COMPARISON OF GROWTH PERFORMANCE OF BLACK BENGAL GOAT IN DIFFERENT REGIONS IN BANGLADESH

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COMPARISON OF GROWTH PERFORMANCE OF BLACK BENGAL GOAT IN DIFFERENT REGIONS IN BANGLADESH

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CERTIFICATE

This is to certify that the thesis entitled ***"COMPARISON OF GROWTH PERFORMANCE OF BLACK BENGAL GOAT IN DIFFERENT REGIONS IN BANGLADESH"*** *submitted to the Department of Animal Nutrition, Genetics and Breeding, Sher-e-Bangla Agricultural University, Dhaka in partial fulfillment of the requirements for the degree of* ***MASTER OF SCIENCE (MS) in ANIMAL BREEDING AND GENETICS,*** *embodies the results of a piece of bona fide research work carried out by* ***MD. ANWAR HOSSAIN,*** *Registration No.* ***13-05681*** *under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma in any other institution.*

I further certify that any help or sources of information received during the course of this investigation has duly been acknowledged.

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COMPARISON OF GROWTH PERFORMANCE OF BLACK BENGAL GOAT IN DIFFERENT REGIONS IN BANGLADESH

ABSTRACT

The Black Bengal goat is known as Poor man's cow due to its high prolificacy, quality meat and famous skin. It is one of the prominent goat breeds in our country. Making better performance to grow higher profit from this goat is the key to strengthen local economy. Thus the present study was carried out the factors affecting growth of this goat. The data of 120 goats were collected from Dhaka, Kishoreganj and Sunamganj districts to analyze the effect of different locations on growth performances. The growth performance of goats was found the best in Dhaka followed by Kishoreganj and Sunamgonj in terms of weight at birth (0.97±0.02 vs 0.90±0.02 & 0.82±0.02); 3 months (5.51±0.05 vs 4.99±0.08 & 4.93±0.08); 6 months (8.71±0.08 vs 8.07±0.07 & 7.64±0.06) and 12 months (12.97±0.08 vs 12.34±0.11 & 11.60±0.05). The study revealed that kids have grown well in Dhaka than other two districts irrespective of sex. Average weight of male and female in Dhaka was at birth (0.96±0.03 & 0.99a±0.03); 3 months (5.66a±0.03 & 5.24a±0.09); 6 months (8.93a±0.09 & 8.29a±0.08) and 12 months (13.18a±0.08 & 12.58a±0.10). The growth performance was higher in Dhaka in different types of birth i.e. sigle, twins and triplets. Kids of Dhaka were found better in all parity of dam, Kishoreganj in middle and Sunamoganj with lower growth. The kids in Dhaka grown well and mixed trend recorded in other two districts. According to above discussion, growth performance is better in Dhaka by geography, sex, type of birth, parity of dam and season than Kishoreganj and Sunamganj.

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LIST OFABBREVIATIONS AND SYMBOLS

>	=	Greater than
<	=	Less than
±	=	Plus minus
^{o}C	=	Degree Celsius
%	=	Percentage
ANOVA	=	Analysis of Variance
cm	=	Centimeter
CV %	=	Percent Coefficient of Variation
DF	=	Degree of freedom
DLS	=	Department of Livestock Services
DM	=	Dry matter
et al.,	=	And others
e.g.	=	exempli gratia (L), for example
etc.	=	Etcetera
g	=	Gram (s)
GDP	=	Gross Domestic Product
GM	=	Geometric mean
i.e.	=	id est (L), that is
Kg	=	Kilogram (s)
L	=	Litre
Lbs	=	Pound
m^2	=	Meter squares
mg	=	Milligram
ml	=	Milliliter
MS	=	Mean Square
No.	=	Number
SAU	=	Sher-e-Bangla Agricultural University
SAS	=	Statistical Analysis
SE	=	Standard Error
SS	=	Sum of Squares
Viz.	=	Namely

CHAPTER 1
INTRODUCTION

The Black Bengal goat is a famous goat breed in the world. It occupies a very significant position as an animal genetic resource in the predominantly agro-based farming system of Bangladesh. Goat in Bangladesh is valued for their contribution for meat, skin, milk and manure. It provides one of the main sources of income for the farmers of Bangladesh. The goat is a prolific animal; twins or triplets are common in kidding (Banerjee, 1989). Thus, goat plays an important role in the livelihood of a large proportion of small farmers particularly women, landless and marginal farmers inhabiting geographically isolated areas, who seldom have other means of survival (Choudhury *et al.,* 2012). This one of the earliest domesticated farm animals (Naderi *et al.,* 2008; Luikart *et al*., 2006) is called the "Poor man's cow" in our country and it's the second important livestock in Bangladesh (MacHugh and Bradley, 2001; Akhter *et al.,* 2006; Kosgey, 2004).

Developing countries are producing about 90% goats among the total goat population of the world. Goat population in Bangladesh is the fourth highest in Asia and constitutes nearly 11.79% of the total population (FAO, 2013). According to the Department of Livestock Services (DLS), a total of 412.2 million of livestock population including 26.4 million of goat are producing animal protein (DLS, 2020). About 41% of the total income is provided by goats in farmer house (Husain, 1993). It also serves as a store of value and instant cash asset (Morand-Fehr *et al.*, 2004).

Black Bengal goat is the only goat breed Bangladesh of its own which is a famous goat breed in the world especially for meat and skin. It plays a very significant position as an animal genetic resource in the predominantly agro-based farming system of Bangladesh. It is measured that more than 90% of

goat population in Bangladesh comprised the Black Bengal goats, the rest are Jamunapari and their crosses (Amin *et al.,* 2001; Husain, 1993).

Goats have become more significant in the rural economy even throughout the country, while dairy cattle and poultry industry are making significant impact as a provider of animal protein in the country (Lebbie, 2004). Government of Bangladesh has given special emphasis on Black Bengal goat for farmers to reduce the poverty with targeting the millennium development goals (MGDs) achievement. Goat rearing is more popular where dairy or poultry farming is not suitable enough. The goat is important for its adaptability, early sexual maturity fertility, prolificacy, delicious meat, short generation interval, high market demand and excellent skin quality. The breed is early maturing with first kidding occurring at about 12 months.

Goats are the best convertor of low-quality roughage, green grasses, shrubs and various tree leaves which are provided. Farmers keep cattle, chicken, with goats and also produce agricultural products. They like to rear goat due to it require less feed and capital than others.

Most of the goats are reared in Bangladesh under semi intensive system. The average number of goats per household is 2.31 which are mostly reared by small, landless and medium farmers (Faruque *et al.*, 2010). Goat farming in rural areas 75.8% are contributed by Small, landless and marginal farmers and 24.2% are contributed by medium and large farmers (Huque, 2008). Over growth of human population and that's why pressure on land use, goats are keeping a vital role in smallholder production systems in areas with high possibility (Bett *et al.,* 2007).

In the developing country like Bangladesh the production of goat meat is the primary objective. The quality of meat production should be the far most important criteria of domestication of goat (Huq, 1988).

Body weight and growth rate are economically important objectives that demand particular attention in order to improve meat production of the Black Bengal goat. Higher growth rate is essential for optimal meat yield and is one of the main determinants of productivity of goat (O'Shea, 1983).

There are very little works has been done in our country on growth performances of Black Bengal goats instead of its higher importance. The weight of dam affects the weight gain of the kids first month less than during the second and third month of life (Romagesa Vila, 1981). Body weight and growth performances have economic importance and it demands special attention in order to improve meat production. Selecting the best animal for the best growth is the key to increase meat yield (Albuquerque and Meyer, 2001; O'Shea, 1983). In case of Black Bengal goats, a positive correlation between birth weight and rate of growth, age at maturity and mature body weight with length, height and heart girth was found which influence the future productive and reproductive performance of the animal (Husain *et al.*, 1995; Banerjee, 1989; Prasad *et al.,* 1981).

Hossain *et al.* (2005) described the benefits of farmers in Bangladesh through goat rearing. Goats are valued for their contribution in the national economy of Bangladesh. Thus the government established five goat development farms under the Department of Livestock Services (DLS). Bangladesh Livestock Research Institute (BLRI), different Agriculture based universities and some NGOs are devoted in the research and production of goat. The goal is to produce a quantity of quality products with maximum efficiency. A component in achieving this goal is to improve goat genetically in the areas of quantity, quality and efficiency. Genetic improvement can be achieved by selection (Falconer, 1989). Marketable kid with more body weight gain is the way to profitability.

Sarker (2020) and Ratul (2020) studied on oocyte of goat whereas Amy (2019) studied on the reproductive performance in Black Bengal goat.

Tabreze (2018) studied the growth performances of Black Bengal goat in village condition at Savar Upazila under the Dhaka District. He reported that, the growth performance was better in single male kid from third parity of dam in summer season. But he did the study in a limited area and did not compare the result with other parts of the country.

Thus, there are some necessities to study on this topic further to update the research findings. From that stand point the present research work has been undertaken with following objectives:

- To study growth performance of Black Bengal goat in village condition
- To observe the effect of different factors on body weights at different ages
- Estimate genetic and phenotypic correlations among body weights at different ages

CHAPTER 2
REVIEW OF LITERATURE

Growth performance is the key to make a goat farm profitable. Thus there are many research work has been done throughout the world. Some of the researches were also done in our country with Black Bengal goat. A summary of important research findings in home and abroad are illustrated in this chapter according our research parameters.

2.1 Growth pattern in different ages of Black Bengal goat

Adult body weight is an important and economic factor which influences the growth and production pattern of any goat enterprise and has more influence mainly on the growth behavior of kids (McGregor, 1984). A number of experiments have been carried out in this regard which are summarized as follows:

Tabreze (2018) Least-squares means for body weights at birth, 3, 6, 9 and 12 months of ages were 1.10, 5.02, 8.41, 10.41 and 12.42 kg, respectively.

Routa et al. (2018) carried out an experiment in the Jamunapari goats were introduced to the study area (CIRG) from their natural habitat, the Chakarnagar area of Etawah district of Uttar Pradesh, which is situated 150 km from the Central Institute for Research on Goats (CIRG) in Mathura, India, 1982 to 2012.The study area has semiarid climate and an average annual rainfall of about 375mm which is scattered during the months of June to September. The result of the experiment observed that the highest coefficient of variation (CV) was observed for body weight at 9 month of age (25.4%) and the lowest CV was (21.3%) at birth weight.

Jalil et al. (2016) observed that the productive and reproductive performances of Black Bengal Goat (BBG) under farming condition. Data were collected from Bangladesh Livestock Research Institute (BLRI) goat research farm during 2006 to June 2013. They revealed that the mean of body weight at birth 3, 6, 9 and 12 months were 1.31, 5.65, 9.63, 14.20 and 17.70 kg, respectively.

Paul et al. (2014) conducted at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the average birth weight of kid in NBF, Modhupur and Dimla were 1.09±0.27, 1.09±0.25, and 1.10±0.27 kg, respectively.

Mia et al. (2013) conducted at nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. The result of the experiment revealed that, the highest coefficient of variation (CV) was observed for body weight at 3 month of age (27.46%) and the lowest CV was for 12 month body weight (13.32%).

Halim et al. (2011) investigated at 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. 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. The result of the experiment revealed that 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 for intensive and semi-intensive condition.

Paul et al. (2011) observed at the Artificial Insemination (AI) Center under the Department of Animal Breeding and Genetics, Bangladesh Agricultural University (BAU), Mymensingh to study Characterization of Black Bengal goat. In that study they revealed that the buck body growth rate rapidly increased 6 month (8.95 kg) to 9 month (12.05 kg) but then slowly increased 9 month (12.05 kg) to 12 month (14.20 kg). Similarly does body growth rate rapidly increased 3 month (3.93 kg) to 6 month (7.41 kg) but then slowly increased 6 month (9.53 kg) to 12 month (12.40 kg).

