**Chapter one**

**INTRODUCTION**

There are about 300 breeds and varieties of goats domesticated in the India and Indian subcontinent. In Bangladesh, it constitutes about 7% of the total Asiatic goat population which accounted for 25.17 millions heads (DLS, 2010). Goats have been an integral component of farming system and support a large rural population of landless and marginal farmers. Black Bengal goat, Jamunapari goat and their crosses are available in our country. Among them 90% of the goat is Black Bengal goat and remaining 10% are Jamunapari and their crosses.

The Jamunapari is the tallest breed and commonly known as the *Pari* (Angel) in its area of origin - Uttar Pradesh - because of its majestic appearance. The number of this breed in Bangladesh is not known, but most are found in Chuadanga, Meherpur, Kushtia, Jhenidah, Pabna, and Jessore districts (Faruque and Khandoker, 2007). It is dual purpose breeds for its milk as well as meat production. It is also prolific, twin and triplet births being common (Khan and Singh, 1989). It has proven to be most suitable to tropical climates and has consequently been used widely for upgrading indigenous stock for meat and milk in various countries.

Black Bengal goats graze on barren and road-side land with grass and least homemade supplies such as rice gruel, various tree leaves such as jackfruit leaves, mango leaves etc. But in case of Jamunapari goat most of farmers fed wheat bran, motor bran, gram chuni, banana residues in addition to the mentioned above.

Recently, goat rearing is considered as an effective tool for poverty alleviation as it requires less investment and less rearing cost. Bangladesh government adopted a nation campaign on goat rearing to reduce the poverty. Different NGOs has also been coming up for poverty alleviation through Black Bengal goat distribution.

Several mathematical models such as linear regression, multiple regression, logistic, non- linear models can assist in better understanding of farming system by estimating productivity from the incomplete or partial collected data. It also reduces the confusion for calculating the yield by estimating its parameters. The different fit statistics such as R², Root Mean Square Error (RMSE), and Co- efficient of variation (COV) can be used to study the fitness of actual and predicted data. The higher the R² value higher the fitness (Khan et al, 2012).

In Bangladesh the farmers are rearing goat under extensive system and in this system control measures on feeding, vaccination and treatment is not possible. If semi-intensive systems could be introduced which will allow to use all the measures. How the production systems would affects on live weight, live weight gain and other productive traits has not been any clear indication. Moreover, very little number of findings are available for semi-scavenging system with different breeds (Black Bengal, Jamunapari and their crossbreds),Therefore, the current study was **undertaken with Black Bengal and Jamunapari goat to investigate the following objectives:**

 (1) To know the management practices of goat rearing under semi-intensive conditions.

(2) To know the weight at birth, weight and age at weaning and sexual maturity of goats.

(3) To know the weight gain up to weaning and sexual maturity by fitting the linear regression equation.

 **Chapter Two**

 **REVIEW OF LITERATURE**

Management includes: feeding, breeding, housing, medication and treatment, marketing and overall care. Generally for the following events/purpose: buck management, wether management, doe management, pasture/grazing management, health and sanitation including disease prevention (vaccination), marketing, transportation, carcass and waste disposal.

There are several breeds such as Black Bengal, Jamunapari, Beetal and their crossbreds can be found in Bangladesh. And the total goats population is about 25.17 million (DLS, 2010) and out of this about (90%) are Black Bengal Goat (Amin et al, 2001). Goats of Bangladesh are called the poorman’s cow because their initial investment is lower, maintenance cost lower and special of high prolificacy, high fertility, early sexual maturity, adaptability to hot humid conditions and superior quality of meat and skin. (Amin et al, 2001; Husain et al, 1996, 1998). but there are some drawback of this goats are reported to be slower in growth, low producer of milk, higher kid mortality (Honhold, 2001; Husain et al, 1996, 1998).

Goats are small in size so that they do not require more management skills and can easily be handled and managed by women and children.

**Housing:**

Goats of Bangladeh are usually reared by extensive system. (Bera *et al*, 2008; Faruque , 2007; Hossain *et al,* 2003; Salim et al, 2002 ) but they produces lower milk and which is not sufficient for twin or triple kids. So this system of production causes reduced growth rate and poor reproductive performance, which in turn results in severe economic losses. However goats can be reared in semi-intensive and intensive conditions.

Hossain *et al.,* (2004) was found that all does were kept on the wooden platform of concrete house and kids are kept in a specially designed wooden brooding pen. On the other hand an experiment conducted by Malan (2000) under intensive management and provides adequate nutrition kidding and recorded faster growth at 7 to 8 months.

Sabdullah *et al.,* (1991) was observed very few farmers provide separate houses for goat. They are housed on the verandah, corridor, cow shed, and kitchen and in the open yard of the homestead. It has been found that 47% of the goats are housed in an open shed and 30% in the cow shed while the remainder are kept in the house.

