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Reproductive performance of local breed dairy cattle in selected districts of West Hararghe Zone, Oromia, Ethiopia

Segni Giza[1*], Kefelegn Kebede[2], Ararsa Duguma[3]
[1]Oromia Agricultural Research Institute, Mechara Agricultural Research Center, Mechara, Ethiopia
[2]Haramaya University, School of Animal and Range Sciences, Haramaya, Ethiopia
[3] Livestock Development Institute, Holeta, Ethiopia
*Corresponding author: Segni Giza https://orcid.org/0009-0005-4517-2863

Abstract

A study was carried out to assess the reproductive performance of local breed dairy cattle in selected districts of West Hararghe Zone, Oromia Regional State, Ethiopia. A total of 174 local dairy cattle owners with two or more cows were interviewed using a structured questionnaire to collect information on age at first service, age at first calving, calving interval, number of services per conception, and days open. The least-squares means of age at first service of local breed dairy cattle were 47.67±0.90, 45.40±0.83, and 43.06±0.82 months in Gemechis, Tullo and Habro districts, respectively. The age at first calving of local dairy cattle was 57.42±0.82, 55.05±0.77 and 52.69±0.75 months in Gemechis, Tullo and Habro districts, respectively. Again, the calving interval of local dairy cattle was 15.96±0.37, 17.53±0.34 and16.66±0.34 months in Gemechis, Tullo and Habro districts, respectively. On the other hand, the day open of local breed dairy cattle of the recent study was 157.88±3.54, 173.50±3.30 and 166.45±3.24 days respectively in Gemechis, Tullo and Habro districts respectively whereas the Number of services per conception of local breed dairy cattle was 1.69±0.09, 2.00±0.81 and 1.74±0.08 respectively in Gemechis, Tullo and Habro district respectively. In conclusion, there is significant variation across districts in all reproductive performance parameters like age at first service, age at first calving, calving interval, number of services per conception, and days open in the present study. This variation may be due to nutrition, environment, and disease, and it requires intervention.

Keywords: Artificial insemination, Local breed, Reproductive performance

Introduction

Ethiopia is home to a huge number of livestock due to its diverse and vast agroecological zones and the significance of livestock in subsistence strategies. The country has the greatest cattle population, yet their reproductive and productive abilities are extremely low (Muluye and Melku 2016; Ayalew *et al.,* 2018; and Melku *et al.,* 2016). Similarly, Niraj *et al*. (2014) and Nibret *et al.* (2014) reported that in many regions of Ethiopia, dairy cows' reproductive performance was found to be below the ideal values required for profitable milk production. According to Belay *et al.,* (2012) the cause for low performances of dairy cattle might be genetic and environmental factors like feed shortage, low level of management, lack of access to land, disease, lack of proper poor breeding management such as lack of accurate heat detection and timely insemination might have contributed considerably to long days open (postpartum anestrous), late age at first calving, long calving interval, short lactation length and low milk production. The profitability of dairy production is mostly determined by reproductive and productive characteristics (Beneberu and Nibo, 2023).

The effectiveness of animal production is determined by reproductive performance, a biologically significant phenomenon. The cow must reproduce in order to generate milk and replacement stock. Feed has an impact on cattle's reproductive and productive performance, and inadequate management and health care are the primary causes of low production (Abera and Megersa, 2016). According to Yusuf *et al*. (2020), reproductive efficiency has an impact on the profitability of livestock operations, particularly commercial dairy cows. This implies that while low reproductive performance lowers dairy herd profitability, good reproductive performance yields high profitability. On the other hand, little is known about Ethiopian cattle's ability to reproduce specifically in the West Hararghe Zone. Therefore, knowing the reproductive performance of local dairy cattle will be helpful in suggesting future genetic and non-genetic improvement alternatives for the producers to increase profit.

Materials and Methods

Description of Study Area

The study was conducted in selected districts of West Hararghe Zone, at Kerakufis and Efa-Andode kebeles from (Tullo) district, Bareda and Badeda kebeles from (Habro) district and Segeria and Hida Dima kebeles from (Gemechis) district.

Study Population and Design: Farmers/cattle owners made up the study population, and a cross-sectional study design was employed.

Data collection techniques

A structured questionnaire was developed and utilized to gather data from local-bred dairy cattle owners who were chosen at random and had at least two dairy animals. The local-bred dairy cattle's reproductive performance was then studied. The questionnaires were checked for clarity before the interview. Respondents were informed of the study's purpose before the interview. The actual questions and questionnaires were then presented. As a result, data were gathered on the age at first service, age at first calving, calving interval, number of services per conception, and days open.

Model for analysis of reproductive performance parameters:

Model of (Re)productive performance

$$Y_{ijk} = \mu + F_i + Y_j + E_{ijk}$$

Where:

y_{ijk} are the dependent variables (AFS, AFC, CI, NSPC and DO)
μ = the overall mean
F_i = the effect of the ith districts (i= 3: Gemechis, Habro and Tullo)
Y_i = the effect of the jth breed (j= local breed
E_{ijk} random residual error

Data Analysis

SAS JMP 17 software package was used for data analysis. ANOVA was used to analyse numerical data. The statistically significant association between variables was considered to exist if the p-value was less than 0.05, and significant treatment means were compared using Tukey adjustment at a 95% confidence interval.