Faruque et al. (2010) found at the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Saver and Dhaka. Ninety elite pre-pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi- intensive management to compare performance. In the study they observed that the birth weight was highest (P<0.10) in intensive rearing system (1.49+0.13 kg) and lowest (1.28+0.11 kg) in semi-intensive rearing system.

Hassan et al. (2010) revealed that which goats were ear-tagged and maintained under semi-intensive conditions from July 2007 to June 2009. Ninety-six does and eight bucks were housed in slatted floor permanent house raised above the

ground. Buck was kept separate from does to avoid unplanned mating. In the study they observed that the mean body weight at birth, 3 month, 6 month, 9 month and 12 month were1.6, 7.9,12.2,16.8 and 21.4 kg respectively.

Ahuya et al. (2009) stated that the smallholder farmers participating in the Food and Agricultural Research Management in Africa (FARM-Africa) goat improvement project in the Meru Central and South districts, which are located 250km to the East of Nairobi on the slopes of Mt. Kenya. The goats were reared under zero-grazing system. In that study they reported that the highest coefficient of variation (CV) was observed for body weight at the age of weaning weight (23.69%) and the lowest CV was for birth weight (21%).

Thiruvenkadan et al. (2009) reported at the body weight of 566 the Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu, India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. The results of the experiment revealed that the highest body weight 2.24 kg in the period of (2000-2003) and the lowest body weight 2.07 kg in the period of (2004-2007).

Boujenane and Hazzab (2008) studied that there were raised in a station at Ouarzazate region (South-East of Morocco). Data were collected between 1988 and 2005 from a total of 1498 kids (735 males and 763 females), the progeny of 46 sires and 404 dams. All kids were weighed at birth, every 3 weeks up to weaning, then every month until 6 months of age. The result of the experiment observed that the highest coefficient of variation (CV) was observed for body weight at 6 month of age (22.4%) and the lowest CV was (17.05%) at 3 month.

Dadi et al. (2008) found that at the effects of non-genetic factors on post weaning growth and reproductive performances of Arsi-Bale goats maintained at Adami Tulu Agricultural Research Center in the mid Rift Valley of Ethiopia from (1999-2003). The results of the experiment revealed that the year of birth had a significant effect ($P < 0.05$ and $P < 0.001$) on all traits studied except for

18MW. Live weights tended to increase from 1999 to 2001 and decreased thereafter.

Rahman et al. (2007) conducted at the Artificial Insemination Center, Bangladesh Agricultural University, Mymensingh to record the Black Bengal bucks morphology and to relate body weight with different body measurements. A total of 22 Black Bengal bucks of different ages were taken and were divided into six age groups (0, 3, 6, 9, 12 and 15 months). The body weight of Black Bengal bucks at 0, 3, 6, 9, 12 and 15 months of age were 1.21 ± 0.12, 4.26 ± 0.25, 7.68 ± 0.31, 12.76 ± 0.42, 16.56 ± 0.57 and 21.82 ± 0.70 kg respectively.

Rashidi et al. (2008) observed that in the genetic parameters for economic traits in Markhoz goats. Data collected from 1993 to 2006 by the Markhoz goat Performance Testing Station in Sanandaj, Iran, were analyzed. The traits recorded as body weight performance at birth (BW), weaning (WW), six month (6MW), nine month (9MW), yearling (YW) and yearling fleece weight (YFW) were investigated. Flocks were housed in semi-intensive conditions with dry summer and cold winter. The result of the experiment revealed that the highest coefficient of variation (CV) was observed for body weight at 6 month of age (24.57%) and the lowest CV was for birth weight (17.05%).

Baiden (2007) reported that the 441West African Dwarf goat (WADG) kids born from September 1999 to August 2002 at three locations in the Dangme West District of the Greater Accra Region in Ghana to determine the effect of environmental factors on birth weight, birth type and pre weaning survivability. Results of the experiment overall mean birth weight for kids was 1.32 ± 0.01 kg. Kids born at Baabi were significantly ($p < 0.05$) heavier than those born at Minya but closer ($p > 0.05$) in weight to those born at Sota.

Bosso et al. (2007) stated at the genetic parameters for growth traits and to evaluate genetic trends in West African Dwarf goat and Djallonke sheep. The West African Dwarf is a goat breed found on the coast of west and central

Africa. In that study they observed that the average birth weights for West African Dwarf kids and Djallonk´e lambs were about 1.57 and 2.01 kg, respectively. Kids and lambs were weaned at 5.75 and 8.51 kg, respectively.

Gaddour et al. (2007) stated that the kid's weight of local Alpine, Damascus, Murciana goat averages at birth and at 120 days age were about 3.49 and 15.78 kg, respectively.

Hassan et al. (2007) reported the status of different productive and reproductive parameters of Black Bengal and Crossbred goats at Bandaikhara village under Atrai Upazilla of Naogaon district during the period of September to December/2005. The results of the experiment revealed that the average birth weight of Black Bengal goat and Crossbred goats were 1.60±.50 and 1.90±.75 respectively and differences are statistically significant ($P<0.05$).

Rahman (2007) showed that an experiment on Black Bengal buck and reported that body weight of Black Bengal bucks at 0, 3, 6, 9, 12 and 15 months of age were 1.2140.12, 4.26±0.25, 7.68+0.31, 12.76+0.42, 16.56+0.57 and 21.82+0.70 kg, respectively. Body weight significantly ($p<0.05$) differ with different age groups.

Snyman (2007) conducted an investigation into reproductive performance and kid mortality aspects in South African Angora goats. This study was conducted from 2000 to 2004 on 12 South African Angora goat studs, kept under a variety of management systems. The result of the experiment revealed that coefficient variation (CV) of birth weight, weaning weight and 12 month weight 16.0%, 20.3% and 16.1% respectively.

Alam (2006) showed an experiment on white goat and reported that the body weight of does at birth, 3, 6, 9, 12 months of age were 1.18, 4.17, 6.78, 10.91, 13.22 and 1.07, 3.18, 6.48, 10.32, 12.18 kg, respectively.

Muluken (2006) on farm growth assessment of goats in Sekota woreda revealed that the average birth weight and weaning to be 2.27 kg and 7.91 kg respectively.

Tesfaye, et al. (2006) observed that the mean birth weight and weaning weight of Central Highland goats were 2.32 kg, 6.72 kg and 62.63 g/day, respectively.

Kumar et al. (2005) studied at the data containing 236 the Tellicherry kids (123 male and 113 female) born in four seasons i.e. 1- Southwest monsoon (June to September), 2- Northeast Monsoon (October to December), 3- Winter (January to February) and 4- Summer (March to May) maintained at Mecheri Sheep Research Station, Pottaneri, Tamilnadu from 1991- 2001. In the experiment they observed that the least square mean in birth weight, 3-month and 6 month were 2.274±0.08, 9.303±0.19, 13.137±0.022 kg respectively.

2.2 Effect of sex on the body weight of kids

Tabreze (2018) found that, sex of Black Bengal goat has highly significant (p<0.01) effect on the body weight at 3 months (5.22±0.04 and 4.77±0.04 kg) and 6 months of ages (8.74±0.04 and 7.96±0.04 kg) respectively for male and female and significant (p<0.05) effect on the body weight at 9 months (10.66±0.09 and 10.10±0.10 kg) and 12 months (12.88±0.06 and 11.82±0.07 kg). He concluded that, male had heavier body weight than female in all the ages.

Belay *et al.* (2018) reported that, the birth weight of male kids (2.98 kg) was heavier than female (2.82 kg) in F1 crossbred Boer-Abergelle goat kids.

Routa *et al.* (2018) observed that the sex had significant effect (p<0.05) on body weight at different ages.

Islam *et al.* (2016) also found the higher body weight in male (1.65±0.10 kg) than female (1.35±0.06 kg) in his experiment at Beltoli and Sobagia villages under Sadar upazila of Mymensingh district during June 2014 to July 2014.

Deribe *et al.* (2015) conducted an experiment where evaluate the growth performance of Boer-Central Highland Goats (CHG) cross kids at Sirinka Agriculture Research Center SARC. The study was performed in a period of 5 successive years from 2009 and 2013. In a study they reported that there was a significant difference (p<0.05) between male and female kids in weight from birth to weaning. However, males had higher body growth than females.

Paul *et al.* (2014) reported that the birth weight of kid was not significantly influenced by sex of kid at three different regions i.e., Bangladesh Agricultural Uiversity (BAU), Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012.

Patel and Pandey (2013) studied at the production and reproduction performance of Mehsana goats and growth performance of their offspring under farm condition. They reported that the mean birth weight was significantly higher in male kids as compared to female kids.

Khan *et al.* (2013) studied on the live weight gain of goats under semi-intensive conditions of Chittagong district of Bangladesh during the period of July, 2012 to January, 2013. Data of 72 black Bengal and 32 Jamunapari goats were collected. The study revealed that the Average birth weight of male and female black Bengal goat's kids were 1.22±0.15, 1.01±0.14, 1.42±0.10 and 1.12±0.27 kg, respectively for farm 1 and 2. For Jamunapari goats kid birth weight were 1.51±0.07 and 1.42±0.09 kg, for male and females, respectively in the farm 2.

Mia *et al.* (2013) observed that the nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh Agricultural University, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. In that study they reported that the male kids were heavier than

females from birth to 12- month of age, and the differences between the two sexes were significant at all ages under study, except at birth and 3 month of age. Sex had an appreciable effect on growth after weaning until mature age of the goat.

Sundaram *et al.* (2012) stated at 27 male Tellicherry goats and 10 female Tellicherry goats maintained at the Livestock unit of Tamilnadu Agricultural University were taken for the study (Coimbatore, India). The goats were maintained as per the routine feeding and management practices of the farm. In that study they found that the birth weight of the Tellicherry goats in the farm was 2.62 ±5.04 Kg for male and 2.34 ±0.72 Kg for female.

Mioc *et al.* (2011) studied at production characteristics of Croatian multicolored goat kids (birth weight, age and body weight at weaning, and average daily gain) in extensive breeding conditions. The experiment reported that the average birth weight of male kids was higher than female kids (2.3: 2.27 kg), although the differences were not significant (P> 0.05). On the other hand, the research determined the significant influence of sex on average.

Faruque *et al.* (2010) found at the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Savar, Dhaka. Ninety elite pre- pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi-intensive management to compare performance. In the study they observed that overall birth weight was observed as 1.37 + 0.039 kg and 1.37+0.10 kg, respectively for male and female kid.

Alex *et al.* (2010) reported that the farmer's flocks of All India Co-ordinated Research Project (AICRP) on goats for improvement of Malabari goat. The data was collected from three centres of AICRP on goats located in Tellichery,

Tanur and Badagara, which are respectively in Kannur, Malappuram and Kozhikode districts of Kerala. These are three northern districts of Kerala, which is the home-tract of Malabari goats. In the study they observed that the birth weight of female and male kids were 2.36±0.04 kg and 2.39±0.04 kg, respectively.

Hassan *et al.* (2010) conducted that which goats were ear-tagged and maintained under semi-intensive conditions from July 2007 to June 2009. Ninety-six does and eight bucks were housed in slatted floor permanent house raised above the ground. Buck was kept separate from does to avoid unplanned mating. In the study they observed that the growth rate and weight of the male kids were higher than the female at all stages but the effect was non-significant ($P<0.05$).

Bharathidhasan *et al.* (2009) observed that the growth performance of 99 Barbari kids from birth to weaning age (90 days) and the influence of nongenetic factors like sex, season, type, parity and year on birth weight, weaning weight and preweaning weight gain at University Research Farm, Madhavaram Milk Colony, Chennai. Barbari kids born in summer (March - May), southwest monsoon (June-August), northeast monsoon (September-November) and winter (December-February) during the period between 2005 and 2007. The experiment revealed that the average birth weight of male and female kids was 1.92 ± 0.07 and 1.84 ± 0.07 kg, respectively. Even though male kids weighed 4.17 % higher birth weight than female kids, there was no-significant difference observed.