 **Feeding:**

Goats are allowed to graze in the farm from 8 am to 5 pm with 1 hour rest (1-2 pm). (Bera *et al*, 2008; Hossain *et al,* 2004; Hossain *et al,* 2003; Salim et al, 2002; Saadullah *et al,* 1991). A concentrate mixture consisting of maize, wheat bran, rice polish and soybean meal was fed twice daily at 8.00 am and 5pm. Adlibitum green grasses were supplied to buck daily. Fresh drinking was made available throughout the study period. Sometimes, mother does with small kids are kept tethered besides the house.

Concentrate supplementation improved growth rate of goats under grazing condition and increasing rates of gain with increasing level of concentrate in the diet (Mushi et al, 2009; Turner et al, 2005; Haddad 2005; Cameron et al, 2001; Salim et al, 2002; Johnson and McGowan, 1998). However, animals lost live weight without supplementation under the same feeding regime. Therefore, feeding of grazing goats with concentrate supplement may be suggested to optimize growth performance.

Salim et al., (2002) was reported that certain reproductive parameters such as age at puberty, gestation weight and kid birth weight may be improved by supplementary feeding of concentrate.

 **Breeding:**

All does were naturally mated at 24 hours after onset of estrus and at the mating does were found to the pregnant. (Hossain *et al,* 2004; Hossain *et al,* 2003; Saadullah *et al,* 1991). The average age and weight of bucks were 18 ± 1.25 month and 20 ± 2.5kg. Respectively all the does were naturally mated at 24 hours after onset of estrus .In most of the cases availability of fully matured breeding bucks in the villages is rare since most of them are castrated at an early age as people prefer meat from castrated goat. Grayling (2000) reported that Seasonal fluctuations in both day length and temperature are key factors in determining the length of the breeding season in small ruminants. The breeding season is initiated as day length decreases.

**Growth:**

**Birth Weight:**

The birth weight of male and female Black Bengal goat kids was 1.24 ± 0.036 kg and 1.19 ±0.128 kg, respectively in semi-intensive management. Relatively higher birth weight of male

Kid has also been reported by many authors (Hassan *et al,* 2010; Amin et al. 2001; Chowdhury et al, 2002; Hussain, 1999; Husain et al, 1997). But also observed the litter type did not affect birth weight of kid but birth weight of male kid was significantly affected by the feeding level and parity. Birth Weight is positively correlated with growth rate, adult size and kid viability.

Chowdhury et al., (2002) reported the birth weight is 1.49 kg in intensive management which is higher than Semi-intensive management 1.28 kg. Heavier birth weight is an indication of better nutrition and health for higher of kids weaned reduction of kid mortality and increase growth rate of kid. Hassan *et al., (*2007) observed that the birth weight of Black Bengal goats and Crossbred goats were 1.5 kg and 2.0 kg respectively under traditional farming. Rout *et al.,* (1999) reported that female Jamunapari weighed about 3.7 kg at birth, 18.6 kg at six months, and 39.7 kg at 12 months.

**Weaning weight:**

Chowdhury et al., (2002) reported that the weaning weight of Black Bengal kids were 6.56 kg and 4.87 kg for intensive and semi-intensive conditions respectively. On the other hand Khan et al., (2012) observe the weaning weight of Black Bengal goat is 6.5 to 7.5 kg under semi-intensive conditions.

**Age at puberty**

Young Black Bengal goats female attain puberty at an average age of 7.2±0.18 months and and weight of 8.89±0.33 kg respectively in semi-intensive conditions. (Rume et al, 2011; Hassan *et al ,* 2007; Hossain et al, 2004; Chowdhury et al, 2002; Hussain ,1999 ; Huq *et al*, 1988 ). But season and feeding level affected on age at first heat but rearing system did not affect.

The average age at first sign of heat of crossbred goats were 222.5± 5.5 days, (Hassan *et al.,* 2007). However Amin et al., (2001) reported age at first heat was higher 250 days under farmer’s condition than Hassan *et al,* 2007).

**Average daily body Weight gain:**

 The average daily body weight gain of Black Bengal goat from birth to 3 months of age is highest and that is 43.29 g/day and lowest for 9 to 12 months is 23.04 g/day and also observed average daily gains decreased significantly with the increase in age and similar result is reported by Husain,et.al.(1997) Sabdullah (1991) and Khan and Singh (1989).

**Predicting Body Weight Using Linear Measurements:**

Different kinds of mathematical models linear and non linear regression can be found to fitting the partial and incomplete data for prediction the total yield Khan (2009). The models can be taken different shapes such as linear, concave, convex etc and its depend on the model parameters (Beever et al, 1991, Druet et al, 2003). A large number of goodness of fit statistics such as Akaike Information Criteria (AIC), Rootmean square error (RMSE), R square (R2), Co-efficient of variation (COV) have been reported by several authors ( Olori et al , 1999 and Val-Arreola et al, 2004). On the basis of goodness of fit a set of suitable models can be selected. Khan and Khatun (2013) fitted the Gompertz curve to the daily collected data for birth to weaning of Black Bengal Goat and they found this model was fitted well with the collected data and they observed that predicted value was higher than that of actual value.

