was observed significantly ($P < 0.01$) higher in the morning than in the evening for the three stage of lactations. From the survey results, the mean milk production per day/cow and per lactation was 8.45 ± 1.23 and 2314.45 litres, respectively. The overall average lactation length was 9.13 ± 1.99 months. The mean age at first service (Months), age at first calving (year), days open till conception, calving interval (Months) and number of services per conception from survey data were 24.30 ± 8.01 , 3.05 ± 0.65 , 21.36 ± 3.84 months and 1.56 ± 0.57 , respectively. The present study showed that productive and reproductive performance of crossbred cows owned by small-scale dairy producers in Jimma town was low. Thus, there is a need to improve feed supply, health care and services, access to artificial insemination, proper breeding management and supply of improved genotypes in order to improve the performance of dairy cows in the study area.

Key words: Age at First Calving % Caving Interval % Lactation Stage % Milk Production % Oromia

INTRODUCTION

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 [1]. The size of the calf crop is all important for herd replacement and the production of milk depends on heavily on the cow reproductive activity [1]. According to Mukasa-Mugerwa *et al.* [2] age at first puberty is an important determinant of reproductive efficiency.

Singh *et al.* [3] described that age at first calving to be one of the most important economic traits of dairy animals. Days open till conception (DO) is one way of measuring fertility in cattle [4].

Ethiopia holds the largest cattle population in Africa estimated at about 43.1 million heads of cattle [5] of which

10 million is dairy cows yielding 3.2 billion liters per year. About 99 percent of the dairy cattle are non-descriptive indigenous animals. The national average milk yield per cow per day is 1.54 liters for indigenous cows [5]. Per capita/year milk consumption in the country is about 16 kg/year, which is much lower than African and world per capita average of 27 kg/year and 100 kg/year, respectively [6].

Productive and reproductive performance of cattle is influenced by feed, genetics, disease and management practices [7, 8]. Livestock productivity in Ethiopia is said to be poor due to a number of reasons among which is the low genetic capacity of the indigenous cattle [2]. In Ethiopia, the poor genetic potential for productive traits, substandard feeding, poor health care and management practices, are the main contributors to low productivity [9].

Productive and reproductive traits are crucial factors determining the profitability of dairy production [10]. 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 [10].

Currently, a large number of smallholder crossbred dairy farms are operating in the study area. However, information on productive and reproductive performance of crossbred dairy cows in the Jimma town, Oromia Region is limited. The aim of the present study was, therefore, to investigate the productive and reproductive performance of crossbred (Zebu x Holstein-Friesian) dairy cows and identifying factors affecting performance of cows.

MATERIALS AND METHODS

Description of the Study Area: The study was conducted in Jimma town of Oromia Regional State, southwestern Ethiopia. The study area, Jimma city is located at 355km south-western of Addis Ababa. The area lies between a latitude of 7°41'N and longitude of 36°50'E and has an elevation of 1704 meters above sea level. The area is characterized by a humid tropical climate of heavy annual rainfall that ranges from 1200-2000 mm per year. About 70% of the total annual rainfall is received during rainy season, which lasts from the end of May to early September. The mean annual maximum and minimum temperature ranges from 25°C-30°C and 7°C-12°C [11].

Sampling Procedure: To select sample farmers systematic random sampling technique was used. A total of 54 dairy farmers were randomly selected from 72 small-scale dairy farmers registered at Jimma town municipality Bureau of Urban Agriculture.

Data Collection and Analytical Technique: A single-visit-multi-subject formal survey technique [7] was used to obtain data on the productive and reproductive performance of Holstein-Friesian x Zebu crossbred dairy cows and constraints associated to dairy cattle performance as identified by respondents. A follow-up study was also conducted to obtain information on milk yield of cows based on lactation stages. The data was

subjected to statistical analysis using Statistical Package for Social Sciences (SPSS) software, version 16.0 (SPSS Inc. Chicago, Illinois, USA). Descriptive statistics such as means, frequency distribution and percentages were used. Furthermore, t-test was used to examine differences between levels of significance of milk yield between lactation stages. Differences were considered to be significant at the level $p < 0.05$.