Thiruvenkadan *et al.* (2009) reported at the body weight of 566 Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu, India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. They reported that the sex highly significant effects on body weights

at different ages and male birth weight (2.28±0.03) was heavier than female (2.07 ±0.03).

Paul (2008) reported an experiment on Black Bengal goats in the central part of Bangladesh and reported that body weight of Black Bengal bucks and does at 0, 3, 6, and 12 months of age were 1.08±0.06, 5.22±0.33,8.95±0.34, 12.05±0.47 14.20±0.41 and 1.01±0.23, 3.93±0.19, 7.41±0.27, 9.53±0.38, 12.40±0.41 kg, respectively. Body weight significantly ($p<0.05$) differ with different groups.

Rashidi et al. (2008) studied that the estimate genetic parameters for economic traits in Markhoz goats. Data collected from 1993 to 2006 by the Markhoz goat Performance Testing Station in Sanandaj, Iran, were analyzed. The traits recorded as body weight performance at birth (BW), weaning (WW), six month (6MW), nine month (9MW) and yearling (YW) were investigated. Flocks were housed in semi-intensive conditions with dry summer and cold winter. In that study they observed that the effect of sex was significant ($p<0.01$) and male weight was heavier than female weight in every stage.

2.3 Effect of type of birth on growth performance of kids

Tabreze (2018) found that, type of birth has highly significant ($p<0.01$) effect on body weight at birth, 3, 6, 9 and 12 months. Single type (0.99±0.01kg) birth of kid weight was higher than twins (0.93±0.01 kg) and triplets (0.87±0.01 kg).

Paul *et al.* (2014) studied at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the different types of birth, single kids showed the highest weight at birth followed by twins and triplets.

Mia *et al.* (2013) reported that the effect of type of birth was significant ($p<0.01$) on the body weight at birth only. Single and twin kids had a heavier

weight at birth than the triplet, whilst no marked difference was found between single and twin kids.

Banerjee and Jana (2010) studied at a flock of Sirohi (45 does) goats that were/ are reared at the Government Livestock farm from 2003 to 2007 to study the factors affecting birth weight of Sirohi Goat kids reared in hot and humid climate of West Bengal. In that study they indicated that the single born kids were heavier than the twins and the triplets. The difference in body weights for different types of births may be due to that littermates had to share the prenatal maternal nourishment in contrast to the single born kids.

Thiruvenkadan *et al.* (2009) observed that the body weight of 566 Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. In that study they reported that the single type birth weight (2.34±0.03 kg) was comparatively higher than multiple type birth weight (2.01±0.03 kg).

Toplu and Altinel (2008) suggested that the viability in pre-weaning period and growth performance in the period from birth to 8 months of age of Hair kids (Anatolian Black Goat). A total data of 439 kids in 2003 and 2004 years were used in the study. In that study they revealed that the single kids weight at birth 2.60 kg and twins 1.78 kg.

Elabid (2008) conducted at ninety-two male and female Sudan Nubian kids used in this experiment and kids were born to Nubian parent stock during the period 1998 to August 2000 to study various factors affecting birth weight of Sudanese Nubian goat kids. The result of the experiment revealed that the birth weight of single born kids was significantly higher than both twin and triplet born kids; following the same lines the birth weight of twins was significantly higher than that of triplets. The respective values for birth weight of singles, twins and triplets were 2.489±0.522, 1.963±0.325 and 1.500 kg, respectively.

Rashidi *et al.* (2008) studied that to estimate genetic parameters for economic traits in Markhoz goats. Data collected from 1993 to 2006 by the Markhoz goat Performance Testing Station in Sanandaj, Iran, were analyzed. The traits recorded as body weight performance at birth (BW), weaning (WW), six month (6MW), nine month (9MW) and yearling (YW) were investigated. Flocks were housed in semi-intensive conditions with dry summer and cold winter. In that study they revealed that the birth weight of single born kids was significantly higher than both twin and triplet born kids; following the same lines the birth weight of twins was significantly higher than that of triplets. The respective values for birth weight of singles, twins and triplets were 2.56 ± 0.01, 2.53 ± 0.01 and 2.27 ±0.11 kg, respectively.

Baiden (2007) reported that the 441West African Dwarf goat (WADG) kids born from September 1999 to August 2002 at three locations in the Dangme West District of the Greater Accra Region in Ghana to determine the effect of environmental factors on birth weight, birth type and pre weaning survivability. Results of the experiment showed that there was no significant difference (p>0.05) between the average birth weights of singles and twins, but singles were significantly heavier (p<0.05) than triplets. The average birth weight of quadruplets (1.25 ± 0.11 kg) was similar (p>0.05) to that of triplets (1.24 ± 0.05 kg).

Kumar *et al.* (2005) showed that the data containing 236 the Tellicherry kids in Tamilnadu from 1991- 2001. In the experiment they observed that the effect of type of birth on body weight at six months of age was significant (P<0.01). As expected, the body weight of kids born as single was significantly heavier than the multiples.

2.4 Effect of parity of dam on the body weight of kids

Tabreze (2018) shown that, first, second and third parity of dam has highly significant (p<0.01) effect on body weight at 3 months (4.95±0.05, 5.04±0.04 and 5.08±0.05 kg) and 12 months (12.21±0.67, 12.39±0.08 and 12.67±0.07 kg)

and significant (p<0.05) effect at birth weight (0.94±0.01, 0.95±0.01 and 0.97±0.01 kg) and 6 months body weight (8.29±0.06, 8.37±0.05 and 8.54±0.05 kg) respectively of all ages. Body weight is higher in third parity than first and second parity in all ages.

Routa *et al.* (2018) conducted that the Jamunapari goats were introduced to the study area (CIRG) from their natural habitat, the Chakarnagar area of Etawah district of Uttar Pradesh, which is situated 150 km from the Central Institute for Research on Goats (CIRG) in Mathura, India, 1982 to 2012.The study area has semiarid climate and an average annual rainfall of about 375mm which is scattered during the months of June to September. The result of the experiment observed that the parity of dam had significant effect (p<0.05) on body weight at different ages.

Paul *et al.* (2014) studied at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the parity of dam significantly (p<0.01) influenced the birth weight in three different regions. There was a tendency to increase weight with the advance of parity in all regions. Significantly highest birth weight was observed in 3rd parity and lowest in 1st parity in all regions.

Deribe and Taye (2013) conducted at Abergele in the semiarid parts of Sekota district to evaluate growth performance of Abergele goats managed under traditional management systems. Data on growth and growth rates were collected from 724 kids for two years. The results of the experiment revealed that the parity of doe had significant effect (p<0.01) on kid birth weight that kids born from first parity dams had lower weight than kids born from other higher parity dams.

Mia *et al.* (2013) stated at nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. The result of the experiment revealed that parity of the dam has significant ($p<0.01$) influence on birth weight. Birth weight increased with the progress of parity.

Faruque *et al.* (2010) reported at the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Savar, Dhaka. Ninety elite pre-pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi-intensive management to compare performance. In the study they observed that the birth weight of male kids was significantly ($p<0.001$) affected by parity whereas birth weight of female kids was not affected ($p>0.05$) by parity.

Bharathidhasan *et al.* (2009) studied at the growth performance of 99 Barbari kids from birth to weaning age (90 days) and the influence of nongenetic factors like sex, season, type, parity and year on birth weight, weaning weight and pre-weaning weight gain at University Research Farm, Madhavaram Milk Colony, Chennai. Barbari kids born in summer (March-May), southwest monsoon (June-August), northeast monsoon (September-November) and winter (December-February) during the period between 2005 and 2007. The experiment observed that the effect of second parity on birth weight was more than first and third parity. The weaning weight and average pre-weaning daily gain had increased in second parity than first parity.

Thiruvenkadan *et al.* (2009) conducted at the body weight of 566 the Tellicherry goats, maintained at Mecheri Sheep Research Station Pottaneri, Tamil Nadu India were collected over a period of 20 years (1988 - 2007). The body weights at different ages (i.e. at birth and at three, six, nine and 12 months) were recorded. The results of the experiment revealed that the increased birth weight 1st to 3rd parity and then decline birth weight in 4th parity. Then again increased body weight in 5th and 6th parity were reported.

Kumar *et al.* (2005) reported in 236 the Tellicherry kids (123 male and 113 female) born in four seasons i.e. 1- Southwest monsoon (June to September), 2- Northeast Monsoon (October to December), 3- Winter (January to February) and 4- Summer (March to May) maintained at Mecheri Sheep Research Station, Pottaneri, Tamilnadu from 1991-2001.The result of the experiment revealed that the parity had significant effect on body weight at birth and three months of age. The mean birth weight was higher at 4th parity and the mean three month body weight was higher at the 3rd parity. The birth weight reached maximum at 4th parity but the three months weight was maximum at 3rd parity itself indicating that the kids can be selected from 3rd parity for higher growth rate than at 1st and above 4th parity.

2.5 Effect of season on growth performance of kids

Tabreze (2018) studied on Black Bengal goat in Savar and cocuded that, season plays a vital role on growth performance. The effect was highly significant (p<0.01) in birth weight (0.91±0.01, 0.99±0.01 and 0.97±0.01 kg), 3 months (4.87±0.04, 5.22±0.04 and 4.89±0.06 kg) and 12 months (12.21±0.06, 12.65±0.07 and 12.30±0.10 kg) of ages respectively in winter, summer and rainy season whereas significant effect (p<0.05) at 6 months body weights (8.20±0.04, 8.63±0.05 and 8.23±0.07 kg) respectively.

Routa *et al.* (2018) investigated that the Jamunapari goats were introduced to the study area (CIRG) from their natural habitat, the Chakarnagar area of Etawah district of Uttar Pradesh, which is situated 150 km from the Central

Institute for Research on Goats (CIRG) in Mathura, India, 1982 to 2012.The study area has semiarid climate and an average annual rainfall of about 375mm which is scattered during the months of June to September. The result of the experiment observed that the Season of birth had significant effect ($P < 0.01$) on body weight at 3 months of age.

Paul *et al.* (2014) studied at the productive and reproductive parameters of Black Bengal goat in a nucleus breeding flock of Bangladesh Agricultural University, and two other regions i.e., Modhupur (Tangail) and Dimla, (Nilphamari). Data were collected on a regular basis from January 2011 to January 2012. In that study they reported that the season of birth has a significant ($p<0.05$) effect on birth weight. Winter born kids were significantly ($p<0.05$) heavier than that of other seasons at three different regions.

Kuthu *et al.* (2013) conducted on pedigree, breeding and performance records of Teddy goats (both male and female) kept at (I) Livestock Experiment Station Rakh Ghulaman, District: Bakkhar (1984-2008) (II) Livestock Experiment Station, Rakh Khariewala District: Layyah (1972-2008) and (III) Livestock Experiment Station Chak Katora, District: Bahawalpur (1974-2008) Pakistan were utilized in this study. In the experiment they revealed that the study showed that monsoon born kids continued to weigh heavier than those of summer born due to adequate availability of greens to dams during winter and the proceeding monsoon season.

Mia *et al.* (2013) stated at nucleus breeding flock (NBF) at artificial insemination centre, department of animal breeding and genetics, Bangladesh agricultural university, Mymensingh from April, 2007 to March 2011 to study the genetic evaluation of growth traits of Black Bengal goat. In that study a total of 63 Black Bengal does and 17 Black Bengal bucks were used as parental stock in this study. The does were reared semi intensively and stall fed twice daily on a diet consisting of Napier, German and / or maize fodder as per requirement. The result of the experiment reported that the different stages of

growth, the variation in body weights due to season of birth was highly significant (p<0.05). Winter born kids were significantly (p<0.05) heavier at birth to 9 month of age, than their counterparts from the rainy season.