**Summary:**

There were several breeds such as: Black Bengal, Jamunapari, could be seen under different production systems: extensive, semi-intensive and intensive. The management of systems (feeding, housing, and rearing) was differed with the differences of production system. Similarly, the productive and reproductive traits e.g. birth weight, weaning weight, age and weight at sexual maturity, and mature live weight of the goats were varied due to various breed, groups, production systems and management. If proper management could be maintain the traits value might be higher.

 **Chapter three**

 **MATERIALS AND METHODS**

**Study area:**

 The study was conducted at Panchlaish Thana under the district of Chittagong.

**Duration of the study:**

The duration of the study was July, 2012 to January, 2013 during my DVM internship placement in the Upazilla Veterinary Hospital, Panchlaish and Laboratory rotation at CVASU.

**Data collection:**

 Data were collected from 2 different farms and 2 different breed of goat. Data were collected from 36 Black Bengal goats and 16 Jamunapari goat breed. Birth weight of kids was taken within 24 hours after birth of kids. The kids birth weight and subsequent live weight at weekly interval were recorded for estimates the birth weight, weight gains and age and weight at weaning up to sexual maturity. The goats were weighted by balance during the study period.

**Management and rearing of Black Bengal goats and Jamnuapari Goats:**

 The Goats were reared under semi-intensive condition. The house was tin sheded and floor of the house was made of concrete. There was no separate shed for male or female, Black Bengal Goat or Jamunapari goat, kids or growing animal. There was no isolation shed for sick animal. Most of the time all the goats were allowed to grazed in the field. Feed was provided three times in a day at morning, noon, afternoon and adequate water supply were provided during feeding. In addition supplied some concentrates like broken rice, rice gruel, wheat bran, motor bran, gram chuni, banana, tree leaves, herbs, etc.When the goats showed heat then recorded and at the end of estrus the goats were allowed for natural services. Other management practices such as new born kid management, pregnant does, deworming, proper vaccination against commonly PPR were followed. (Please see page- 09 & 10 for details about the management).

**Fitting the Linear Regression equation:**

The linear regression y=a+bx (Where x is the ages of goats and a and b are the parameters that define the shape of the curve) usedto fitting the observed values of birth to weaning and weaning to sexual maturity. To obtain the model parameters, a (intercept), b (slope) and fit statistics, R² (Co-efficient of determinant) the above linear model was fitted with Microsoft Office Excel 2007.

**Statistical analysis:**

The collected data were unequal which was tabulated in Excel and edited. The collected data were analyzed by using the statistical pakage SAS (SAS 2010).

The following statistical models were used to obtain the least square means with standard error of all parameters. The model is given as:

Yijkl=µ+Bi+Sj+Fk+eijkl Where ,Yijkl= value of the traits, µ is the overall mean, Bi is the effect of Breed and Si is the sex effect, Fk is the effect of farm, eijkl is the random error. The mean differences were compared using least significant difference that (Isd) Steel *et al. (*1997*)* at 5% level of significance.

**MANAGEMENT PRACTICES OF FARM**

The farm was situated in Panchlaish thana under the district of Chittagong. 2 types of goat breed were reared in this farm. The breeds were Black Bengal goat and Jamunapari goat. The number of Black Bengal Goat was higher than jamunapari goat.

**Rearing System**:

Rearing system of goat in this farm was semi-intensive system.

**Housing:**

The house was situated in dry and high place. It was placed vertically east-west and faced to south. The facilities of passing free air and light was available, also well arrangement of water discharges was available in this house. They were provided sufficient spaces for goat. They were provided 12 square feet spaces for adult goat and for kids 4- 7 squares feet. The house was situated in 1 meter high from the ground and the roof 7 feet high from the platform. In winter season they provided 1.4 inches thin straw was spreaded in the floor. It kept the goat warm. This straw was cleaned once a week.

The house was tin sheded and floor of the house was made of concrete. The number of shed in this farm is 4. Fifteen goats were reared in one shed. There was no separate shed for male or female, Black Bengal Goat or jamunapari goat, kids or growing animal. There was no isolation shed for sick animal.

**Feeding system:**

 Most of the time the goat was allowed to graze in the field. Feed was provided three times in a day at morning, noon, afternoon and adequate water supply were provided during feeding. In addition, some concentrates like broken rice, rice gruel, wheat bran, motor bran, gram chuni, banana residues was supplied and during the scarce period of time they fed the goats tree leaves, herbs, etc. Kids feed milk of his dam up to weaning. No special care was taken in kids. Always they provided fresh food and clean water. **(Ration: - Appendix- I)**

**Breeding System:**

All does were naturally mated. At the end of estrus the goats were allowed for natural service.

Breeding system performed by Black Bengal male with Black Bengal female, jamunapari male with Jamunapari female and breeding also done by Jamunapari with Black Bengal goat.

 25-30 does were serviced by 1 buck.

