Reproductive Performance of Boran Cows at Tatesa Cattle Breeding Center

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Abstract: The reproductive performance of Boran cows at Tatesa Cattle Breeding Center found in Gurage Zone, central Ethiopia, was studied based on individual cow records from November 2009 to April 2010. The overall mean values of age at first calving, calving interval (CI), days open (DO), gestation length (GL) and number service per conception (NSC) were 1729.9, 622.6, 340.3 and 277.7 days and 1.6, respectively. Both parity and season of previous calving had significant ($P < 0.01$) effect on calving interval. Also, season of previous calving had significant ($P < 0.01$) effect on the number of service per conception in the breeding center. The short rainy season calving interval was 522.5 days and the number of services per conception was 1.3. It was concluded that the poor reproductive performance of Boran cows in the breeding center could be due to the management system prevailing in the center.

Key words: Calving Interval · Season · Parity · Service Per Conception · Ethiopia

INTRODUCTION

The introduction of modern agriculture enforces to introduce modern breeding practices targeted to improve livestock productivity [1]. The increase in productivity could be obtained through crossing of *Bos taurus* and *Bos indicus* (local Zebu). The aim has been to combine adaptability, hardiness, disease resistance and heat tolerance of local zebu with the high milk producing potential and faster growing rate of exotic breed [2]. Genetic improvement of indigenous breeds is possible by way of selective breeding and/or strategic cross breeding, some effort has been exerted to date to improve any of the indigenous breeds [3]. Livestock productivity remains marginal in Ethiopia, despite the large livestock resource in the country, due to various factors among which the low genetic potential of indigenous cattle for milk and meat production. Increase in milk yield in the F_1 generation, compared with local stock, crossbred females reach age of puberty (age at first service) at a much younger age and also calved at younger age than their local herd mates. Furthermore, cross breeds have slightly shorter calving intervals and in general cross bred exhibit increase fertility rate more than indigenous cattle [4, 5].

Tatesa Cattle Breeding Center is a government owned breeding center implemented with an objective of production and distribution of crossbred pregnant heifers for supporting small scale dairy production. To date, no systematic effort has been made to analyze the data that have been generated so as to re-evaluate the performance of the breeding center. Accurate evaluation of the reproductive performance of local cattle and crossbred animals and determination of the effect of some non-genetic factors on these traits are required. This would help to improve the management level of the breeding center as well as to devise strategies to increase the out put. The present study aimed to evaluate the reproductive performance of Boran cows at Tatesa Cattle Breeding Center based on the available farm records.

MATERIALS AND METHODS

The present study was conducted on reproductive performance of local Boran cows using individual cow records compiled for the last 10 years, 1998 to 2008, at Tatesa Cattle Breeding Center.

Study Area: The study was carried out in Tatesa cattle breeding center, which is located in Gurage Zone near Wolkitie town, central Ethiopia. The center is found at an altitude of 1870 m.a.s.l and receiving an average annual rain fall of 1324 mm. The mean annual minimum and maximum temperature of the area was 13.7°C and 22.7°C respectively [6]. The area experienced a bimodal rainfall

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pattern with a short rainy season that lasts from February to March followed by a long rainy season from June to September.

Study Animals and Design: The study was conducted at Tatesa Cattle Breeding Center and the data collection was carried out from November 2009 to April 2010 and the data collected were 10 years period recorded information. In the Breeding Center heat detected by herdsmen and attendants and cows in the Center were allowed to graze in groups of emaciated, pregnant, nursing, open cows and heifers. Cards with ear tag number for individual animals that is bearing the production and reproductive performance information found in the farm. A regular vaccination program was practiced to control common diseases prevailing in the area. A retrospective type of study was carried out to evaluate the reproductive performances of Boran cattle in the center. Recorded data for the last 10 years (1998-2008) on the birth date, insemination, parity and other reproductive performance of the breed were used for this study. Only the data of cows with complete information were included in the study.

Data Collection and Analysis: Collected data were entered into Microsoft Excel spreadsheet and summarized by descriptive statistics including mean and standard error. It was further analyzed by General Linear Models of SPSS (version 11.5) to see the effects of different factors on the performance parameters.

Models employed for the analysis were as follows:

$$Y_{ijdk} = \mu ++ S_i + P_j + Z_d + e_{ijdk}$$

Where, Y = the observations on each trait; μ = Value common to all animals (overall mean); S_i = Effect of the jth season (Long, short and dry); P_j = Effect of the jth parity (1, 2 and 3); Z_d= Effect of the dth year (1998 to 2008) and e_{ijdk} = Random error associated with Y_{ijdk}^{th} observations

RESULTS

The overall mean values and standard errors of age at first calving, calving interval, days open, number of services per conception and gestation length of Boran cows at Tatesa Cattle Breeding Center were 1729.9 ± 58.2, 622.6 ± 15.3, 340.3 ± 15.8, 1.6 ± 0.6 and 277.7 ± 0.4 days, respectively (Table 1).