Mioc *et al.* (2011) studied at production characteristics of Croatian multicolored goat kids (birth weight, age and body weight at weaning, and average daily gain) in extensive breeding conditions. The experiment reported that the kids born in spring had significantly higher (p>0.001) average birth weight (2.3 kg) than kids born in winter (1.77 kg).

Banerjee and Jana (2010) suggested in a flock of Sirohi (45 does) goats that were/ are reared at the Government Livestock farm from 2003 to 2007 to study the factors affecting birth weight of Sirohi Goat kids reared in hot and humid climate of West Bengal. In that study they indicated that the kids born as twins in the summer months of the first year heavier than those of the monsoon and winter months respectively, the female kids born in the summer months are heavier than those born in monsoon and winter months respectively.

Faruque *et al.* (2010) observed that the "Improvement of Black Bengal goat through selective breeding" project and then continuation project "Improvement of Black Bengal goat through selective breeding, improved feeding and management practices" project conducted at Bangladesh Livestock Research Institute, Savar, Dhaka. Ninety elite pre-pubertal Black Bengal does and 15 bucks (both foundation stocks) were collected from different parts of Bangladesh. Goats were reared under intensive and semi-intensive management to compare performance. In the study they observed that there were no significant effects of season on birth weight of kids, but it was affected (p<0.10) by rearing system.

Bharathidhasan *et al.* (2009) reported that the growth performance of 99 Barbari kids from birth to weaning age (90 days) and the influence of non-genetic factors like sex, season, type, parity and year on birth weight, weaning weight and pre-weaning weight gain at University Research Farm,

Madhavaram Milk Colony, Chennai. Barbari kids born in summer (March – May), southwest monsoon (June-August), northeast monsoon (September-November) and winter (December-February) during the period between 2005 and 2007. In that study they reported that the birth weight in summer season (1.94 ± 0.08 kg) was heavier than winter season (1.72 ± 0.10 kg). Elabid (2008) observed that the ninety-two male and female Sudan Nubian kids used in this experiment and there were born to Nubian parent stock during the period 1998 to 2000 to study various factors affecting birth weight of Sudanese Nubian goat kids. The result of the experiment revealed that the effect of year/season of kidding on birth weights. The results verified significant effects on the birth weight ($P< 0.05$). The heaviest kids were kidded at wet summer 1999 (2.82 ± 0.51 kg) while the lightest kids were delivered at winter 2000 (2.06 ± 0.26 kg).

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CHAPTER III
MATERIALS AND METHODS

The experiment on "Comparison of Growth Performance of Black Bengal Goat in Different Regions in Bangladesh" was conducted under the supervision of the Department of Animal Nutrition, Genetics & Breeding at Sher-e-Bangla Agricultural University, Dhaka-1207.

3.1 Study Site

The data of growth performances of Black Bengal Goat were collected from 3 different regions of Bangladesh. The goat farmers of selected areas were considered as the population of the study.

Table 3.1 Study area

SL	District	Upazilla	Village	No. of Farms
1	Dhaka	Savar	Kalma	15
			Adorshagram	13
			Anarkoli	12
2	Kishoregonj	Tarail	Sachail	13
			Kalna	15
			Kajla	12
3	Sunamganj	Derai	Galishal	10
			Rasulpur	15
			Nachni	15

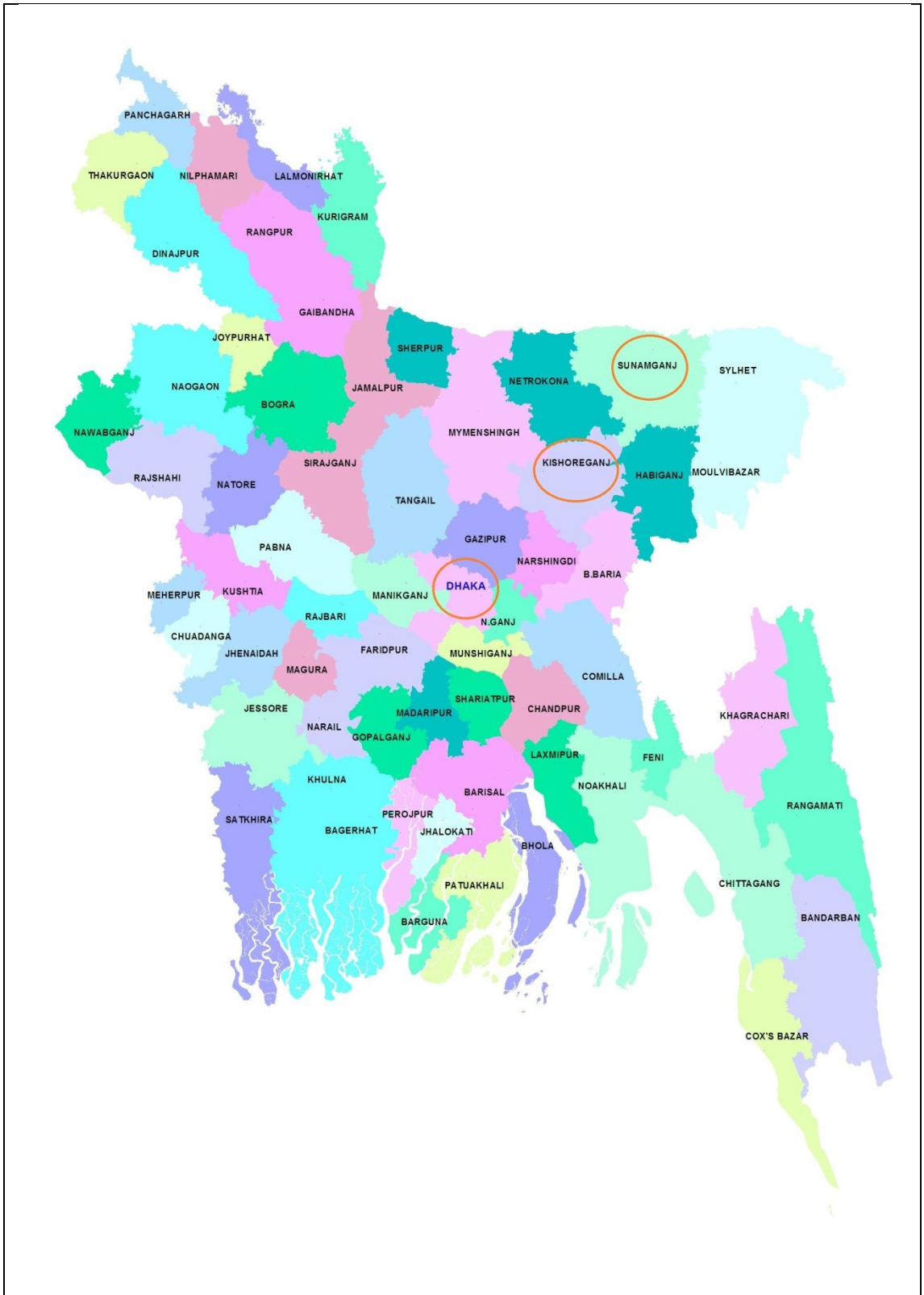

Figure 3.1: Districts under study

3.2 Study Duration

The study was conducted from January to December, 2020.

3.3 Data Collection

An interview schedule was developed to gather necessary data regarding the objectives of the study. Some of the questions were open and some were closed. The interview schedule was pre-tested with 10 goat farmers of the study before finalization. The experience of the pre-test was used for corrections, modifications and alterations of the interview schedule for final data collection. Recommendation from research supervisors was also helped to finalize the interview schedule. A copy of interview schedule in English version has been furnished in appendix-I.

The researcher himself visited the goat farms of the targeted villages to collect the data. Each and every farmer was interviewed individually during visiting the farm. Every point of the questionnaire was clarified to the farmer in local language to get the real data as well as to feel comfortable with the study.

3.4 Feeding and Management of Goats

During the study, husbandry practices of goat were observed and noted carefully. In some cases the researcher gave some advices to the farmers according to the husbandry practices and in case of disease and disorders. Husbandry practices includes mainly of housing, feeds and feeding management, reproductive care and health management of Black Bengal goats.

Both semi-intensive and extensive farming were observed during the study. Grazing in the pasture land in the day time and took night shelter in the owners premises was the common scenario in most of the farms. In some occasion, the goats are tethered by rope and allowed to graze by road side or suitable pasture land convenient to the farmers.

Generally, goat house should be raised about 4 feet above the ground due to the bad smell of the goat urine. Some farmers made their goat house in a galvanized iron sheet with a wooden slatted floor whereas some farmers made with straw or bamboo and polythene. Moreover some farmers kept their goat besides their living room or under the space of their bed. Providing bedding materials (eg. rice straw, rice bran and dry tree leaves) to the goat in winter was common in all over the study area.

Goats are herbivorous animal. They live of leaves of tree viz., mango leaves, jack fruit leaves, banana leaves or cut grass from the cultivated land. Due to increase in number of goat, some farmers had to cultivate high yielding grasses like Napier, German and Maize for their goats. Some of the farmers were used to feed commercial concentrate in pellet form in the morning and again in the afternoon at the rate of 200-250 g/ goat. Wheat bran and rice bran are also used in daily basis. Water from tube-well was found as the major source of drinking water for goats.

Natural breeding was practiced as a whole thus did not use artificial insemination (AI). They did not keep breeding buck also in every farm. Animals in an advanced stage of pregnancy, farmers generally take it close observation for kidding and proper care of kids during and after birth. Farmers supplied little bit more grass and tree leaves to their lactating does than that of pregnant does while they supplied more amount of concentrates feed to their pregnant does than that of lactating does.

Most of the farmers did not maintain the bio-security measures strictly though they were informed about these. But the situation was changing by time. The numbers of sincere and alert farmers were increasing day by day who were maintaining bio-security measures as it reduces diseases. Commonly faced diseases were Peste des Petits Ruminants (PPR), fever, cough diarroea, naval infection etc.

Vaccination against Peste des Petits Ruminants (PPR) was not so common but most of the farmers dewormed their goats with broad spectrum anthelmintic such as Endex (Triclabendazole-900mg, levamisol-600), levanid (Tetramisole HCL-2gm, Oxyclozanide 1.4gm), Injection of vermic (Ivermectin) or with Fasinex (Triclabendazole-900mg). Anti-diaorrheal drug and saline were also used. Sumidvet powder was generally used if any wound occurred. Treatment of animals for any disease was done when the disease was prevailed.

Above discussions might be indicative that farmers were more careful about housing, feeding but less careful about health care and breeding buck keeping issues.

3.5 Parameters studied

The growth records of goats in the interval of time were taken into consideration in the current study. Body weight at birth, 3, 6 and 12 months were analyzed to assess the growth pattern under following parameters:

- Geography: Comparison among growth patterns in three study areas.
- Sex of kid: Effect of sex on growth was studied.
- Type of birth: Single, twins or triplet
- Parity of dam: How many times the dam kidded
- Season: Effect of season on growth performance

3.6 Statistical analysis

All values were expressed as (Mean±SE). Statistical significance of differences between different parameters was evaluated by using student's t-test. The statistical analysis was done by SPSS program (Version 16.0; SPSS Inc., Chicago, IL, USA).

CHAPTER IV

RESULTS AND DISCUSSION

Data of growth performances of goats were collected from three different locations of three districts and analyzed to make a conclusion on growth performance of Black Bengal goats of the country. A total of 120 goat data were collected for this experiment. The result of the study is illustrated in this chapter.

4.1 Effect of Geography

The data of 40 goats from each of 3 districts were collected from respective farmers. The growth performance of goats was found the best in Dhaka followed by Kishoreganj and Sunamgonj (Table 4.1 and Figure 4.1).