Animal Management: The cows are managed 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. The feed on which the animals are fed include natural pasture (cut-and-carry), hay, milling by-products, concentrate mix and none-conventional feeds. Cows are hand milked with twice per day milking frequency. Animals are watered from pipe with watering once and twice per day in rainy and dry seasons, respectively. Natural mating is the only breeding system used for inseminating cows. There was no regular vaccination and spray/dipping, but farmers took their animals for treatment when ever diseases occurred.

RESULTS AND DISCUSSION

Milk Production Based on Lactation Stage, Results of Follow up Data: The milk production performance at different stage of lactation and lactation period of dairy cows in the study area are shown in Table 1. The average daily milk yield was 7.01 ± 2.73 , 5.55 ± 2.83 and 3.50 ± 1.64 liters for the 1st, 2nd and 3rd stage of lactations, respectively with an overall average of 8.45 ± 1.23 liters per day/cow. The milk production was significantly ($P < 0.001$) decreased in 3rd than 1st and 2nd stage of lactation. The milk production was decreased with the advance of lactation stage. This results were in agreement with Asaminew and Eyasu [12] who reported that the average milk production from crossbred cows was 7.3, 5.5 and 3.5 liters for first, second and third lactations, respectively, with an overall average daily milk production of 5.2 liters. However, the result of this study is lower than that of Adebabay [13] who reported 10.96 ± 1.73 , 9.12 ± 1.93 and 5.04 ± 0.74 liters for first, second and third lactations, respectively. In this study average milk yield per lactation was estimated to be 2042.11 liters in lactation period of 241.67 ± 26.22 days. The lactation period obtained in the present study was shorter than the report of Asaminew and Eyasu [12].

Table 1: Mean monitored milk yield (liter/day) of crossbred cows in the study area

Stage of lactation	Mean ± SD
First	7.01± 2.73 ^a
Second	5.55±2.83 ^b
Third	3.50±1.64 ^c
Mean	8.45±1.23
Lactation milk yield, liters	2042.11
Lactation length, days	241.67±26.22

Means with different superscripts in the same column differ significantly (P<0.001)

Source: 2010 monitoring study

Table 2: Mean morning and evening milk yield during different stages of lactation

Stage of lactation	Morning milk	Evening milk
First	4.17±1.89 ^a	2.43±1.01 ^a
Second	2.84±1.18 ^b	2.25 ± 0.95 ^b
Third	3.65±1.47 ^c	1.45±0.58 ^c

Means with different superscripts in the same column are differ significantly (P<0.001),

Source: 2010 monitoring study

Table 3: Mean production and reproductive performance of crossbred dairy cows, survey result

Variables	Mean ± SD	Minimum	Maximum
Age at first service (month)	24.30±8.01	13	36
Age at first calving (years)	3.05±0.65	2	4
Calving interval (month)	21.36±3.84	12	36
Lactation length (month)	9.13±1.99	6	16
Days open (month)	5.19±1.72	3	9
Service per conception	1.56±0.57	1	3
Milk production/d/cow (liters)	8.52±3.04	2	18

Source: 2010 field survey

The overall average milk production/cow/day from monitored cows was 8.45 ± 1.23 liters and is higher than the mean of 7.7±0.23 reported by Yitaye [14] in the northwestern Ethiopia.

It was observed that there was a highly significant (P<0.001) difference between morning and evening milk yield for the three stage of lactations. For the respective lactation stages cows produced more milk in the morning than in the evening (Table 2).

Milk Production and Reproductive Performance of Cows: the survey results: Table 3, summarizes survey results on estimated productive and reproductive performance of crossbred dairy cows in the study area.

Milk Production: The average milk production per day was 8.52±3.04 liters per cow and was comparable with the findings of Adebabay [13] who reported that the average daily milk production of crossbred cows was 8 liters. The average daily milk yield observed in this study was higher than the average values reported by Asaminew [12] and Yitaye [14] which was 7.8 ± 0.19 and 7.8 ± 0.19 liters, respectively. In this study, the main reasons for low daily

milk production as indicated by the respondents were shortage of feed and the interaction of poor health, housing and management.

Milk Yield per Lactation: In this study the mean milk yield per lactation was 2333.63 liters. The mean lactation milk yield observed in the present study is higher than the mean of 1508 liters reported for crossbred cows [15].