**Management of Buck:**

When bucks were in service they provided more feed than normal. They provided 450 grams of mixed high quality concentrate daily.

**Management of pregnant does:**

Pregnant does need special care. They provided Supplementary feeding of 150-200 gm of additional concentrate, with green fodder and during last 1 month of pregnancy they provided Stall feeding and was provided plain, dry floor with soft bedding material.

**Management of Newborn kids:**

The kid was wiped with dry cloth to avoid cold and tied the umbilical cord 2 cm away from the abdomen, and cut the lower portion with blade.

**Deworming:**

Regular Periodic de-worming schedule was maintained.

**Vaccination:**

Goats were vaccinated against PPR. A veterinarian was regularly inspect the farm to observed the health status of animal and he treated when the goat was suffering from any diseases or diseases condition like anorexia, diarrhoea, PPR, difficulty of kidding. . If any diseases affected suddenly, they were consulted with the veterinarian.

**Chapter Four**

 **RESULTS AND DISCUSSION**

The results and discussion of this study are described under the following captions.

**Birth weight:**

The birth weight of Black Bengal goats kids and Jamunapari goats kids in two different farms is shown in Table-1. Average birth weight of male and female Black Bengal goats kids were 1.22 ± .15 and 1.01 ± .14 kg, and the 1.42 ± .10 and 1.12 ± .27 kg, in farm -1 and farm -2, respectively. From Table-1, it could be seen that the birth weight of male and female were varied in two different locations. The average birth weight of Black Bengal male kids were higher than the female kids in both locations. However, the average birth weight of male and female Black Bengal kids of Farm-2 were higher than Farm-1.

The average birth weight of male and female Jamunapari kids were 1.51 ±.07 and 1.42 ± .09 kg respectively in farm -2 (Table-1). The average birth weight of Jamunapari male kids were higher than female Jamunapari kids. The average birth weights of male and female Jamunapari kids were higher than Black Bengal male and female kids. So the average birth weight of male kids were higher than female kids for 2 different breed under 2 different farm in 2 different locations.

The birth weight depends on feeding, care and management e.g. over all health hygiene of pregnant does. In this study the average birth weight of male kids at farm 2 were higher than farm 1. In case of female kids birth weight were higher in farm 2 than farm 1. Comparatively male kids birth weight were more difference between two farms than female kids. There was a negative association between birth weight & Litter size. In this study the birth weight of Black Bengal goat was similar with Talukder et al., (2010) but lower than Khan and Khatun (2013). They reported birth weight of kids 1.0 to 1.3 kg and 1.5 to 1.9 kg, respectively. Hassan *et al*. (2010) found the mean body weight of Jamunapari kid was 1.6 kg at birth which was similar to present study. But Rout *et al.,* (1999) reported that female Jamunapari weighed about 3.7 kg at birth which was higher than present study.

**Table - 1:** Birth, Weaning and sexual maturity weight (in kg ) and weight gain (g/day) from Birth to Sexual maturity of Black Bengal goats and Jamunapari Goats under two different Farm.

|  |  |
| --- | --- |
|  |  Breed |
| Black Bengal Goat | Jamunapari goat |
| Farm-1 | Farm-2 | Farm-2 |
| Traits | Male | Female | Male | Female | Male | Female |
| Birth weight(0 days) in kg | 1.22 ± .15 | 1.01 ± .14 | 1.42 ± .10 | 1.12 ± .27 | 1.51 ± .07 | 1.42 ± 0.09 |
| Weaning weight(4 months) in kg | 5.19 ± .35 | 5.05 ± .28 | 5.63 ± .61 | 5.54a ± .40 | 6.59± .69 | 6.79b ± .31 |
| Sexual maturity weight (at 8 & 9 months Black Bengal & Jamunapari Goat respectively) in kg | 9.82 ± .75 | 9.52 ± .62 | 9.65a ± .42 | 9.13a ± .70 | 13.2b ± .75 | 14.1b ± .82 |
| Growth rate g/day (Birth to weaning) | 33.70 | 35.11 | 35.67 | 45.94 | 42.97 | 45.47 |
| Growth rate g/day (4 to 6 months) | 47.97 | 47.49 | 32.93 | 33.04 | 43.33 | 52.91 |
| Growth rate g/day (6 to 8/9 months) | 27.99 | 25.91 | 34.22 | 26.40 | 42.43 | 43.47 |
| Growth rate g/day (Birth to sexual maturity) | 36.11 | 35.76 | 34.60 | 33.65 | 42.88 | 46.51 |

**The letter a and b in the superscript indicated 5% (P<0.05) level of significant**

**Weaning weight:**

The weaning weight of Black Bengal and Jamunapari goats are presented in Table –1.The average weaning weight of male and female Black Bengal goats were 5.19 ± .358 and 5.05 ± .28 kg and 5.63 ± . 61 and 5.54 ± .41 kg, respectively for Farm -1 and Farm -2. From Table-1, it was found that the average weaning weight of male Black Bengal goat was higher than female in both farms. The inverse results were observed for female kids. However, the average weaning weight of male and female Black Bengal kids of Farm-2 were higher than Farm-1. The average weaning weight of male and female Jamunapari was 6.59 ± .69 and 6.79 ± .31 kg, respectively in farm -2. The average weaning weight of Jamunapari female was higher than Jamunapari male .Though the birth weight of Jamunapari male was higher than female kids but the weaning weight of female Jamunapari was higher than male Jamunapari goat. The average weaning weight of male and female Jamunapari was higher than male and female Black Bengal for both farms.

