

## REPRODUCTIVE EFFICIENCY OF BLRI CATTLE BREED-1 AT FARM CONDITION

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### ABSTRACT

The BLRI Cattle Breed 1 (BCB-1) is a native cattle breed developed by Bangladesh Livestock Research Institute (BLRI) through selective breeding among indigenous cattle of Bangladesh. Data asserted from record sheets of 529 animals maintained during 1992 to 2006 were analyzed to evaluate the reproductive efficiency of BCB-1 cattle in different generations, seasons and parities. The highest percent of animals showed heat during summer season (36.88%) followed by rainy (35.73%) and winter season (27.39%). The highest percent of calving was recorded in summer (43.1%) followed by rainy (31%) and winter (26%). Sex ratio of male: female calves born according to season was the highest in summer (106.31:100) intermediate in rainy (106.06: 100) and lowest in winter (105.00:100). Age at first heat (AFH), age at first calving (AFC), calving interval (CI), service per conception (SPC), gestation length (GL) and post partum heat period (PPHP) of BCB-1 cows were 843.65±17.77, 1225.24±258.92, 451.65±6.51, 1.50±0.83, 283.31±11.50, and 105.51±3.95 days, respectively. AFS and PPHP varied with generation ( $p < 0.01$ ) and that of SPC and PPHP with parity of dams ( $p < 0.05$ ). However, AFC, GL and CI of BCB-1 females did not vary with parity, generation or season of birth. It was concluded that the overall reproductive performances of BCB-1 cattle are within the range of other indigenous cattle of Bangladesh and the at such results of reproductive characteristics may be used for planning cattle breeding strategy of the country.

**Key words :** BCB-1, Reproductive efficiencies

### INTRODUCTION

The BCB-1 is developed through selective breeding among indigenous cattle of the active Brahmaputra & Jamuna flood plain agro-ecological zone (AEZ-14) of Bangladesh. In this region, an assorted type of cattle named 'Pabna' was evolved through admixture of indigenous, Hariana, Tharparker and Sahiwal genetic materials (Nasim, 1965). BLRI collected these cattle and conserved *Ex situ*. A selective breeding program was operated to improve milk and meat production performances of the germplasm. Hence, the animals of the breeding herd were selected based on lactation yield and live weight over the last 14 years. Over the last 14 years, the milk yield was increased up to 5.84 liters /year/cow. Meanwhile, the physical appearances and production performances of the cattle has been

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changed to a distinct feature than that of their progenitor and named as BLRI Cattle Breed-1 (BCB-1). The BCB-1 bulls weigh 450 to 500kg and cows weigh 250 to 350kg at their mature age of 7 years. The cows of the breed produced 900-1000 liters milk in a lactation period of 240-260 days. The animals of the breed are red with a gradual shift to fawn or light brick at the ventral part of the body. The milk production level of the breed has yet to be maximized for profitable cattle farming.

Reproductive performance is of economic importance for livestock enterprises. Because low reproductive performance results in higher levels of involuntary replacement, reduced annual milk production and increased maintenance expenditure. The common factors affecting reproductive performances of animals are genetic make up that accumulates over generation of selection, age of animal, season and many other factors (Alam *et al*, 1988). Seasonal effects on economically important traits of female are of interest because of their association with forage availability and quality, temperature and humidity.

On the other hand, parity and generation may also affect the reproductive performance due to genetic and environmental factors. Therefore, the present study was designed to elucidate reproduction characteristics of BLRI Cattle Breed-1 with respect to generations, seasons and ages of the cow as described by parity.

## MATERIALS AND METHODS

### *Source of data*

The experimental data of the present study were collected from the record sheets maintained at the Cattle Research Farm, Bangladesh Livestock Research Institute (BLRI), Savar, Dhaka. Data recorded during the period from 1992 to 2006 were included in this study. Seasons of the year were classified as winter (October-January), summer (February-May) and rainy (June-September). The recorded data were within 6 parities of cows belonging to five generations (foundation to generation four).