Lactation Length: The average lactation period for the studied farms was 9.13±1.99 months. The lactation length observed in the present study was shorter than the lactation length of 10.1, 10.1 and 11.7 months, respectively reported in northwest and central Ethiopia [12, 13, 15].

Age at First Service: The mean age at first service was found to be 24.30±8.01 months. The mean age at first service revealed in this study is shorter than the mean of 36.8 ± 0.8 months reported by Gebeyehu *et al.* [16]. 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 [2].

Table 4: Constraints to milk production, age at first calving and calving interval

Variables	Frequency	Percent
Reason for low milk yield		
Feed shortage	37	68.5
Interaction of nutrition, health, housing and management	17	31.5
Factors affecting age at first calving		
Breed	2	3.7
Feeding	16	29.6
Combined effect of feed, disease and breeding	16	29.6
Feeding and disease	17	31.5
Breed and disease	3	5.6
Factors affecting calving interval		
Feeding	4	7.4
Feeding, disease and breeding management	35	64.8
Feeding and disease	4	7.4
Feeding and breeding management	9	16.7
Disease and breeding	2	3.7

Source: 2010 field survey

Age at First Calving: In the present study the average age at first calving (AFC) was 3.05 ± 0.65 years, which is shorter than AFC of 3.37 years reported by Asaminew and Eyasu [12] and higher than that of Kiwuwa [1], Zelalem [15] and Mekonen [17] who reported 497, 421 and 420 days, respectively for crossbred cows. Alberro [20] reported that the minimum AFC was 29.1 months for F1 Friesian-Zebu cows. Gryseels and de Boedt [19] reported that average AFC was 32.3 months for 50% crosses and 33.9 months for 75% crosses at Debre Zeit farms.

Calving Interval: In this study the average calving interval was 21.36 ± 3.84 months. The mean calving interval observed in the present study was longer than the findings of previous studies [20, 21] for crossbred cows in different regions of Ethiopia. In this study, the relatively longer calving interval might be indicative of poor nutritional status, poor breeding management, lack of own bull and artificial insemination service, longer days open, diseases and poor management practices.

Services per Conception: In this study the average service per conception was 1.56 ± 0.57 . The present result is higher than the service per conception reported for tropical conditions of 1.3 for crossbred cows [22]. The results of this study were lower than average service per conception of 1.8 for crossbred cows reported by Tadesse *et al.* [21] and 1.6 and 1.7 reported by Lobago [10] in the highlands of Ethiopia. Similar estimates were reported by other investigators in Ethiopia from crossbred cows, all in the range of 1.5 to 2.5 [23 - 25].

Days Open (Calving to Conception Interval): In this study the average days open till conception was 5.19 ± 1.72 months. This result of estimated days open was slightly higher than the mean of 148 ± 1.72 days reported by Tadesse *et al.* [21] at Holeta, Ethiopia. Feed shortage, silent estrus and lack of proper heat detection might have contributed considerably to the long days open reported in this study.

Constraints to Productive and Reproductive Performance of Dairy Cows as Perceived by the Respondents: As presented in Table 4, the respondents reported that age at first calving was affected by shortage of feed (29.6%), feeding and disease (31.5) and the combined effect of feeding, disease and breeding management (29.6%). The respondents reported that feed shortage (68.5%) and interactions of nutrition, health, housing and management level were major problems affecting milk production. Age at first calving was reported to be influenced by the onset of puberty, which itself is affected by environment, breed type, season and herd effects Mukasa-Mugerwa [2]. The respondents said that calving interval was influenced by the combined effects of feeding, disease and breeding management (64.8%). Farmers reported that dry season feed shortage was the main reason for seasonal fluctuation of milk production. Poor nutrition increases the susceptibility of dairy cows to health problem and physiological stress which results in lower production, much longer calving intervals, as well as problems in fertility [26, 27].

CONCLUSION

Results of the study revealed that productive and reproductive performance of crossbred cows was found to be low. Feed shortage (both in terms of quantity and quality), lack of access to land, disease prevalence, low level of management, lack of proper poor breeding management such as lack of accurate heat detection and timely insemination might have contributed considerably to delayed age at first service, long days open (postpartum anestrous), late age at first calving, long calving interval, short lactation length and low milk production. This calls for a planned technical and institutional intervention for improved support services such as proper feeding, appropriate breeding program, improved cows and adequate veterinary health services.

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