In the current study the weaning weight of Black Bengal goat was similar with Chowdhury et al. (2002) but lower than Khan and Khatun (2013). They reported weaning weight of goats 4.87 to 5.5 kg and 6.5 to 7.5 kg, respectively.

**Age and Weight at Sexual Maturity:**

The age and weight at sexual maturity of Black Bengal and Jamunapari goats are presented in Table-1. The average weight at sexual maturity of male and female Black Bengal goats were 9.82 ± .75 and 9.52 ± .62 kg and 9.65 ± .75 and 9.138 ± .70 kg in Farm -1 and Farm -2, respectively .From Table-1, it was found that the average weight at sexual maturity of male Black Bengal goat was higher than female in both farm. The inverse results were observed for female kids. However, the average weight at sexual maturity of male and female Black Bengal goats of Farm-1 were higher than Farm-2. Though the weaning weight of male and female Black Bengal goats of Farm-2 were higher than Farm-1.The average age at sexual maturity of male and female Jamunapari goat was 9 months which was higher than Black Bengal goat. But the Black Bengal goat attained sexual maturity at an early age than Jamunapari goat. The average weight at sexual maturity of male and female Jamunapari goats were 13.2 ± .75 and 14.1 ±. 82 kg, respectively in Farm -2. The average weight at sexual maturity of female Jamunapari goat was higher than male. The average age and weight at sexual maturity of male and female Jamunapari goats were higher than male and female Black Bengal goats.

In the current study the age at sexual maturity of Black Bengal goat was 8 months which was similar with Amin et al., 2001; but higher than Khan and Khatun (2013), Chowdhury et al, 2002; Rume et al , 2011 ; Hassan *et al.,* 2007). They reported that age at sexual maturity of goats were 7.2 ± .18 kg. In this study the weight at sexual maturity of Black Bengal goat was 9 to 9.8 kg which was similar with (Rume et al , 2011; Hassan *et al ,* 2007; Hossain et al, 2004; Chowdhury et al, 2002). They reported that weight at sexual maturity was 8.89±0.33 kg. In the current study the age at sexual maturity of Jamunapari goat was 270 days, where Hassan *et al.* (2010) found 354.7±17.1 days, which was higher than present study. The variation of results which occur may be due to genetic cause**.** Chowdhury *et al*., (2002) observed that season and feeding level of were affected of age at first heat but rearing system did not affect the age of puberty. Besides genetically influence, feeding and management are important in respect of age of puberty. The management includes feeding, breeding, housing and disease control which affect the age at puberty.

**Average daily body weight gain:**

 **Birth to weaning:**

The average daily body weight gain from birth to weaning is presented in Table-1.The average daily body weight gain from birth to weaning for male and female Black Bengal goats was 33.70 and 35.11 g /day respectively, in Farm-1. In case of Farm-1, the average daily body weight gain from birth to weaning of female Black Bengal goat was higher than male Black Bengal goat, although the average birth and weaning weight of female was lower than male. So female attained more weight than male Black Bengal goat in Farm-1. But the average daily body weight gain from birth to weaning for male and female Black Bengal goat is 35.67 and 45.94g/ day, respectively in Farm-2. In case of Farm-2, the average daily body weight gain of female is higher than male. But in Farm-2 average daily weight gain of male and female is higher than male and female of Black Bengal goat Farm-1.

But in Farm-2 the average daily body weight gain from birth to weaning for male and female Jamunapari goat was 42.97 and 45.47 g/day, respectively .The average daily weight gain of female was higher than male. So female attained more weight than male Black Bengal goat in Farm-1. In both farm the average daily weight gain of female was higher than male for 2 different breed. But average daily weight gain of female Black female Black Bengal goat of Farm-2 was attained highest gain than Jamunapari and also Farm 1. Although the average weaning weight of male and female Jamunapari was higher than male and female Black Bengal for both farm.

 In the current study the average daily body weight gain from birth to weaning was 34 to 45 g/day which was similar with Husain,et.al.(1997), Saadullah(1991) and Khan and Singh (1989).

They observed average daily body weight gain was 35 to 45 g/day.

**4 to 6 month:**

The average daily body weight gain from 4 to 6 months are presented in Table-1.The average daily body weight gain from 4 to 6 months for male and female Black Bengal goat is 44.97and 47.49 g /day respectively in Farm-1 . In case of Farm-1 the average daily body weight gain from 4 to 6 month of male Black Bengal goat was higher than female Black Bengal goat, although the average birth to weaning weight gain of female was higher. The weight gain of 4 to 6 months was also higher than weight gain from birth to weaning for Black Bengal goat in

 Farm-1.

