Reproductive and Productive performances of Black Bengal Goats reared by the NGO Beneficiaries under semi intensive system in Bangladesh

Halim MA[1*], Kashem MA[2], Mannan A[3], Ahmed SSU[4] and Hossain MA[5]

[1]Department of Agricultural Economics and Social Science, [2]Department of Microbiology, [4]Department of Medicine and Surgery, [5]Department of Pathology and Parasitology, [3] SAQ teaching Veterinary Hospital, Chittagong Veterinary and Animal Sciences University (CVASU), Khulshi-4202, Chittagong, Bangladesh.

ABSTRACT

The present study was carried out to investigate the reproductive and productive performances of Black Bengal goats reared by moderate and ultra-poor households at three different districts of Bangladesh during March, 2008 to June 2009. Two-stage stratified sampling procedures were applied for selection of farmers to conduct field base experiment. A total of 12 households from moderate poor and 12 from ultra- poor were selected purposively from selected NGO beneficiaries. Three separate ultra poor households were also selected for rearing of bucks for breeding of the does of the study areas. As a whole, 81 goats rearing households from 3 districts came under the study. The average (mean±SE) age at puberty, services per conception, gestation period, age at first kidding, post partum heat period and kidding interval were found to be 234.16±6.54 days, 1.22±0.25 numbers, 145.61±2.17 days, 361.83±11.29 days, 67.00±4.97days and 252.45±3.57days, respectively. The effect of herd size on age at first kidding was significant at $P<0.05$, whereas on age at puberty and kidding interval it was found significant at $P<0.01$. The average weight at puberty, weight of kids, weaning weight, litter size, milk yield/day, milk yield/lactation and lactation period were found to be 10.01±0.19kg, 0.93±0.03kg, 4.82±0.53kg, 1.68±0.001 numbers, 75.20±15.22 ml, 5.18±1.11 liters and 69.83±10.09 days, respectively. Body weight of goats at puberty and weaning weight of kids found to be significant among groups at $p<0.05$ whereas milk yield/day found to be significant at $p<0.01$. Thus, it could be recommend that the body weight at puberty, weaning weight, milk yield/day, age at first kidding, age at puberty and kidding interval of Black Bengal Goat have significant impact on rearing.

Key words: Reproductive and productive traits, Black Bengal goat, moderate and ultra-poor households

INTRODUCTION

Bangladesh is one of the poorest and densely populated country, having about 145 millions of people in its 144750 sq. km of area with a per capita annual income of USD 482 and about 49.00% of population of the country is female [1]. The goat secures second position in terms of meat, milk and skin production, representing about 38.0, 23.0 and 28.0%, respectively to the total contribution of livestock in Bangladesh [2]. Black Bengal goats in different parities are reared in semi-intensive system where the goats are grazed once and concentrate supplement is fed at the rate of 300, 200 and 100 g/d to doe, buck and kid, respectively. Different reproductive and productive characteristics of the Black Bengal goats were recorded during 2 years. Reproductive and productive performances of Black Bengal Goat were better in 3rd parity than that of the 1st and 2nd parity [3]. Black Bengal goats play an important role as high quality meat producing animal in Bangladesh. The meat of Black Bengal goat is accepted by people of all community irrespective of caste, creed and religious taboo. Goats have been recently recognized as a tool of poverty alleviation. In some areas goats contribute up to 41% of the total income of the farm [4]. Reproductive performances are always considered to be the most vital factor ensuring to increase the productivity in certain environmental situation. The present study was undertaken to determine the productive and reproductive performances of goats reared by moderate and ultra poor households. The productive performances of the goats were measured in terms of body weight at puberty, birth weight of kids, weaning weight, litter size, lactation length, milk yield per lactation and per day milk yield. The re-production performances of the goats took into account the age at puberty, age at first kidding, gestation period, services per conception, post partum heat period and kidding interval.

MATERIALS AND METHODS

*Corresponding author: halimcv2002@yahoo.com

Selection of study areas

Two stages stratified sampling procedures were applied for selection of farmers to conduct field base experiment. In the first stage, 3 districts were selected purposively from MFTSP areas under PKSF. Subsequently two villages were selected from an Upazila under each district. The selected villages were Domrakandi and Betbaria under Faridpur Sadar Upazilla; Gutia Dakkhin Para and Madhya Para under Uzirpur Upazila of Barishal and Uttar Chowtul and Sayedpara of Habiganj sadar upazila.