Table 4.1. Growth performance of goat in different geography

Geography	Sample Size	Live weight (Kg)			
		Birth	3-month	6-month	12-month
		Mean+SE	Mean+SE	Mean+SE	Mean+SE
Dhaka	40	0.97a±0.02	5.51a±0.05	8.71a±0.08	12.97a±0.08
Kishoreganj	40	0.90a±0.02	4.99b±0.08	8.07b±0.07	12.34b±0.11
Suamganj	40	0.82b±0.02	4.93b±0.08	7.64c±0.06	11.60c±0.05

Mean values in the same column with different superscripts (a, b & c) differ significantly at $p<0.05$.

Birth weight was found higher in Dhaka (0.97±0.02) and Kishoreganj (0.90±0.02) than Sunamganj (0.82±0.02) and the difference was statistically significant ($p<0.05$). Body weight at 3 months of age also differed significantly ($p<0.05$). Statistically, Kishoreganj (4.99±0.08) has similarity with Sunamganj (4.93±0.08) whereas higher weight was found in Dhaka (5.51±0.05). At the age of 6 months, the body weight differed significantly in all three districts. Here the body weights were 8.71±0.08, 8.07±0.07 and 7.64±0.06 in Dhaka,

Kishoreganj and Sunamganj respectively. Body weight at 12 months of age followed the trend of 6 months weight. Higher body weight was found in Dhaka (12.97±0.08) and it was followed by Kishoreganj (12.34±0.11) and Sunamganj (11.60±0.05) at the age of 12 months and they were statistically different (p<0.05).

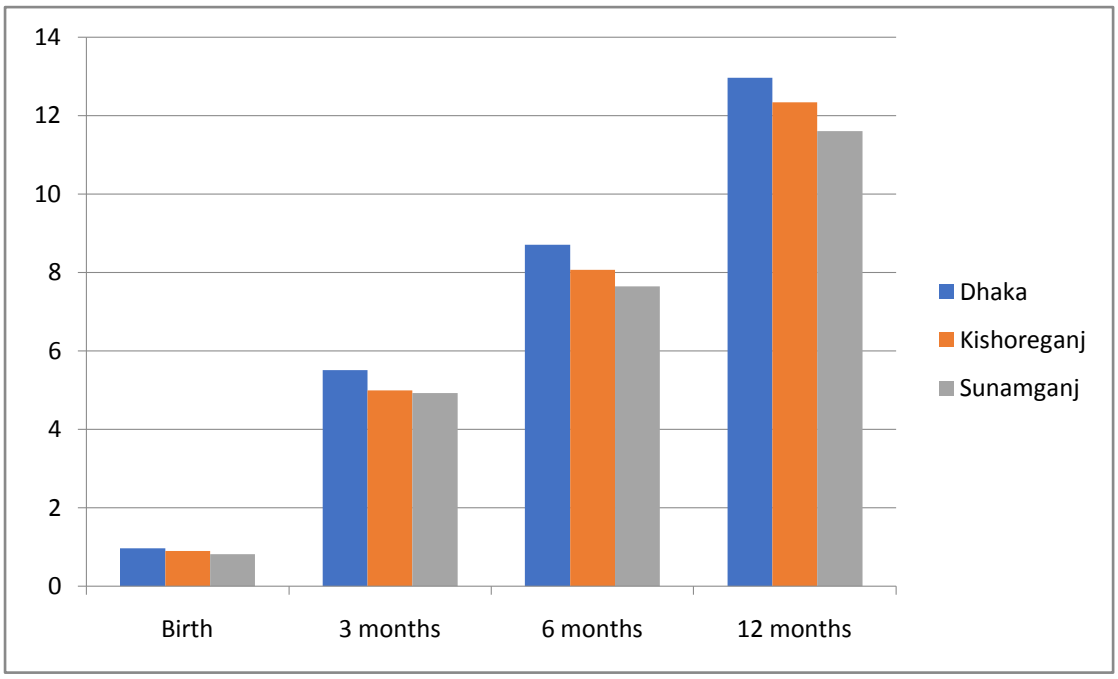

Figure 4.1. Growth performance of goat in different geography

Husain *et al.,* (1996) found geographical differences in his study. Birth weight was similar in three locations and lower in another that is similar to this study. Environmental variation due to geographical changes may result this difference.

4.2 Effect of Sex

Among the sample of 120 goats, 68 produced male and 52 produced female kids. There were 26 male kids in Dhaka and 21 in both Kishoreganj and Sunamganj whereas 14 female in Dhaka and 19 in both Kishoreganj and Sunamganj. The study revealed that kids have grown well in Dhaka than other two districts irrespective of sex and male kids have better growth than female in all ages.

Table 4.2. Growth performance of goat in different sex

Trait	District	Sample Size	Live weight (Kg)			
			Birth	3-month	6-month	12-month
			Mean+SE	Mean+SE	Mean+SE	Mean+SE
Male	Dhaka	26	0.96a±0.03	5.66a±0.03	8.93a±0.09	13.18a±0.08
	K.ganj	21	0.88ab±0.03	5.18b±0.09	8.33b±0.07	12.81b±0.09
	S.ganj	21	0.82b±0.02	5.21b±0.09	7.89c±0.08	11.78c±0.06
	Total	68	0.89a±0.02	5.37a±0.05	8.43a±0.07	12.63a±0.08
Female	Dhaka	14	0.99a±0.03	5.24a±0.09	8.29a±0.08	12.58a±0.10
	K.ganj	19	0.93a±0.04	4.77b±0.10	7.78b±0.10	11.83b±0.12
	S.ganj	19	0.81b±0.03	4.62b±0.08	7.36c±0.05	11.40c±0.07
	Total	52	0.90a±0.02	4.84b±0.06	7.76b±0.07	11.87b±0.09

Mean values in the same column with different superscripts (a, b & c) differ significantly at $p<0.05$.

Male kids in Dhaka (0.96±0.03) born with higher body weight, Kishoreganj (0.88±0.03) on middle and Sunamganj (0.82±0.02) with the lower body weight. They differed significantly ($p<0.05$) when Kishoreganj was related to other two districts (Table 4.2 and Figure 4.2). At the age of 3 months, kids in Dhaka (5.66±0.03) have grown significantly better than both Kishoreganj (5.18±0.09) and Sunamganj (5.21±0.09). Kids of 6 and 12 months were recorded as same trend. Body weights were significantly differed in all three districts. Here, it was higher in Dhaka (8.93±0.09 and 13.18±0.08) and followed by Kishoreganj (8.33b±0.07 and 12.81±0.09) and Sunamganj (7.89±0.08 and 11.78±0.06).

Female kids born with higher body weight in Dhaka (0.99±0.03) and Kishoregabj (0.93±0.04) and that were significantly lower in Sunamganj (0.81±0.03) (Table 4.2 and Figure 4.3). At the age of 3 months, kids in Dhaka (5.24±0.09) have grown significantly better than both Kishoreganj (4.77±0.10) and Sunamganj (4.62±0.08). Kids of 6 and 12 months were recorded as same trend. Body weights were significantly differed in all three districts. Here, it

was higher in Dhaka (8.29±0.08 and 12.58±0.10) and followed by Kishoreganj (7.78±0.10 and 11.83±0.12) and Sunamganj (7.36±0.05 and 11.40±0.07).

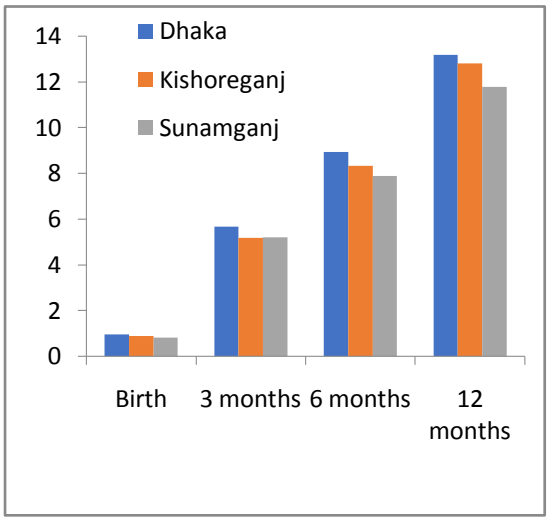

Figure 4.2. Growth performance of goat in male kids

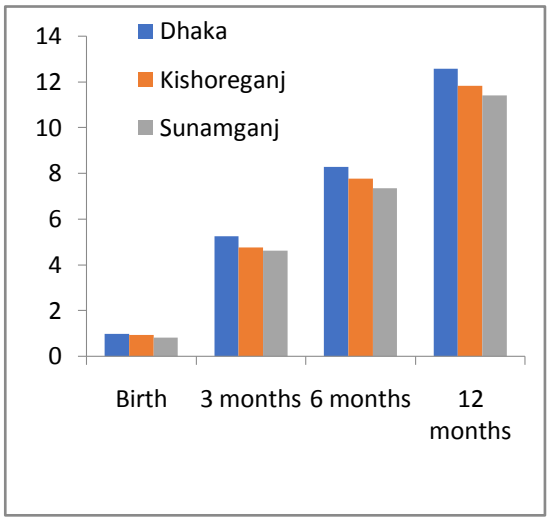

Figure 4.3. Growth performance of goat in female kids

On the other hand, male kids have higher birth weight (0.89±0.02) than female (0.90±0.02) but they were similar in terms of statistical analysis (p<0.05) (Table 4.2 and Figure 4.3). Both statistical and numerical differences were found in the body weight at 3 months of age where male (5.37±0.05) have higher body weight gain than female (4.84±0.06). At the age of 6 months, the body weight followed the previous one both numerically and statistically. Here the body weights were 8.43±0.07 and 7.76±0.07 in male and female kids respectively. The body weight at the age of 12 months was also numerically and statistically higher in male (12.63±0.08) than female kids (11.87±0.09).

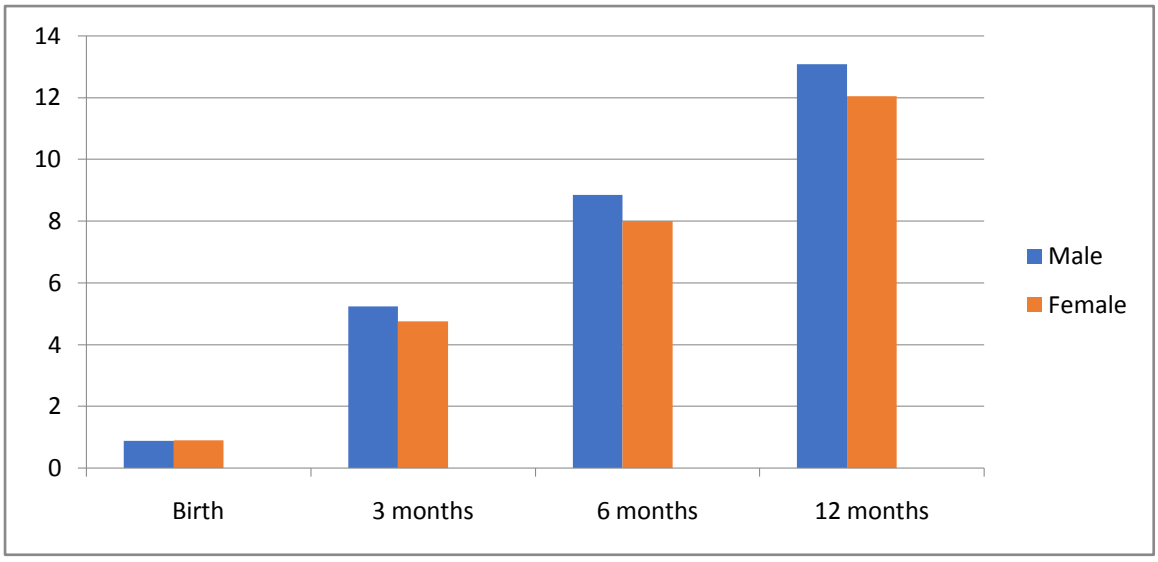

Figure 4.4. Growth performance of goat in different sex

The result was in agreement with the reports of Tabreze (2018), Paul *et al.* (2014), Afzal *et al.* (2004), Portolano *et al.* (2002), Akhter *et al.* (2000) and Husain *et al.* (1996).