 In this study, the average daily body weight gain from 4 to 6 month of different goat breed was 33 to 52 g /day which was similar with Husain et al, 1997; Saadullah (1991). They reported that the average daily body weight gain from 4 to 6 month was 44 to 55 g /day. The average body weight gain was highest in 4 to 6 months. But average daily gain decreased significantly with increase in age (Husain et al., 1997).

**Birth to Sexual Maturity:**

The average daily body weight gains from Birth to Sexual Maturity are presented in Table-1.

The average daily weight gain of male was higher than female Black Bengal goat in both farm .But the average weight gain of female Jamunapari was higher than male. Also the average weight gain of male and female Black Bengal goat was higher in farm 1 than in farm 2 .From table 1 it was also observed female Jamunapari attained highest gain than male and female Black Bengal goat.

 In the current study the average daily body weight gain from birth to sexual maturity of goats were 36 to 46 g/ day which was similar with Husain et al, 1997 and Saadullah (1991)

They observed average daily body weight gain from birth to sexual maturity was 36 to 42 g/day and 40 to 44 g/day, respectively. On the other hand Chowdhury et al., (2002) observed average daily body weight gain from birth to sexual maturity of goats were 30 to 35 g/ day and this observation was slightly lower than present study.

After fitting the regression equation, with the data on birth weight to age at sexual maturity of different goat breeds the regression parameters and the value of R2 are presented in Table-2. The intercept and slope of male Black Bengal under Farm-1 and Jamunapari goat was 0.429 and 0.278; and 0.966 and 0.310, respectively. The intercept and slope of Jamunapari goat was higher than Black Bengal goat under Farm -1. The co-efficient of determination (R²) of male Black Bengal under Farm-1 and Jamunapari goat was 0.992 and 0.998, respectively. The R² value of male Jamunapari goat was higher than Black Bengal goat. So the value of male Jamunapari goat was more fitted. The higher R² values considered as superior (Khan et al, 2012). The intercept and slope of female Black Bengal and Jamunapari goat was 0.252 and 0.275; and 0.603 and 0.343, respectively. The intercept and slope of female Jamunapari goat was higher than Black Bengal goat under Farm -1. The co-efficient of determination (R²) of female Black Bengal under Farm-1 and Jamunapari goat was 0.994 and 0.956 respectively. The R² value of female was higher than Jamunapari goat. So the value of Black Bengal goat was more fitted. The intercept and slope of male Black Bengal and Jamunapari goat was and 0.938 ; and 0.259; 0.966 and 0.310, respectively under Farm-2. The intercept and slope of male Jamunapari goat was higher than Black Bengal goat under Farm -2.

**Table-2:** The regression parameters and R² values after fitting the Regression Equation, with the birth weight to age at sexual maturity of different goat breeds.

|  |  |
| --- | --- |
|  |  **Breed** |
| **Black Bengal Goat** | **Jamunapari goat** |
| **Farm-1** | **Farm-2** | **Farm-2** |
| **Traits** | **Male** | **Female** | **Male** | **Female** | **Male** | **Female** |
|  **a (intercept)** | 0.429 | 0.252 | 0.938 | 0.827 | 0.966 | 0.603 |
| **b (slope)** | 0.278 | 0.275 | 0.259 | 0.256 | 0.310 | 0.343 |
| **R² ( Co-efficient of determination )** | 0.992 | 0.994 | 0.996 | 0.997 | 0.998 | 0.956 |

The co-efficient of determination (R²) of male Black Bengal under Farm-2 and Jamunapari goat was 0.996 and 0.956, respectively. The value of male Black Bengal goat under Farm -2 was higher than Jamunapari goat. So the value of male Black Bengal goat was more fitted. The intercept and slope of male Black Bengal under Farm-1 and Farm -2 was 0.929 and 0.278; and 0.938 and 0.259, respectively. The intercept of male Black Bengal goat under Farm -1 was higher than Farm-2. The co-efficient of determination (R²) of male Black Bengal under Farm-1 and Farm-2 was 0.992 and 0.996, respectively. The R² value of male Black Bengal goat Under Farm-2 was higher than Farm-1. From Table-2, it showed that the highest R² value 0.998 was observed in male Jamunapari goat. So the R² value 0.998 was more fitted and superior. In this study the R² value was higher than Khan et al, 2013. They observed the R² value was 0.93-0.95. Figure 1 to 3 shows the shape of the growth curves of kids from birth to weaning from birth to 75 days the growth was steady after that a slow decline growth was observed. This is due to the increase the age effect; generally in early stage the growth was faster than it is become slower. However, the growth of goats could be influenced by sex,season, age, management. Similar factors were identified by various researchers ( Carles, 1989; Najari et al ,2007 ; Thiruvenkadon et al , 2009 ).