Selection of goat rearers

Two types of goat rearers were selected from the beneficiaries of PKSF funded NGOs in three selected districts and categorized as moderate and ultra poor households. The selected NGO were PPSS at Faridpur, CCDA and BEES at Habiganj; and Padakhep Manobik Unnayan Kendra (PMUK) at Barishal district. The necessary preliminary data related to the objectives of the study were collected from the working NGOs and finally by interviewing the selected targets from which final targeted beneficiaries were selected. A distinction was made between ultra poor and moderate poor households as the beneficiaries occupying only homestead areas having no crop land areas and calorie intake less than 1800 kcal/day were termed as Ultra poor households; and those occupying homestead area, a land area of up to 0.50 acres and calorie intake less than 2122 kcal/day were termed as moderate poor households. A total of 12 households from moderate poor and 12 from ultra- poor were selected purposively from among selected NGO beneficiaries. As a whole, 72 households came under the study for rearing goats. Three separate ultra poor households were also selected from two adjacent villages for rearing of bucks (as buck rearer) for breeding of the does of the study areas as well as for serving other does of neighboring areas at a reasonable rate. As a result in total 81 goats rearing households from 3 districts came under the study.

Distribution criteria of goats and bucks

A total of 168 number of six month-aged does and 9 breeding bucks were distributed among two types of beneficiaries at three locations. Both the moderate and ultra poor households were divided according to herd size such as herd size 1, 2 and 3 with 1, 2 and 4 numbers of goats, respectively. Breeding bucks were given to three separate beneficiaries in each selected district.

Method of data collection and reliability of data

The necessary data related to the objectives of the study were collected from standard record keeping books by locally employed Field Assistants during the experimental period from March 2008 to June 2009. The collected data were cross verified through visiting the areas as well as comparing the collected data by the Field Assistants. The data were edited and coded in the project management office at CVASU and all the collected data were processed and analyzed carefully.

Recycling of weaning kids and distribution to NGO beneficiaries

One female kid was recycled from each survived goat during project life and was distributed to the selected NGO beneficiaries in every area for sustainability of further goat rearing in the respective areas.

Analytical technique and Estimation of economic profitability

The collected data from record keeping books were edited and coded for analysis in accordance with the objectives of the study. All data processing included field and office editing, coding and tabulation. The data entry template was designed in Microsoft Excel. Consistency cross checks and keystroke errors were also detected and corrected accordingly before further processing. The farm business analytical techniques were used for determination of "per goat per year net profitability". Data were also analyzed using descriptive statistics like mean, percentage, ratios and ranking.

RESULTS AND DISCUSSION

Reproductive performances

Reproductive performance of Black Bengal goats was measured in terms of age at puberty, age at first kidding, gestation period, conception rate, post partum heat period and kidding interval according to herd sizes of moderate and ultra poor households, as shown in Table 1.

Age at puberty

The average age of puberty of Black Bengal goats under semi-scavenging farming system was 234.16 ± 6.54 days. Age at first heat varied considerably between goats and was found to be 223.33, 236.33 and 242.84 days in herd size-1, herd size-2 and herd size-3, respectively, the effect of herd size was significant (P<0.01). Similar findings were observed by Chowdhury *et al.* [5]. On the other hand, it was reported the age at first heat as 250 days in Black Bengal goats reared under farmer's condition [6]. Chowdhury *et al.* [5] observed that season and feeding level affected age at first heat but rearing system had no effect.

Services per conception

Difference of services required per conception was not significantly different in 1st and 2nd parities. The average number of services per conception was found to be 1.22±0.25. It was lower than that reported by Chowdhury *et al.* [5] under same management system. It was not affected by the feeding level and parity [5,6].

Gestation period

The gestation length (average) of Black Bengal Goats was 145.61±2.17 days. Gestation period of Black Bengal goats seems to be fairly constant at

Table-1: Reproductive performances of goats according to herd sizes and type of beneficiaries

Reproductive Traits	Moderate Poor (N=36)			Ultra Poor (N=36)			All herd (N=72)		
	Herd Size-1	Herd Size-2	Herd Size-3	Herd Size-1	Herd Size-2	Herd Size-3	Mean ±S.E	F-value	Significance level
Age at Puberty (days)	201.67	221.67	231.67	245.00	251.00	254.00	234.16 ± 6.54	9.87	**
Service per conception	1.07	1.23	1.30	1.17	1.27	1.30	1.22 ± 0.25	0.179	NS
Gestation Period (days)	141.00	144.67	147.67	144.33	147.00	149.00	145.61 ± 2.17	0.168	NS
Age at First Kidding (days)	346.67	360.00	354.67	353.33	363.33	375.00	361.83±11.29	4.67	*
Post Partum heat period (days)	57.67	64.67	68.00	66.33	72.00	73.33	67.00 ± 4.97	2.52	NS
Kidding Interval (days)	223.33	245.00	256.67	246.67	268.33	275.00	252.45 ± 3.57	8.32	**

**Significance at P<0.001; Significance at P<0.05; NS=Non significance

around 146 days [7] yet it may be affected by factors like season, year, sire, litter size, kidding age of dam, parity, birth weight of kid, weight of dam at mating, generation and kidding intervals [5]. Scientists [8] observed that the gestation length was affected by litter size and sex of kids. These factors did not affect length of gestation in Black Bengal goats in this study.