4.3 Effect of Type of Birth

Goats are able to give birth of 1-4 kids at a time. But twins is more common in our country. In the current study, 30 single, 60 twins and 23 triplets were born. The result of the study showed that the growth performance was higher in Dhaka and mixed result found in other two districts. In the study among different types, there were no significant differences on the type of birth as all the means in different ages of growth were found statistically similar ($p<0.05$).

In single kid, body weights at birth and at 3 months of age were statistically similar among 3 districts (Table 4.3 and Figure 4.5). Numerically higher was found in Dhaka (0.91±0.04 and 5.42±0.12) in both cases. Birth weight was medium at Kishoreganj (0.88±0.03) and lower at Sunamganj (0.84±0.04). However, weight at 3 months was medium at Sunamganj (5.11±0.19) and lower at Kishoreganj (5.09±0.13).

Table 4.3. Growth performance of goat in different type of birth

Type	District	Sample Size	Live weight (Kg)			
			Birth	3-month	6-month	12-month
			Mean+SE	Mean+SE	Mean+SE	Mean+SE
Single	Dhaka	9	0.91a±0.04	5.42a±0.12	8.67a±0.18	13.10a±0.11
	K.ganj	12	0.88a±0.03	5.09a±0.13	8.27a±0.11	12.58b±0.16
	S.ganj	9	0.84a±0.04	5.11a±0.19	7.74b±0.13	11.74c±0.12
	Total	30	0.88a±0.02	5.20a±0.09	8.23a±0.10	12.48a±0.13
Twins	Dhaka	23	0.97a±0.03	5.56a±0.05	8.88a±0.09	12.97a±0.10
	K.ganj	16	0.94a±0.04	4.85b±0.13	8.00b±0.12	12.18b±0.20
	S.ganj	21	0.82b±0.03	4.96b±0.10	7.55c±0.07	11.61c±0.08
	Total	60	0.91a±0.02	5.16a±0.07	8.18a±0.09	12.23a±0.10
Triplets	Dhaka	5	1.08a±0.06	5.56a±0.08	8.40a±0.21	13.12a±0.25
	K.ganj	12	0.88b±0.04	5.07b±0.13	7.97a±0.12	12.33b±0.17
	S.ganj	6	0.77b±0.04	4.48c±0.11	7.82a±0.23	11.50c±0.11
	Total	23	0.90a±0.04	5.02a±0.11	8.02a±0.10	12.29a±0.16

Mean values in the same column with different superscripts (a, b & c) differ significantly at $p<0.05$.

In twins kids, higher birth weight was found Dhaka (0.97±0.03) and Kishoreganj (0.94±0.04) and significantly lower at Sunamganj (0.82±0.03) (Table 4.3 and Figure 4.6). At the age of 3 months, kids in Dhaka (5.56±0.05) have grown significantly better than both Kishoreganj (4.85±0.13) and Sunamganj (4.96±0.10). Kids of 6 and 12 months were recorded as same trend. Body weights were significantly differed in all three districts. Here, it was higher in Dhaka (8.88±0.09 and 12.97±0.10) and followed by Kishoreganj (8.00±0.12 and 12.18b±0.20) and Sunamganj (7.55±0.07 and 11.61±0.08).

In triplets, kids at Dhaka (1.08a±0.06) born with higher weight and significantly lower at Kishoreganj (0.88b±0.04) and Sunamganj (0.77b±0.04) (Table 4.3 and Figure 4.7). At the age of 3 and 12 months, body weights were significantly different among 3 districts. It was higher in Dhaka (5.56±0.08 and 13.12±0.25) followed by Kishoreganj (5.07±0.13 and 12.33±0.17) and

Sunamganj (4.48±0.11 and 11.50±0.11). However, there was no statistical difference among 3 districts at the age of 6 months. Numerically higher weight was found in Dhaka (8.40±0.21) followed by Kishoreganj (7.97±0.12) and Sunamganj (7.82±0.23).

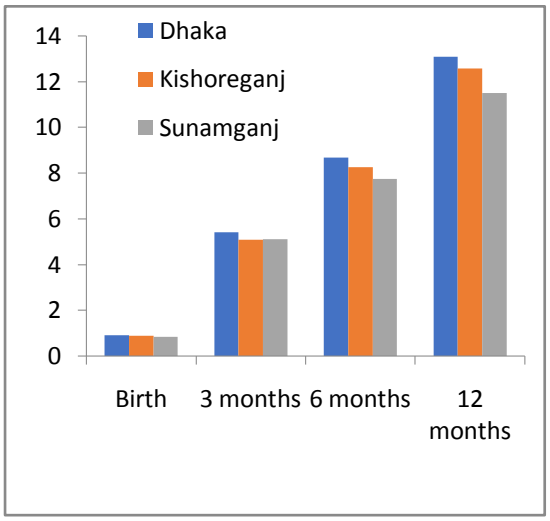

Figure 4.5. Growth performance of goat in single kid

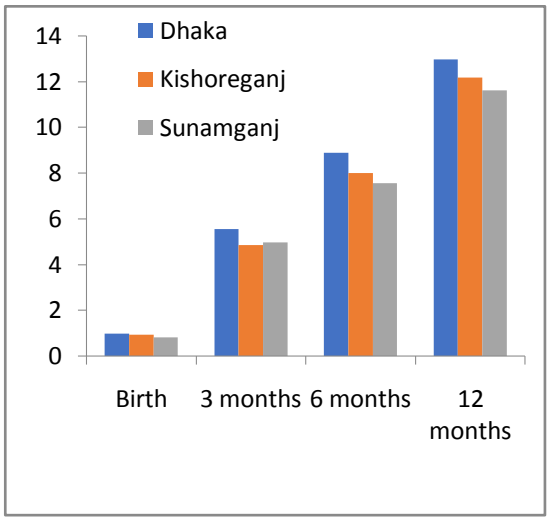

Figure 4.6. Growth performance of goat in twins kid

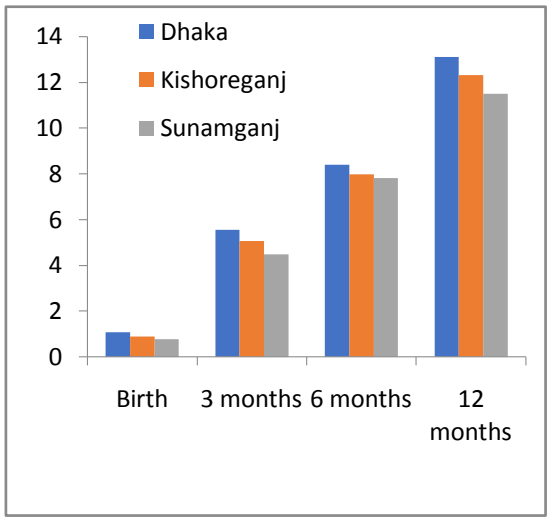

Figure 4.7. Growth performance of goat in triplets kid

On the other hand, in the analysis among types of birth, numerically, single, twins, and triplets have 0.88±0.02, 0.91±0.02 and 0.90±0.04 kg of birth weight respectively where twin kids were heavier than others (Table 4.3 and Figure 4.8). At the age of 3 months, the body weights were 5.20±0.09, 5.16±0.07 and 5.02±0.11 kg in single, twins and triplets chronologically where single born kids were heavier. Body weight at 6 and 12 months followed the trend of 3 months as higher body was found in single (8.23a±0.10 and 12.48a±0.13) than twins (8.18a±0.09 and 12.23a±0.10) and triplets (8.02a±0.10 and 12.29a±0.16). All the means were numerically different but statistically similar (p<0.05).

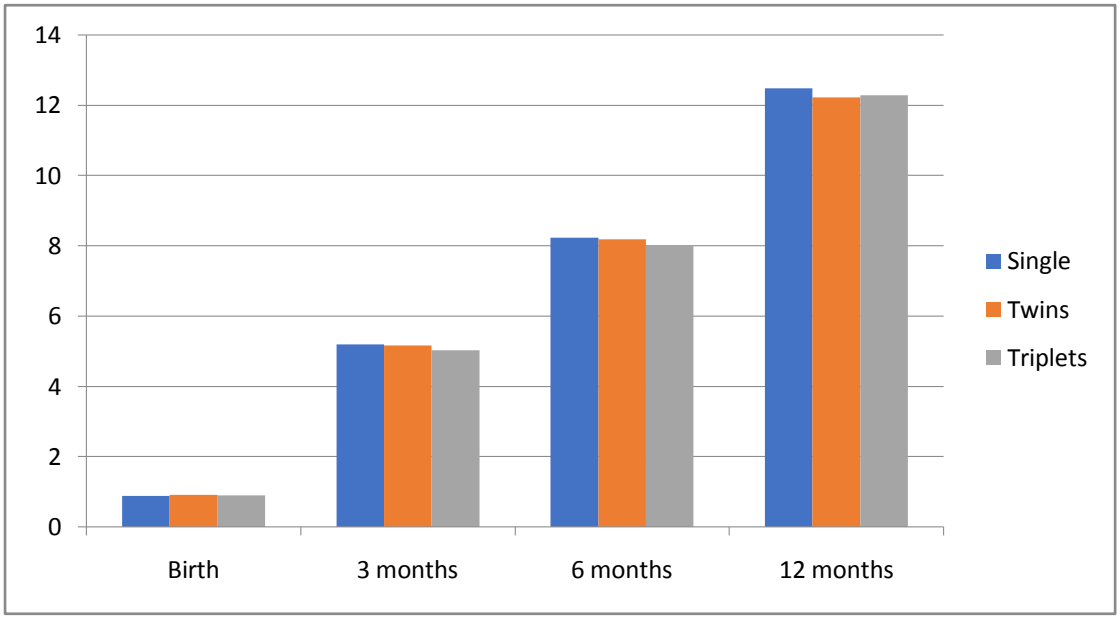

Figure 4.8. Growth performance of goat in different type of birth

The lower birth weight with increasing litter size has also been observed by Al-Shorepy *et al.* 2002), Mourad and Anous (1998), Mia and Bhuiyan (1997) and Gokhale et al. (1996). Paul *et al.* (2014), Kuthu et al. (2013), Mia *et al.* (2012), Boujenane and El Hazzab (2008), Dadi *et al.* (2008), Elabid. (2008), Rashidi *et al.* (2008), Kumar *et al.* (2005), Portolano *et al.* (2002), Husain *et al.* (1996), Sanchez *et al.* (1994), Singh *et al.* (1990) and Wilson (1987) noticed that birth weight of single born kids was highest followed by twins and triplets which are strongly supports in our present study.

4.4 Effect of Parity of Dam

Mother goats are known as dam. The term parity refers to the number of kidding or giving birth. In the 120 sample goats of the study, 35 goats were in first parity in which 10 in Dhaka, 12 in Kishoreganj and 13 in Sunamganj whereas 46 were in second in which 15 in Dhaka, 16 in Kishoreganj and 15 in Sunamganj and 39 goats in third parity in which 15 in Dhaka, 12 in Kishoreganj and 12 in Sunamganj. Kids of Dhaka were found better in all parity of dam, Kishoreganj in middle and Sunamoganj with lower growth. There was no statistical (p<0.05) difference in the growth performances in the goats of different parity as total mean in the present study. However numerical differences were found among the total means.