Calving interval was significantly affected by parity ($P <0.05$) and season of calving ($P <0.01$) at Tatesa cattle breeding center. Number of services per conception significantly ($P <0.05$) influenced by season of calving. The detailed analysis for factors affecting the mean values of reproductive performance indicated in Tables 2 and 3.

DISCUSSIONS

The mean age at first calving observed in the present study for Boran breed at Tatesa cattle breeding center was 1729.9 days (i.e. ˜57 months or 4.7 years). This finding

Table 1: Mean reproductive parameters of Boran cows at Tatesa cattle breeding center.

Reproductive parameter	Number of observation	Mean ± SE
Age at first calving (days)	52	1729.9 ± 58.2
Calving interval (days)	109	622.6 ± 15.3
Days Open (days)	108	340.3 ± 15.8
Number of service per conception (Number)	202	1.6 ± 0.6
Gestation Length (days)	187	277.7 ± 0.4

N= number of observation

Table 2: Least squares means and standard error (LSM+SE) of factors affecting reproductive performance and statistics significance levels given below

Parity level	NSC (No) Mean ± SE	CI (days) Mean ± SE	GL (days) Mean ± SE	DO (days) Mean ± SE
Overall	1.6+0.6 (n=202)	622.6+15.3 (n=109)	276.4+0.58 (n=84)	340.3+15.8 (n=108)
1	1.5 +0.1 (n=89)		0276.1+0.94 (n=32)	356.3+19.0 (n=60)
2	1.7±0.1 (n=66)	651.6+19.8 (n=63)	277.8+0.77 (n=29)	327.8+32.0 (n=30)
3	1.5+0.1 (n = 47)	582.9+23.1 (n=46)	274.4+1.65 (n=23)	307.7+46.8 (n=18)
Season Overall	1.4+0.08 (n =85)	606.8+19.58 (n=61)	276.4+0.58 (n=84)	357.6+23.09 (n=59)
Long rainy season	1.4+0.10 (n=37)	666.3+24.40 (n=27)	276.8±0.82 (n=36)	348.1+31.54 (n=20)
Short rainy season	1.3+0.15 (n=28)	522.5+27.08 (n=24)	275.5+ 1.16 (n=29)	376.1+43.31 (n=24)
Dry season	1.6+0.18 (n=20)	648.1+57.40 (n=10)	276.7+1.05 (n=19)	340.5+43.47 (n=15)

Table 3: Analysis of factors affecting reproductive performance of Boran cows at Tatesa cattle breeding center.

Parameters	Factors		Mean ± SE	95% CI	t-Value	P-Value
CI	Season (N=128)	Short rainy n=56)	553.8 ± 22.6	509.0-598.6		
		Dry season (n=39)	641.6 ± 28.4	585.4-697.8	2.49	0.014*
		Long rainy (n=38)	655.7 ± 19.6	617.0-694.4	3.27	0.001**
	Parity (N=109)	1				
		2 (n=63)	651.6 ± 19.8	612.4 -690.8		
		= 3 (n=46)	582.9±23.02	537.3- 628.5	2.26	0.026*
NSC	Season (N=202)	Short rainy (n=59)	1.4 ± 0.09	1.21 - 1.57		
		Dry season (n=54)	1.9 ± 0.14	1.59 - 2.15	3.04	0.003**
		Long rainy (n=89)	1.5 ± 0.08	1.33 - 1.66	0.74	0.459
	Parity (N=202)	1 (n=89)	1.4 ± 0.08	1.2 - 1.8		
		2 (n=66)	1.7 ± 0.11	1.5 -1.9	2.01	0.046*
		= 3 (n=47)	1.6 ± 0.13	1.3 -1.8	0.67	0.501
DO	Season (N=118)	Short rainy (n=42)	368.6 ± 30.8	307.5- 429.6		
		Dry season (n=31)	411.3 ± 48.6	315.0- 507.5	0.90	0.368
		Long rainy (n=45)	339.9 ± 19.4	301.4- 378.4	0.67	0.502
	Parity (N=118)	1 (n=60)	356.3 ± 19.0	318.5- 394.0		
		2 (n=30)	327.8 ± 32.0	264.3- 391.2	0.77	0.441
		= 3 (n=28)	307.7 ± 46.8	214.9- 400.0	1.10	0.274
GL	Season (N=187)	Short rainy (n=59)	277.4 ± 0.81	277.3- 279.4		
		Dry season (n=51)	276.9 ± 0.67	275.8- 279.0	0.43	0.670
		Long rainy (n=77)	278.8 ± 0.54	275.6 -278.2	1.13	0.258
	Parity (N=187)	1 (n=84)	277.7 ± 0.51	276.7- 278.7		
		2 (n=61)	277.8 ± 0.67	276.4- 279.1	0.12	0.907
		= 3 (n=42)	277.0 ± 0.97	275.1- 278.9	0.65	0.519