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 **Chapter Five**

 **CONCLUSIONS**

The study reveals that the average birth weight, weaning weight, weight at sexual maturity and weight gain from birth to weaning, weaning to sexual maturity of male and female of Black Bengal and Jamunapari goats were different in between two farm. The study also showed that the weight gain of goat depends on birth weight; balance feeding, presence or absence of diseases, available milk from mother and management of kids. But some constraints in this study were small population size, presence of diseases, limited time, and seasonal differences. It is also recommended that poverty alleviation in developing countries like Bangladesh would be possible if special emphasis is given from household to farm level goat rearing along with implementation of other national strategies initiated by the government. So it can be said that considering the socio-economic and climatic condition of Bangladesh rearing of Black Bengal goat in semi intensive conditions would be more suitable than extensive system. However, more study with large studied population and different geographical region is recommended for making final comments.

 **Chapter Six**

**REFERENCES**

Amin, M R, Husain S S, Islam A B M M. 2001. Reproductive peculiarities and litter weight in

different genetic groups of Black Bengal goats. Asian -Australasian Journal of Animal Sciences, 14(3): 297-301.

Bera, S, Samanta A K , Santra A K, Maiti S K. 2008. Effects of breeding practice and sex on growth black bengal goats under village conditions of west Bengal, 3 (1): 23

Beever, D E, Rook A J, France J, Gill M. 1991 . A review of empirical & mechanistic models

of lactation performance of the dairy cow. Livestock production Sciences, 29 : 115-130.

Chowdhury, S A, Bhuiyan M S A, Faruque S. 2002. Rearing Black Bengal goat under semi-intensive management. I. Physiological and reproductive performances. Asian -Australasian Journal of Animal Sciences, 15: 477-484.

Cameron, M R, Luo J , Sahlu T, Hart S P, Coleman S W, Goetsch A L.2001. Growth and slaughter traits of Boer x Spanish, Boer x Angora, and Spanish goats consuming a concentrate-based diet. Journal of Animal Sciences, 79: 1423-1430.

Carles, A B . 1986 . Factors affecting the growth of sheep and goats in Africa.

 agtr. ilri.cgiar.org/documents/library/docs/x5464b/x5464boa.htm

Department of Livestock Services (DLS) 2010. Pasu Sampad Adhidaptar-ar-Chromobikash.

 Pp: 32.

Faruque, M O, Khandoker M A M Y. 2007: Recent advances of goat genotyping in Bangladesh.In:Workshop on recent advances of livestock genotyping in Bangladesh. Genotyping of goats and buffaloes for breed and type determination. 10 May, Dhaka, Bangladesh. Pp: 28-40.

Faruque, S. 1999. Study on the reproductive characteristics of does in different genetic group. MS.Thesis . Dept. of Animal Breeding and Genetics. BAU. Mymensingh .

Greyling, J P C . 2000. Reproduction traits in the Boer goat doe. Small Ruminant Research,

 36, 171- 177.

Haddad, S G. 2005. Effect of dietary forage: concentrate ratio on growth performance and

carcass characteristics of growing Baladi kids. Small Ruminant Research, 57: 43-49.

Hassan, M R, Talukder M A I, Sultana S. 2010. Evaluation of the production characteristics of the Jamunapari goat and its adaptability to farm conditions in Bangladesh**.** The BangladeshVeterinarian, 27(1): 26-35**.**

Hassan, M M, Mahmud S M N, Islam S K M A, Miazi O F. 2007. A comparative study on reproductive performance and productivity of the Black Bengal and Cross goat at Atrai, Bangladesh. Journal of Zoological Science, Rajshahi University, 26: 55-57.

Honhold, N. 2001. Final Report on Veterinary Epidemiology. Bangladesh Livestock Research Institute, Savar, Dhaka-1341.

Hossain, S M J, Alam M R, Sultana N, Amin M R, Rashid M M. 2004. Milk Production form Indigenous Black Bengal Goat in Bangladesh, Journal of Biological Sciences, 4 (3): 262-265.

 Hossain, S S, Mafizul A B M M. 2003. Reproduction and growth of black bengal goats in Bangladesh. International conference on goats , New Delhi, 545-5.

Hussain , S M J, Sultana N, Alam M R, Hasnath M R. 2004. Reproductive and productive performance of Black Bengal goat under semi-intensive management. Journal of Biological Sciences, 4(4): 537-541.

Husain, S S.1999. Sustainable genetic environment of economic trait of Black Bengal goats through selective and cross breeding. Bangladesh Agricultural University Research Programme, 10:72.

Husain , S S, Amin M R, Islam A B M M. 1998. Goat productions & its breeding strategy in Bangladesh. Proc. 1st National workshop on Animal Breeding held on B A U, Mymensingh, Bangladesh. Pp: 17-36.

Hussain , S S, Horst P, Islam A B M M. 1997. Growth performance of Black Bengal

goats in different regions of Bangladesh. Asian-Australasian Journal of Animal Science, 10 (5): 491-494.