Results and Discussions

Table 1. Least square mean±(LMS±SE) of reproductive performance of local dairy cattle across study districts

Variable	AFS	AFC	CI	DO	NSPC
R^2	0.08	0.09	0.06	0.06	0.05
CV	1.43	1.08	1.58	1.53	3.45
Districts					
Gemechis	47.67^{a}±0.90	57.42^{a}±0.82	15.96^{b}±0.37	157.88^{b}±3.54	1.69^{b}±0.09
Tullo	45.40^{ab}±0.83	55.05^{ab}±0.77	17.53^{a}±0.34	173.50^{a}±3.30	2.00^{a}±0.81
Habro	43.06^{b}±0.82	52.69^{b}±0.75	16.66^{ab}±0.34	166.45^{ab}±3.24	1.74^{ab}±0.08
P-value	0.001	0.0002	0.00078	0.0063	0.0192

AFS= age at first service, AFC=age at first calving, CI= calving interval, DO=days open and NSPC=number of services per conception

Age at First Services

Age at first service (AFS) is the age at which heifers attain body condition and sexual maturity for accepting service for the first time (Genzebu *et al*., 2016). Age at first service marks the start of the heifer's reproduction and production, and it influences the female's lifetime calf crop, which in turn affects her productive and reproductive life. Genetics, diet, and other environmental factors all affect age at first service (Zewdie *et al.,* 2020). The results from the present study showed that AFS significant ($p<0.05$) difference between Gemechis and Habro districts. This difference might be due to nutrition, environment, and disease. The Age at first service (AFS) of local breed dairy cattle was 47.67±0.90, 45.40±0.83, and 43.06±0.82 months in Gemechis, Tullo and Habro districts, respectively. The present study was in line with the findings of Bekuma *et al*. (2020, which is that the average age at first service (AFS) for local dairy cows in Gimbi district was 42.23 ± 7.4. Prolonged age at first calving will have high production in the first lactation, but lifetime production will be decreased due to fewer calvings. If the age at first calving is below optimum, the calves born are weak, have difficulty calving and have less milk production in the first lactation (Marcondes *et al.,* 2025).

Age at First Calving

Age at first calving is the period that a female calf needs to reach puberty and reproduce for the first time. First calving results in the beginning of an indigenous cow's productive life and influences both the productive and reproductive life of the female, directly through its effect on lifetime calf crop and milk production and indirectly through its influence on the cost invested for up-bringing.

According to the recent findings, AFC showed a significant ($p<0.05$) difference between Gemechis and Habro. This difference might be due to disease, environment, nutrition, or poor heat detection at the time of insemination. Age at First Calving (AFC) in the current study was 57.42±0.82, 55.05±0.77 and 52.69±0.75 months in Gemechis, Tullo and Habro districts, which is less than the finding of Tarekegn, 2020) that reported the Age at First Calving (AFC) of

indigenous dairy cows was 45.13±2.31 in Angot District of North Wollo Zone.

Calving Interval

Calving interval refers to the period from one calving to the next calving (Dalcq *et al*., 2018). The results from the current study showed a significant ($p < 0.05$) difference in CI between Tullo and Gemechis. The Calving Interval (CI) of the recent finding was 15.96±0.37, 17.53±0.34 and16.66±0.34 months in Gemechis, Tullo and Habro districts, respectively, which is in line with the finding of Bekuma *et al.* (2020), which reported the calving interval of local dairy cows was 15.03 ± 1.04 in Gimbi District of Wollega Zone.

Days Open

DO is the interval in days between calving and successful insemination (Tadesse *et al*., 2022). Results from the present study showed that the DO of dairy cows has significant $p<0.05$) differences between Tullo and Gemechis districts. The DO in the present study is 157.88±3.54, 173.50±3.30 and 166.45±3.24 days, respectively, in Gemechis, Tullo, and Habro districts, which is greater than the finding of (Tadele and Nibret, 2014), which reported the overall days open of indigenous dairy cows in Maksegnit Town was 86.5±4.5 days. Longer DO in Tullo could be associated with problems of conception rates, longer calving intervals, and an increased occurrence of silent heat that have been considered to be the results of energy deficiency and feed shortages, and fear of releasing their heifers or cows to bulls or AITs. A shorter DO in Gemechis might be achieved by raising dairy producers' awareness and improving management practices.

Number of Services Per Conception

The number of services per conception has been defined as the number of services required for a successful conception. The number of services per conception (NSPC) depends largely on the breeding system used (Cielava *et al*., 2017). It is higher under uncontrolled natural breeding than hand-mating and artificial insemination. According to the present study, the NSPC were significant ($p<0.05$) between Tullo and Gemechis. Number of Services Per Conception (NSPC) in the current study was 1.69±0.09, 2.00±0.81 and 1.74±0.08, respectively, in Gemechis, Tullo and Habro districts. This difference might be due to management in terms of nutrition, health care, housing, heat detection, timely insemination, and breeding, as well as environmental factors.

Conclusions and Recommendations

Most reproductive performance parameters, such as age at first service, age at first calving, calving interval, number of services per conception, and days open in the present study, have significant variation across the study districts. This variation may be due to environment, nutrition and health care. Generally, intervention is required to improve the reproductive performance of local dairy cattle in the study area.

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Conflict of interest

No potential conflict of interest was reported by the author(s)

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