Table 4.4. Growth performance of goat in different parity of dam

Parity	District	Sample Size	Live weight (Kg)			
			Birth	3-month	6-month	12-month
			Mean+SE	Mean+SE	Mean+SE	Mean+SE
First	Dhaka	10	0.96a±0.04	5.47a±0.12	8.71a±0.17	13.16a±0.11
	K.ganj	12	0.84ab±0.03	5.09ab±0.14	8.26a±0.11	12.52b±0.19
	S.ganj	13	0.83b±0.03	4.90b±0.15	7.59b±0.12	11.59c±0.10
	Total	35	0.87a±0.02	5.13a±0.09	8.14a±0.11	12.36a±0.14
Second	Dhaka	15	0.95a±0.04	5.59a±0.05	8.91a±0.11	13.00a±0.11
	K.ganj	16	0.94a±0.04	4.94b±0.11	8.00b±0.11	12.20b±0.17
	S.ganj	15	0.85a±0.03	4.97b±0.13	7.72b±0.11	11.61c±0.08
	Total	46	0.92a±0.02	5.16a±0.08	8.21a±0.10	12.27a±0.11
Third	Dhaka	15	0.99a±0.03	5.45a±0.09	8.50a±0.14	12.80a±0.15
	K.ganj	12	0.91a±0.05	4.95b±0.16	7.98b±0.13	12.36a±0.20
	S.ganj	12	0.75b±0.03	4.90b±0.12	7.58b±0.09	11.58b±0.11
	Total	39	0.89a±0.03	5.13a±0.08	8.06a±0.10	12.29a±0.12

Mean values in the same column with different superscripts (a, b & c) differ significantly at p<0.05.

First parity kids in Dhaka (0.96±0.04 and 5.47±0.12) were with higher body weight during birth and 3 months of age, Kishoreganj (0.84±0.03 and

5.09±0.14) on middle and Sunamganj (0.83±0.03 and 4.90±0.15) with the lower body weight (Table 4.4 and Figure 4.9). They differed significantly (p<0.05) when Kishoreganj was related to other two districts. At the age of 6 months, kids in Dhaka (8.71±0.17) have grown significantly better than both Kishoreganj (8.26±0.11) and Sunamganj (7.59±0.12). Body weights were significantly differed in all three districts at the age of 12 months. Here, it was higher in Dhaka (13.16±0.11) and followed by Kishoreganj (12.52±0.19) and Sunamganj (11.59±0.10).

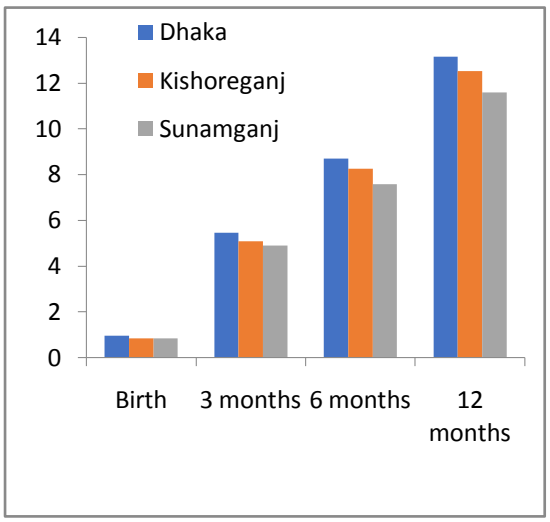

Figure 4.9. Growth performance of goat in first parity

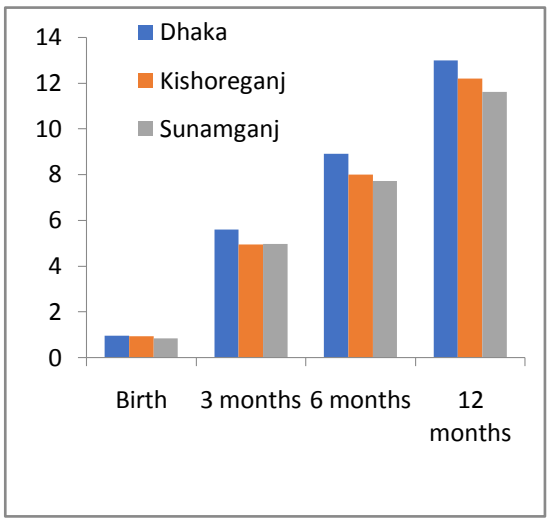

Figure 4.10. Growth performance of goat in second parity

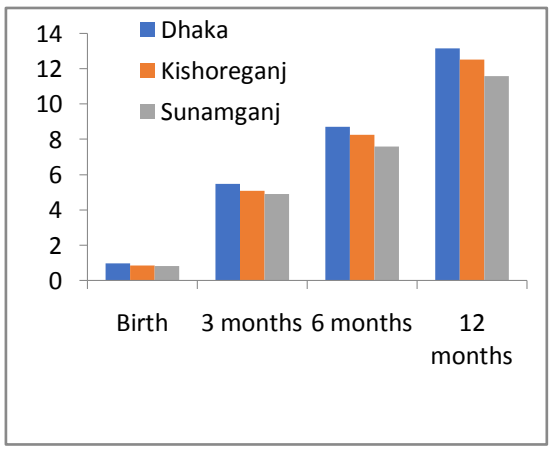

Figure 4.11. Growth performance of goat in third parity

Second parity kids born with numerically higher body weight in Dhaka (0.95±0.04) than Kishoregabj (0.94±0.04) and Sunamganj (0.85±0.03) but they were statistically same (Table 4.4 and Figure 4.10). At the age of 3 and 6 months, kids in Dhaka (5.59±0.05 and 8.91±0.11) have grown significantly better than both Kishoreganj (4.94±0.11 and 8.00±0.11) and Sunamganj (4.97±0.13 and 7.72±0.11). Body weights were significantly differed in all three districts at the age of 12 months. Here, it was higher in Dhaka (13.00±0.11) and followed by Kishoreganj (12.20±0.17) and Sunamganj (11.61±0.08).

Third parity kids were also higher in Dhaka (0.99±0.03) and Kishoreganj (0.91±0.05) but significantly lower in Sunamganj (0.75±0.03) (Table 4.4 and Figure 4.11). They followed similar trend in the mean of weight at 3 and 6 months. Higher body weights were found in Dhaka (5.45±0.09 and 8.50±0.14) and significantly lower in Kishoreganj (4.95±0.16 and 7.98±0.13) and Sunamganj (4.90±0.12 and 7.58±0.09).

On the other hand, according to total means, numerically higher body weight was found at birth in second parity (0.92±0.02) than third (0.89±0.03) and first (0.87±0.02) parity (Table 4.4 and Figure 4.12). The body weight at 3 and 6 months of age was also higher in second parity (5.16±0.08 and 8.21±0.10) than first (5.13±0.09 and 8.14±0.11) and third (5.13±0.08 and 8.06±0.10) parity. However, the trend was changed in late one. The growth was higher 12 months in first parity (12.36±0.14) followed by second (12.27±0.11) and third (12.29a±0.12) parity. All the means were numerically different but statistically similar (p<0.05).

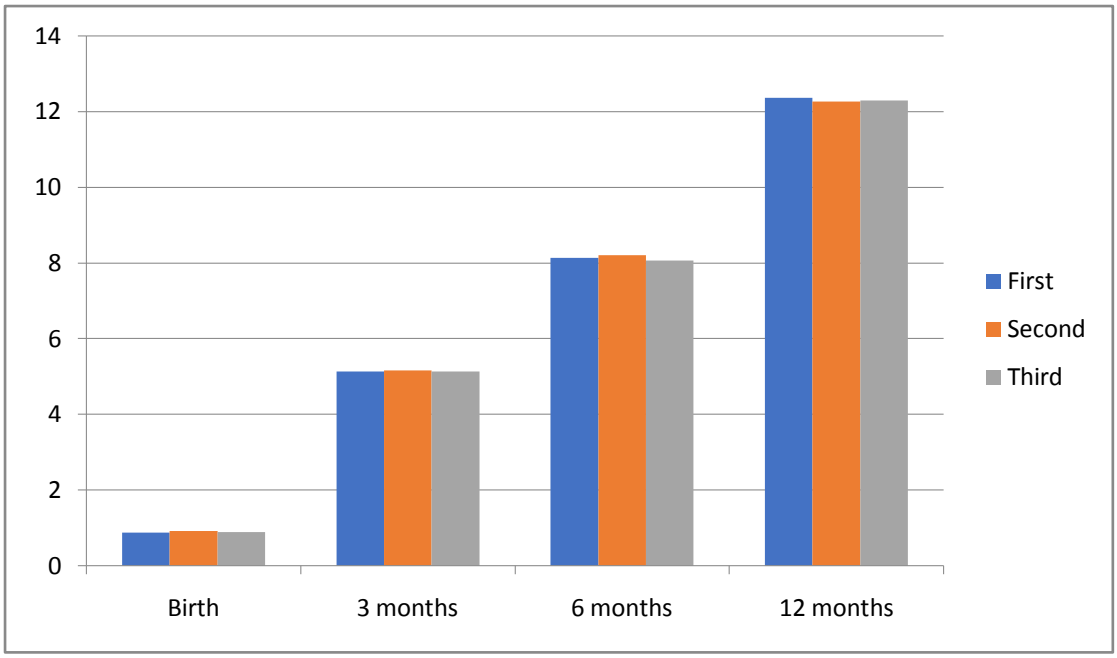

Figure 4.12. Growth performance of goat in different parity of dam

The result is not in agreement with Tabreze (2018), Paul *et al.* (2014), Taye *et al.* (2013), Thiruvenkadan *et al.* (2009), Baiden (2007), Chowdhury *et al.* (2002) and Husuin *et al.* (1996) who noticed higher body weight at third parity than other two.

4.5 Effect of Season of Birth

In the current study, 51 goats kidded in winter among them 19 in Dhaka, 14 in Kishoreganj and 18 in Sunamganj; 55 in summer among them 16 in Dhaka, 20 in Kishoreganj and 19 in Sunamganj and 14 in raiy season including 5 in Dhaka, 6 in Kishoreganj and 3 in Sunamganj. The effect of kidding season was studies and noted that, kids in Dhaka grown well and mixed trend recorded in other two districts. On the other hand, as a total of season, kids born in summer season were grown better at the age of 3 months than other two seasons whereas season have no effect on growth performances.

Table 4.5. Growth performance of goat in different season of birth

Season	District	Sample Size	Live weight (Kg)			
			Birth	3-month	6-month	12-month
			Mean+SE	Mean+SE	Mean+SE	Mean+SE
Winter	Dhaka	19	0.95a±0.03	5.44a±0.08	8.69a±0.11	13.07a±0.11
	K.ganj	14	0.95a±0.04	4.90b±0.09	8.23b±0.11	12.33b±0.17
	S.ganj	18	0.78b±0.03	4.86b±0.12	7.63c±0.11	11.50c±0.08
	Total	51	0.89a±0.02	5.09ab±0.07	8.19a±0.09	12.31a±0.12
Summer	Dhaka	16	0.98a±0.03	5.61a±0.05	8.88a±0.12	12.96a±0.11
	K.ganj	20	0.89ab±0.03	5.22b±0.10	8.14b±0.08	12.55b±0.13
	S.ganj	19	0.83b±0.03	5.00b±0.10	7.65c±0.08	11.63c±0.08
	Total	55	0.89a±0.02	5.26a±0.06	8.19a±0.08	12.36a±0.10
Rainy	Dhaka	5	1.00a±0.04	5.46a±0.23	8.20a±0.23	12.58a±0.21
	K.ganj	6	0.83a±0.04	4.42b±0.17	7.48b±0.14	11.67a±0.31
	S.ganj	3	0.97a±0.07	4.85ab±0.43	7.60ab±0.15	11.93a±0.03
	Total	14	0.92a±0.03	4.88b±0.18	7.76a±0.13	12.05a±0.18

Mean values in the same column with different superscripts (a, b & c) differ significantly at $p<0.05$.

In winter, higher birth weights were found in Dhaka (0.95±0.03) and Kishoreganj (0.95±0.04) whereas significantly lower in Sunamganj (0.78±0.03) (Table 4.5 and Figure 4.13). At the age of 3 months, the weight was higher in Dhaka (5.44±0.08) and significantly lower in Kishoreganj (4.90±0.09) and Sunamganj (4.86±0.12). Body weights were recorded as same trend at 6 and 12 months of age. The higher weight was found in Dhaka (8.69±0.11 and 13.07±0.11), medium at Kishoreganj (8.23±0.11 and 12.33±0.17) and lower in Sunamganj (7.63±0.11 and 11.50±0.08). The differences were statistically significant.