Hussain , S S, Horst P, Islam A B M M. 1996. Phenotypic selection on the improvement of growth performance of Black Bengal kids. Asian-Australasian Journal of Animal Science, 9 : 149-153.

Huq, E, Rahman M, Miah M A. 1988. A study on the relationship between management practices followed by the goat raises with some of the selected characteristics in the selected area of Sathkhira Upazilla. Bangladesh Journal of Animal Sciences, 19: 1-7.

Johnson, D D, McGowan C H. 1998. Diet/management effects on carcass attributes and

meat quality of young goats. Small Ruminant Research, 28: 93-98.

Khan, M K I, Khatun M J. 2013. Different traits of Black Bengal goats under two feeding regime and fitting the Gompertz curve for prediction of weaning weight in the semi-scavenging system. Indian Journal of Animal Research (Accepted).

Khan, M K I, Blair H T, Lopez-Villalobos.2012. Lactation curves of different cattle breeds under cooperative dairying conditions in Bangladesh. Journal of Applied Animal Research, 40 (3 ): 179- 185.

Khan, A A, Singh D K.1989. Annual Progress Report. All India coordinated Research project

on goats for Meat Production. Birsa. Agricultural university, Ranchi, Bihar, India. 130-137.

Malan, S W. 2000. The improved Boer Goat.Small Ruminant Research, 36 , 165-170.

Mushi, D E, Safari J, Mtenga L A, Kifaro G C, Eik L O. 2009. Effects of concentrate levels

on fattening performance, carcass and meat quality attributes of Small East African x Norwegian crossbred goats fed low quality grass hay. Livestock Sciences. 124:148-155.

Najari, S, Goddour M, Djemali M . 2007. Growth model adjusted of local goat population

under pastoral conditions in Tunisian arid zone. Journal of agronomy. ISSN 1812 -5378.

Olori, V E S, Brotherstone S, Hill W G, Mcguirk B J. 1999. Fit of Standard models of the lactatic curve to weekly records of milk production of cows in a single level. Livestock Production Science. 58 : 55-63.

Rume, F I, Chowdhury A K, Islam M S, Islam M, Karim M R. 2011. Study on the

productive and reproductive characteristics of goats in the Bangladesh. Bangladesh Research Publications Journal, 5 ( 3) : 214 -210.

SAS®, 2010 User’s Guide, Statistics. 8th edition. Cray (NC) : SAS Institute Inc.,

Salim, H M, Shahjalal M, Tareque A M M, Kabir F. 2002. Effects of concentrate

Supplementation on growth and reproductive performance of female Sheep and Goats under grazing condition. Pakistan Journal of nutrition, 1 (4) : 191-193.

Saadullah, M.1991, Research and Development Activities and needs on Small Ruminants in Bangladesh. Paper presented at SRUPNA 1st annual workshop, July 1991, Bogar, indonesia , 2-10 .

Steel, R G D, Torrie J H, Dickey D A. 1997. Principles and procedure of statistics-A Biometrical Approach.3rd ed.Mc Graw-hill Co., Inc.,New York and London. Pp: 139-177.

Talukder, M A I, Hassan M R , Mohanta U K , Amin M R. 2010. Productive and reproductive

 Performances of Brown Bengal goat in hilly area at Naikhonnngchari. Proceedings of the Annual Research Review Workshop, 197 : 86 -90.

Thiruvenkadan, A K, Murugan M, Karunanithi K, Muralidharan J, Chinnamani K . 2009.

Genetic and non genetic factors affecting body weight in Tellicherry goats. South African Journal of Animal Science, 39 (supplements 1) : 107- 111.

Turner, K E, Wildeus S, Collins J R .2005. Intake, performance, and blood parameters in young goats offered high forage diets of lespedeza or alfalfa hay. Small Ruminant Research, 59: 15-23.

Val, Arreola D, Kebreab E, Dijkstra J, France J. 2004. Study of the lactation curve in dairy cattle on farms in central Mexico. Journal of Dairy Science, 87 : 3789-3799.

 **Chapter Seven**

**APPENDIX-I**

 **Ration Formulation for Goats**

 **Concentrate Mixture for Goats**

|  |  |
| --- | --- |
| **Ingredients** | **Percent (%) in mix** |
| Crushed rice | 36 |
| Wheat bran/Rice polish | 23 |
| Khesari | 15 |
| soybean | 20 |
| Fish meal | 1.50 |
| Dicalcium phosphate | 2.00 |
| salt | 1.00 |
| Vitamin-mineral premix | 0.50 |

**Concentrate Mixture for kids**

|  |  |
| --- | --- |
| **Ingredients** | **Percent (%) in mix** |
| Crushed rice | 26 |
| Rice polish | 25 |
| Khesari | 24 |
| Soybean cake | 16.1 |
| Protein concentrate | 1.9 |
| Soybean oil | 1.20 |
| molasses | 3.80 |
| Dicalcium phosphate | 0.5 |
|  Common salt | 1.00 |
| Vitamin-mineral premix | 0.50 |