### *Feeding & management system*

In general, heifers and cows were allowed to graze kept on the naturally grown grasses for 4 to 5 hours a day and a mixture of concentrate (wheat bran, khesari bran, til oil cake, soya meal, fish meal, salt) feeds was supplied twice daily (morning and afternoon). Green grass or silage depending on their availability fed to the animals in different period of a year. Urea-molasses treated straw used as basal feed in absence of green grass or silage. Management practices were more or less similar throughout the rearing period. No extra prenatal care and management applied to the animals in the herd. There were no special management cares for dry, pregnant and milking cows other than to supply some more concentrate mixture to the milking cows. However, the amount of concentrates supplied per animal per day depended on its availability. Sometimes animals were kept without any concentrates for days and in some cases only on wheat bran.

**Analysis of data**

The collected data were tabulated and analyzed following univariate analysis of Generalized Linear Model (GLM) procedure using SPSSx computer package. The differences in means were tested using least significant difference (LSD) method.

**RESULTS AND DISCUSSION**

**Breeding pattern**

A total of 1402 breeding records recorded during 1992 to 2006 comprising 517 heats in summer, 501 in rainy and 384 in winter season were analyzed to study breeding pattern of BCB-1cattle. The highest percent of animal’s came into heat during summer season (36.88%) followed by rainy (35.73%) and winter (27.39%), respectively (Fig. 1). The low availability of green grass along with cold temperature of winter season may lead to lower percentage of cows in heat during this season.

**Calving pattern**

Maximum calving took place during summer season (43.1%) followed by 31.19 and 25.71% respectively during winter and rainy season (Fig. 2). This implies that maximum breeding has occurred during summer and rainy seasons. This is important because green grasses availability of the period may support higher milk production of milking animals.

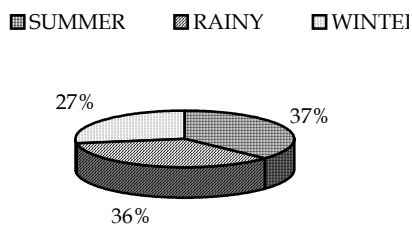


Fig 1. Breeding pattern of BCB-1 cows

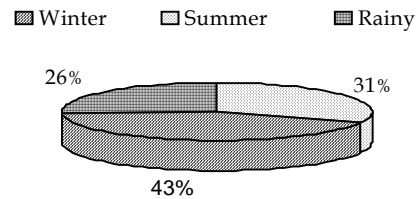


Fig. 2. Calving pattern of BCB-1 cows

**Sex ratio**

Sex ratios of calves according to season of birth and parity are cited in Table 1 and Table 2, respectively. Overall sex ratio of BCB-1 cattle was 105.84 males against 100 females. The sex ratio observed under present study was in close agreement with the findings of Asker and El-Itriby (1957) and Mehrotra and Dey (1998). The sex ratio observed by Mehrotra and Dey (1998) was 110.26 males: 100 females (52.44: 47.56) and that of by Asker and El-Itriby (1957) was 108.33 males: 100 females (52: 48). The higher number of male calves compared to female calves has economic advantages in beef farming. Because, male calves grown faster than that of female and price of meat from male is always higher than its counterpart. The ratio was nearly uniform throughout the year. Mehrotra and Dey (1998) in their study found uniform sex ratio throughout the year.

Table 1. Sex ratio of calves born in different seasons of a year

Season	Observation	Male : Female
Winter	164	105.00 : 100
Summer	229	106.31 : 100
Rainy	136	106.06 : 100
Pooled	529	105.84 : 100

Virgin and fresh cows have a higher tendency of delivering female calves than older cow.

Table 2. Ratio of male and female calves born in different parities of dams

Parity	Observation	Male : Female
First	162	095.18 : 100
Second	115	091.67 : 100
Third	74	124.24 : 100
Fourth	61	110.03 : 100
Fifth	41	127.78 : 100
Sixth	31	121.42 : 100
Seventh	29	123.08 : 100
Eighth	16	128.57 : 100

#### *Age at first estrus*

BCB-1 heifers came into first estrus at  $843.65 \pm 17.77$  d of age. However, few early maturing heifers of the breed came into first heat as early as 483 d of age and that of 1373 d for late maturing heifers. In general, BCB-1 heifers came into first heat at younger age than other indigenous genetic groups ( $1283.19 \pm 41.93$  d for non-descript, Rahman *et al.*, 1987; 1350 d for non-descript, Jabbar and Ali, 1988; 1177 d for Pabna cattle, Hoque *et al.*, 1999). Age at first heat increased ( $p < 0.01$ ) by 85 days in second generation and that of 57 days in third generation. Continual interrupted nutritional environment in association with weak recording system may lead to the delaying of first heat in subsequent generation.