Age at first kidding
The average age at first kidding of the does distributed in three districts was observed as 361.83±11.29 days, which differed significantly due to herd size (P<0.05). This value is lower than the findings made by Chowdhury *et al.* [5] who reported that the average age at first kidding in semi-intensive rearing system was 405 days.

Post partum heat period
The overall mean post partum heat period in goats was 67.00±4.97 days in this study. This is supported

by the observation of Chowdhury *et al.* [5] with an exception of scavenging system in which case it was reported to be 125 days for the first generation and 70 days for the second generation. Shorter post partum heat period of 60 days in Black Bengal goats was also reported by Devendra and Burns [7]. Relatively shorter post partum heat period as was observed in the semi-intensive and intensive system supported the present study. Apparently, the better management and nutrition seem to be the most important contributing factors responsible for shortening the post partum heat period.

Kidding interval
The average kidding interval at 2nd parity was found to be 252.45±3.57 days which was significantly higher than the 1st parity (P<0.01). These results suggest that kidding interval might be reduced with age of Black Bengal Goat. The present experimental findings corroborate with those of Chowdhury *et al.* [5]. This is probably due to proper physiological

Table-2: Productive performances of goats according to herd sizes and type of beneficiaries

Productive Traits	Moderate Poor (N=36)			Ultra Poor (N=36)			All herd (N=72)		
	Herd Size-1	Herd Size-2	Herd Size-3	Herd Size-1	Herd Size-2	Herd Size-3	Mean ±S.E	F-value	Significance level
Body weight at puberty (in kg)	11.00	10.47	9.73	10.10	9.73	9.03	10.01± 0.189	3.310	*
Birth weight of kids (in kg)	1.07	0.97	0.85	0.97	0.89	0.83	0.930 ± 0.026	0.131	NS
Weaning weight (in kg)	5.40	5.03	4.57	5.00	4.60	4.10	4.82 ± 0.525	2.389	*
Litter size (in nos.)	1.77	1.83	1.72	1.59	1.68	1.51	1.68 ± 0.001	0.001	NS
Milk yield per day (in ml)	79.53	95.86	77.10	79.38	69.90	49.45	75.20 ± 15.22	4.150	**
Milk yield per lactation (in liters)	5.70	6.55	5.14	5.61	4.80	3.28	5.18± 1.11	1.230	NS
Lactation period (in days)	71.67	68.33	66.67	70.67	68.67	66.33	69.83 ± 10.09	1.321	NS

**Significance at P<0.01; *Significance at P<0.05; NS = Non significant

function of organs and glands involved in hormonal surge for onset of estrous and ovulation with advancement of age. Moreover, average kidding intervals of 235.00, 256.67 and 265.67 days were observed for herd size-1, herd size-2 and herd size-3 respectively in this study. In this regard, the kidding interval of Black Bengal goats ranged from 255 to 300 days in animals reared under village conditions, as was reported by Husain *et al.* [9] which support the present observation. Amin *et al.* [6] also observed 211 days kidding interval of the same breed in similar rearing condition. Shortening of kidding interval from 192 days at low feeding level to 177 days at high feeding level was observed by Chowdhury *et al.* [5].

Productive performance
The productive performance of Black Bengal goats was measured in terms of body weight at puberty, birth weight of kids, weaning weight and litter size, lactation length, per lactation milk yield and per day milk yield according to herd sizes for moderate and ultra poor households in the study areas (Table1).

Body weight at puberty
The body weight of goats at puberty was higher in moderate households (average 10.4 kg) than that of ultra poor households (average 9.62 kg). The average body weight at puberty for all herd size was found to be 10.01±0.189 kg, which differed significantly among groups (P<0.05). This value is almost similar to 8.89 kg for goats reared under the same system [5].

Birth weight
The average birth weight of kid was observed as 0.93±0.026 kg. In both intensive and semi-intensive conditions, birth weight of kids gradually decreased with the increase of litter size. So, there was a negative correlation between birth weight and litter size [8]. Birth weight is positively correlated with growth rate, adult size and kid viability [7]. Chowdhury *et al.* [5] reported that birth weight was higher (1.49 kg) in intensive management than that of semi-intensive management system (1.28 kg). These workers also observed that heavier birth weight was an indication of reduction of kid mortality and increase of kid growth rate. The observed results indicate that, birth weight of kids decreased with increase of herd size due to lack of proper management and feeding practices at rural level.