*P <0.05, **P <0.01

is not within the range expected for *Bos indicus* cattle in the tropics and the reported value ranges, 35.1 to 53 months [7, 8]. The finding of this study is in a general agreement with the report of Masama *et al.* [9] who reported 58.3 months from Zimbabwe. But, it is much longer than the various reports from Ethiopia [4,5, 10-12] and other part of Africa [13]. An early study done by Alberro [8] indicted that age at first calving for *Bos indicus* is longer than *Bos taurus* breeds of cattle. Hence, their crosses have shorter age at first calving compared to *Bos indicus*. Management and environmental factors, especially nutrition determines pre pubertal growth rates and reproductive development [4,5, 9]. As Shiferaw *et al.* [4] stated that well managed and fed heifers grow faster and inseminated earlier. So this can result in more economic benefit in terms of distributing and sale of pregnant heifers for smallholder dairy producers.

The mean calving interval of 622.6 days observed in this study is much higher than the 487 and 525 and 551.8 days reported by Shiferaw *et al.* [4] and Haile-Mariam *et al.* [11] for Boran breed and Boran crossbred cows Ethiopia. Among the factors contributing for long calving intervals age of cows, breed of cows, calving season and forage availability in any particular year have to be considered as impact factors. The result of this study showed that cows calved during the short rainy season had significantly (*P <0.05*) shorter calving interval. Cows that calved during the short rainy and the very short dry period (i.e. 1 to 2 months) seasons have shorter calving intervals than the others. Because they entered the breeding phase periods during the long rainy season, which had better nutritional status for normal cycling and conception [13]. The current study showed that days open was 358.1 days for Boran cows, which is much longer than the report of Masama *et al.* [9], Mwatawala and Kifaro [13] and Lyimo *et al.* [14]. Various factors could account for for such longer calving to conception periods including type of management, nutrition, effective heat detection and competence in conducting artificial insemination [4,9,13,14]. The number of parity significantly (*P <0.01*) influenced the calving interval of Boran cows in the center. This finding is in line with the observation of Negussie *et al.* [5], Ibrahim *et al.* [10] and Bekele *et al.* [15] on indigenous and cross breeds. Generally during the second parity longer calving interval was seen due to the fact of lactation stress in young growing animals in early parities. In later parities there is physical maturity with advancing age of cows.

The mean number of service per conception in the current study (1.6±0.6) was in a general agreement with the recorded values for tropical cattle elsewhere [4, 11, 15-17]. On the other hand, Mureda and Mekuriaw [12] and Haile *et al.* [18] reported a relatively higher (2.4 and 2.16 respectively) number of services per conception than in the present study. The significant effect of season (*P <0.01*) on number of services per conception observed in this study is in agreement with Tessema *et al*. [19]. The number of service per conception was higher in the dry season. The significant effect of parity (*P <0.05*) on number of service per conception observed in this study is in agreement with a number of other reports [1, 5, 18]. Appropriate and in time heat detection and insemination could be attributed to lower or higher number of service of per conception.

The finding of this study showed that cows calving during the short rainy season had significantly (*P <0.01*) lower calving interval than those calving during dry season and long rainy season in contrast with the reports of Haile-Mairam *et al.* [11] and Mukasa-Mugerwa *et al.* [20]. Cows calving during the short rainy season and early period of the long rainy season take the advantage of improved pasture and crop in body weight and increase their probability of conception during the early postpartum period which results in shortening of calving interval [11].

From the result obtained during this study it can be concluded that the cows in the center had poor reproductive performance compared to other reports in the country for indigenous and cross breed cows. The range of most of the parameters investigated was longer than the reports of others especially of calving interval, age at first calving and days open. The poor reproductive performance of Boran cows in the breeding center could be due to the management system prevailing in the center. Hence, crossing of Boran breed with pure Friesian breed is mandatory to improve the performance of cows at rural smallholder level and benefited from the animals.

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