Table 3. Reproduction performances of BCB-1 cattle

Parameter	Mean $\pm$ SD	Minimum	Maximum
Age at first heat (d)	$843.65 \pm 17.77$ (104)	483	1373
Age at first calving (d)	$1225.24 \pm 258.92$ (114)	769	2154
Calving interval (d)	$451.65 \pm 6.51$ (306)	316	909
Services per conception	$1.50 \pm 0.83$ (419)	1	5
Gestation length (d)	$283.31 \pm 11.50$ (395)	221	327
Post partum interval to heat (d)	$105.51 \pm 3.95$ (309)	23	567

Figure in the parenthesis indicates number of observations

**Age at first calving**

BCB-1 cows calved for first time at  $1225.24 \pm 258.92$  d of age. The ages for first calving of other indigenous cattle were in close agreement with BCB-1 cattle. The age at first calving of North Bengal Grey and Red Chittagong cattle was  $1190.70 \pm 118.05$  d (Al-Amin, 2004) and  $1246.08 \pm 121.66$  d (Ghose *et al.*, 1977), respectively. On the other hand, Jabber and Green (1983) reported older age of Non-descript cattle at their first calving (1394.3 d). Age at first calving of BCB-1 cattle did not vary ( $p>0.05$ ) with birth seasons as well as generations.

**Calving interval**

The average interval between two successive calving of BCB-1 cows was  $451.65 \pm 6.51$  d. The calving interval (CI) however, may be as short as 316 to as high as 909 d. Calving interval did not vary ( $p>0.05$ ) among different generation, parity and calving seasons. Earlier reports on CI of BCB-1 cattle demonstrated by different researchers (Ghose *et al.*, 1977; Khan *et al.*, 1999; Deb, 2004) corroborated with present findings. Calving interval of Pabna cattle was  $447.94 \pm 4.56$  to  $489.52 \pm 75.70$  d. Moreover, calving interval of RCC ( $409.9 \pm 17.8$  to  $529.35 \pm 127.54$ , Ghose *et al.*, 1977; Mondal, 1998; Khan *et al.*, 1999; Habib *et al.*, 2003) and Non-descript cattle ( $445.00$  to  $536 \pm 110$ , Majid *et al.*, 1995; Rahman *et al.*, 2001) justifies the present results.

Table 4. Reproduction performances of BCB-1 cows in different generations

Parameter	Generation (mean $\pm$ SE)				Sig. level
	G-F	G-1	G-2	G-3	
AFS (d)	-	769.27 $\pm$ 31.97 (30)	853.98 $\pm$ 26.08 (46)	911.19 $\pm$ 32.03 (26)	**
AFC (d)	1204.17 $\pm$ 487.16 (6)	1208.58 $\pm$ 252.28 (48)	1244.76 $\pm$ 254.29 (46)	1227.21 $\pm$ 186.87 (14)	NS
CI (d)	468.04 $\pm$ 16.28 (46)	434.38 $\pm$ 10.53 (120)	452.27 $\pm$ 10.53 (108)	490.78 $\pm$ 21.27 (32)	NS
PPHP (d)	121.93 $\pm$ 16.08 (43)	96.10 $\pm$ 5.02 (130)	103.92 $\pm$ 5.98 (108)	130.11 $\pm$ 13.64 (28)	*
SPC (no.)	1.57 $\pm$ 0.92 (87)	1.40 $\pm$ 0.75 (178)	1.58 $\pm$ 0.92 (137)	1.35 $\pm$ 0.61 (17)	NS
GL (d)	281.58 $\pm$ 8.07 (78)	282.75 $\pm$ 9.71(170)	283.70 $\pm$ 13.86 (130)	284.94 $\pm$ 16.04 (17)	NS

AFC: age at first service; AFC: age at first calving; CI: calving interval; PPHP: postpartum heat period; SPC: service per conception; GL: gestation length; G-F Foundation generation, G-1: first generation; G-2: second generation; G-3: third generation, \*: Significant at 5%; \*\*: Significant at 1%; NS: Not significant; Figure in the parenthesis indicates number of observations