Weaning weight
The average weaning weight for herds of all sizes was found to be 4.82±0.525 kg, the difference was statistically significant among groups (P<0.05). The weaning weights of kids at 3 months of age observed in herd size-1, 2 and 3 were 5.20, 4.92 and 4.33 kg, respectively. In this study, it was found that the weaning weight was higher in herd size-1 and herd size-2 than herd size-3. The weaning weight of Black Bengal goats was 6.56 kg [5] for intensive and semi-

intensive condition, which supports our findings. The weaning weight depends on adequate supply of nutrition and low weaning weight is mainly due to malnutrition, poor hygienic management and inadequate health status of doe [9]. The weaning weight falls with the increase in number of goats in a herd of both moderate and ultra-poor households.

Litter Size
Litter size means the average number of kid born per kidding and it increased from first parity up to third parity. The litter size of the goats in first parity was found to be of single kid comprised 67.17%, whereas twin comprised 32.83% of the total kids born, while in the second parity single, twin and triplet kids birth were found to be 21.10, 61.45 and 17.45%, respectively considering all herd sizes. These observations corroborate with the findings of Hassan *et al.* [3]. The average litter size was found to be 1.68±0.001 in both moderate and ultra poor households.

Milk yield
The average milk yield for all herd sizes was observed to be 75.20±15.22 ml/day and the difference was statistically significant among herds (P<0.01). The average milk yield/day in a parity increased up to 4 weeks. Then after the 4th week, there was a gradual decrease till the end of lactation. The values for the average milk yield/day/goat of moderate and ultra poor households were found to be 79.46, 82.88 and 63.28 ml for herd size 1, 2 and 3, respectively in the present study, which was much lower than the reported value of Chowdhury *et al.* [5]. Similarly, the value of this study was also lower than that reported for rural scavenging condition by Husain [10]. The variation of milk yield might be due to differences in feeding and management practices by the moderate and ultra poor households.

Lactation yield
The present study showed that average lactation yield was 5.18±1.11 liters. In this study, it was also found that lactation yield increased from first parity to second parity. The lactation yield recorded in the present study is lower than the findings made by Chowdhury *et al.* [5]. Milk yield/lactation might have been affected by nutrition. Lactation yield was positively correlated with the nutrition, age, genotype and season [5,11]. Differences of genotype in total lactation yield were evident [11]. Moreover, milk was suckled by kids during the day when they were allowed to room with mother. Therefore, the data were based on partial milking and it only provided a trend of milk yield rather total yield of does.

Lactation length
The average lactation length observed for moderate and ultra poor households was 69.83±10.09 days. This value is lower than the findings of Chowdhury *et al.* [5]. It was reported that lactation length of Black Bengal goats was 98-105 days under rural

scavenging condition [9] which differs with the present study because lactation length might have been affected by age and management factors.

CONCLUSIONS

From the present findings it can be concluded that improved feeding and better management practices may help in higher reproductive and productive performances of Black Bengal goats that would be profitable for goat rearing at rural areas in Bangladesh.

ACKNOWLEDGEMENTS

REFERENCES

1. BBS (2007). Statistical Year Book of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Government of the Peoples Republic of Bangladesh.

2. FAO (Food and Agricultural Organization of the United Nations) (1997). Production Year Book. *Rome, Italy*. 53: 213-219.

3. Hassan MM, Mahmud SMN, Islam SKMA and Miazi OF (2007). A comparative study on reproductive performance and productivity of the Black Bengal and cross bred goats at Atrai, Bangladesh. *Univ. J. Zool. Rajshahi Univ.* 26: 55-57

4. Husain SS (1993). A study on the productive performance and genetic potentials of Black Bengal goats. Ph.D. Thesis. Bangladesh Agricultural University, Mymensingh. 3-108.

5. Chowdhury SA, Bhuiyan MSA and Faruk S (2002). Rearing Black Bengal goats under semi-intensive management 1. Physiological and reproductive performances. *Asian- Aust. J. Anim. Sci.* 15(4): 477-484

6. Amin MR, Hussain SS and Islam ABMM (2001). Reproductive peculiarities and litter weight in different genetic groups of Black Bengal does. *Asian-Aust. J. Anim. Sci.* 14(3): 197-301

7. Devendra C and Burns M (1983). Goat Production in the Tropics (revised edition). *Commonwealth Agricultural Bureaux. Slough, U.K.*

8. Amoah EA and Bryant MJ (1983). Gestation period, litter size and birth weight in goats, *Anim. Prod.* 36: 105–110.

9. Hussein MZ, Naidu R, Turuki I and Singh R (1983). Goat production and development in Fiji. *World Anim. Rev.* (FAO). 48: 25-32.

10. Husain SS (1999). Sustainable genetic improvement of economic traits of Black Bengal goats through selective and cross breeding. *Bangla. Agric. Univ. Res. Prog*. 10: 72-80.

11. Mia MM, Ali A and Howlider MAR (1993). Growth performance of Black Bengal, Barbari, Anglo-Nubian and Barbari × Black Bengal goats. *Indian J. Anim. Sci*. 63(11): 1214-1215.