**Post partum interval to estrus**

The interval between calving and estrus followed by calving was  $105.51 \pm 3.95$  d. The earliest day of first heat after calving was 23 d and in some cases it was as long as 567 d. The present result is lower than the published information for other cattle ( $138.80 \pm 8.18$  to  $160.72 \pm 80.26$  d, Khan *et al.*, 1999; Roy, 1999), RCC ( $139.20 \pm 9.64$ , Khan *et al.*, 1999) and Non-described cattle ( $108.30 \pm 208.65 \pm 16.09$ , Majid *et al.*, 1995 and 1998; Rahman *et al.*, 2001; Uddin, 2001). Cows of first and second generation had shorter ( $p<0.05$ ) post partum heat period (PPHP) than cows of foundation and third generation (Table 4). PPHP varied

( $p < 0.01$ ) with age of cows (Table 5). Fresh cows come into heat later than older cows. Longer PPHP in third generation may be attributed by the fact that most of the cows in third generation were fresh.

Table 5. Reproduction performance of BCB-1 cows in different parities

Parameter	Lactation number						Sig. level
	First	Second	Third	Fourth	Fifth	Sixth	
CI (d)	490.51±126.5 (95)	444.11±111.8 (75)	424.29±83.7 (56)	446.12±126.4 (43)	432.96±96.2 (28)	401.94±54.0 (16)	NS
PPHP (d)	140.77±9.1 (100)	108.17±7.5 (75)	88.54±7.4 (56)	98.30±9.9 (46)	79.00±9.9 (29)	80.11±10.4 (18)	**
SPC (no.)	1.24±0.5 (119)	1.55±0.9 (99)	1.53±0.8 (73)	1.50±0.9 (58)	1.93±1.2 (41)	1.71±1.1 (28)	*
GL (d)	282.77±13.0 (115)	283.95±12.4 (94)	282.76±11.4 (67)	284.13±5.7 (55)	280.79±12.2 (39)	287.00±9.1 (25)	NS

CI : calving interval; PPHP : postpartum heat period; SPC: service per conception; GL : gestation length; \* : Significant at 5%; \*\* : Significant at 1%; NS : Not significant; Figure in the parenthesis indicate number of observations

### Gestation length

Gestation length of BCB-1 cows varied from 221 to 327d with a mean of  $283.31 \pm 11.50$  d. The findings of the present study were within the published average gestation length of RCC (276.53 to  $287.00 \pm 1.43$ , Mondal, 1998; Khan *et al.*, 1999), North Bengal Gray ( $280.80 \pm 1.32$ , Al-Amin, 2004), and Non-descript ( $273.48 \pm 2.30$  to  $283.44 \pm 8.13$  d, Majid *et al.*, 1995; Sultana and Bhuiyan, 1997; Rahman *et al.*, 2001). Cows carried male calves in their wombs continued gestation for longer period ( $p < 0.05$ ) than female calves ( $284.31 \pm 12.08$  vs.  $282.25 \pm 10.76$  d). Heavier weight of male calves compared to female may lengthen the gestation length. There were no differences ( $p > 0.05$ ) in gestation length among different generations and parities (Table 4 & Table 5).

Table 6. Reproduction performance of BCB-1 cows in different seasons of a year

Parameter	Season (mean ± SE)		
	Winter	Summer	Rainy
CI (d)	457.04 ± 99.58 (82)	442.03 ± 116.39 (138)	461.57 ± 120.47 (93)
AFC (d)	1216.25 ± 254.45 (36)	1254.56 ± 288.65 (45)	1195.06 ± 221.61 (33)
SPC (no.)	1.49 ± 0.80 (110)	1.45 ± 0.82 (186)	1.57 ± 0.92 (123)

CI : calving interval; PPHP : postpartum heat period; SPC : service per conception; GL : gestation length; \* : Significant at 5%; \*\* : Significant at 1%; NS : Not significant; Figure in the parenthesis indicate number of observations; All parameters showed non-significant differences.

**Services per conception**

BCB-1 cattle required  $1.50 \pm 0.83$  services to deliver a calf. But it varied from minimum 1 to maximum 5 services. Breeding seasons and generations had no effect ( $p > 0.05$ ) on number of services required for each conception (Table 4 & Table 6). The number of services required for each conception varied ( $p < 0.01$ ) among cows with different parities. Heifer received fewer services than older cows (Table 5). The fact was that fertility declined with age of the cows.

It may be concluded that most of the traits of BCB-1 were found independent over generation, parity and season of birth of animal. The reproductive characteristics of BCB-1 cattle seem to be very similar to other indigenous cattle of the country.

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