In summer, kids at Dhaka (0.98±0.03) born with higher weight followed by Kishoreganj (0.89±0.03) and Sunamganj (0.83±0.03) (Table 4.5 and Figure 4.14). The means were statistically different whereas Kishoreganj was related to other two districts. At the age of 3 months, the weight was higher in Dhaka (5.61±0.05) and significantly lower in Kishoreganj (5.22±0.10) and Sunamganj

(5.00±0.10). Body weights were recorded as same trend at 6 and 12 months of age. The higher weight was found in Dhaka (8.88±0.12 and 12.96±0.11), medium at Kishoreganj (8.14±0.08 and 12.55±0.13) and lower in Sunamganj (7.65±0.08 and 11.63±0.08). The differences were statistically significant.

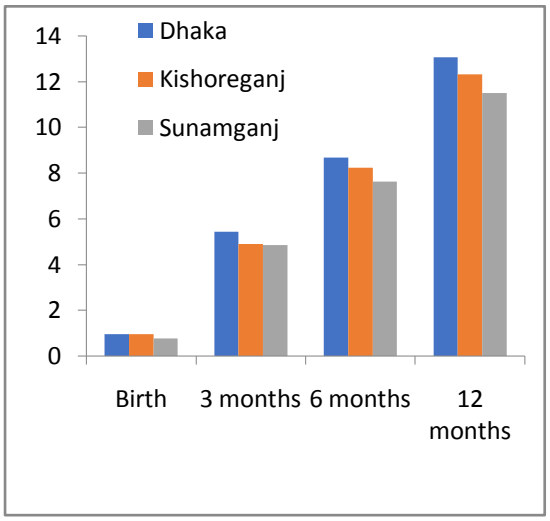

Figure 4.13. Growth performance of goat in winter

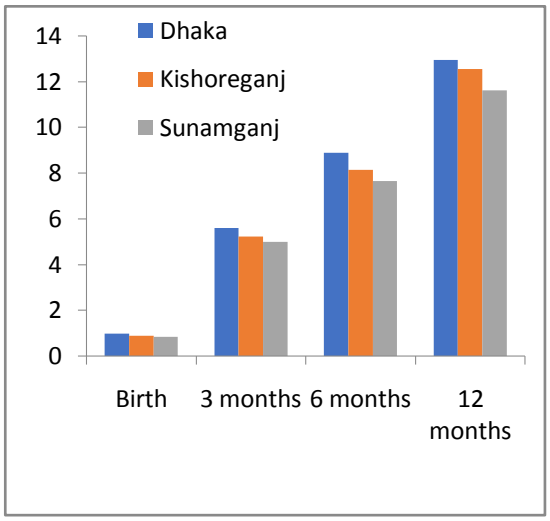

Figure 4.14. Growth performance of goat in summer

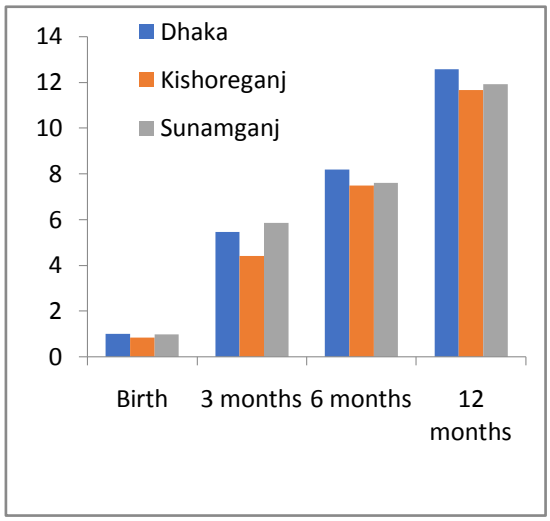

Figure 4.15. Growth performance of goat in rainy

In rainy season, there were no statistical differences (p<0.05) among mean of birth weight and weight at 12 months of age at 3 districts (Table 4.5 and Figure 4.15). Numerically it was higher in Dhaka (1.00±0.04 and 12.58±0.21) followed by Sunamganj (0.97±0.07 and 11.93±0.03) and Kishoreganj (0.83±0.04 and 11.67±0.31). Body weight at the age of 3 and 6 months followed the same trend. It was higher in Dhaka (5.46±0.23 and 8.20±0.23), medium in Sunamganj (4.85±0.43 and 7.60±0.15) and lower in Kishoreganj (4.42±0.17 and 7.48±0.14). The differences were statistically significant (p<0.05) and Sunamganj was related to other two districts.

In the differential study among seasons, the birth weight was higher in rainy season (0.92±0.03) than summer and winter (0.89±0.02 in both) but they were not statistically different (p<0.05) (Table 4.5 and Figure 4.16). Body weight at 3 months was found significantly (p<0.05) higher in summer (5.26±0.06) than winter (5.09±0.07) and rainy (4.88±0.18) season. Here, winter was related to both summer and rainy statistically. The growth at 6 months was similar as birth weight as the means were not statistically different but numerically higher body weight was found higher in winter (8.19±0.09) followed by summer (8.19±0.08) and rainy (7.76±0.13) season.. At the age of 12 months, the highest body weight was recorded in winter (12.31±0.12) whereas medium in summer (12.36±0.10) and the lowest in rainy (12.05±0.18) season. Here the means were not statistically different (p<0.05).

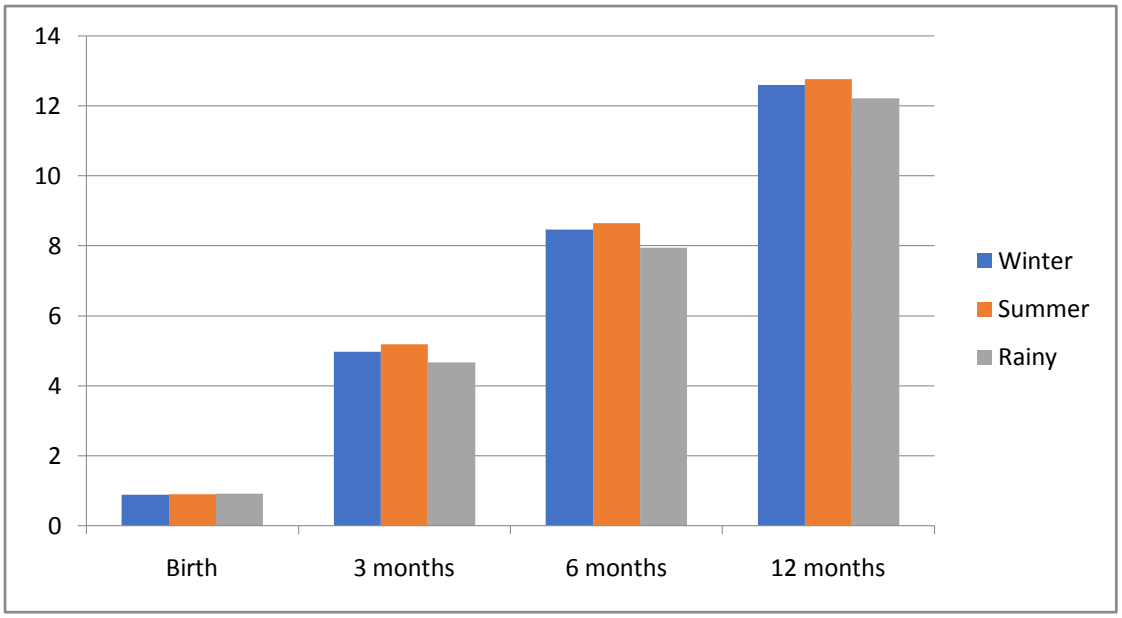

Figure 4.16. Growth performance of goat in different season of birth

Singh and Singh (1998), Husain *et al.* (1996) and Singh *et al.* (1991) reported non-significant effect of the season of birth on body weights at different stages of growth that is dissimilar to the current study. On the other hand, higher growth was reported in the study of Tabreze (2018).

CHAPTER V
SUMMARY AND CONCLUSION

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The present study was done on the basis of data of growth performance of goats collected from the farmers from Dhaka, Kishoreganj and Sunamganj districts. Different factors of growth performances were analyzed in different aspects from a total of 120 goats.

Birth weight was found higher in Dhaka (0.97±0.02) and Kishoreganj (0.90±0.02) than Sunamganj (0.82±0.02) and the difference was statistically significant ($p<0.05$). Body weight at 3 months of age also differed significantly ($p<0.05$). Statistically, Kishoreganj (4.99±0.08) has similarity with Sunamganj (4.93±0.08) whereas higher weight was found in Dhaka (5.51±0.05). At the age of 6 months, the body weight differed significantly in all three districts. Here the body weights were 8.71±0.08, 8.07±0.07 and 7.64±0.06 in Dhaka, Kishoreganj and Sunamganj respectively. Body weight at 12 months of age followed the trend of 6 months weight. Higher body weight was found in Dhaka (12.97±0.08) and it was followed by Kishoreganj (12.34±0.11) and Sunamganj (11.60±0.05) at the age of 12 months and they were statistically different ($p<0.05$).

The study revealed that kids have grown well in Dhaka than other two districts irrespective of sex.

Male kids in Dhaka (0.96±0.03) born with higher body weight, Kishoreganj (0.88±0.03) on middle and Sunamganj (0.82±0.02) with the lower body weight. They differed significantly ($p<0.05$) when Kishoreganj was related to other two districts (Table 4.2 and Figure 4.2). At the age of 3 months, kids in Dhaka (5.66±0.03) have grown significantly better than both Kishoreganj (5.18±0.09) and Sunamganj (5.21±0.09). Kids of 6 and 12 months were recorded as same trend. Body weights were significantly differed in all three districts. Here, it was higher in Dhaka (8.93±0.09 and 13.18±0.08) and

followed by Kishoreganj (8.33b±0.07 and 12.81±0.09) and Sunamganj (7.89±0.08 and 11.78±0.06).

Female kids born with higher body weight in Dhaka (0.99±0.03) and Kishoregabj (0.93±0.04) and that were significantly lower in Sunamganj (0.81±0.03) (Table 4.2 and Figure 4.3). At the age of 3 months, kids in Dhaka (5.24±0.09) have grown significantly better than both Kishoreganj (4.77±0.10) and Sunamganj (4.62±0.08). Kids of 6 and 12 months were recorded as same trend. Body weights were significantly differed in all three districts. Here, it was higher in Dhaka (8.29±0.08 and 12.58±0.10) and followed by Kishoreganj (7.78±0.10 and 11.83±0.12) and Sunamganj (7.36±0.05 and 11.40±0.07).

The result of the study showed that the growth performance was higher in Dhaka and mixed result found in other two districts.

In single kid, body weights at birth and at 3 months of age were statistically similar among 3 districts (Table 4.3 and Figure 4.5). Numerically higher was found in Dhaka (0.91±0.04 and 5.42±0.12) in both cases. Birth weight was medium at Kishoreganj (0.88±0.03) and lower at Sunamganj (0.84±0.04). However, weight at 3 months was medium at Sunamganj (5.11±0.19) and lower at Kishoreganj (5.09±0.13).

In twins kids, higher birth weight was found Dhaka (0.97±0.03) and Kishoreganj (0.94±0.04) and significantly lower at Sunamganj (0.82±0.03) (Table 4.3 and Figure 4.6). At the age of 3 months, kids in Dhaka (5.56±0.05) have grown significantly better than both Kishoreganj (4.85±0.13) and Sunamganj (4.96±0.10). Kids of 6 and 12 months were recorded as same trend. Body weights were significantly differed in all three districts. Here, it was higher in Dhaka (8.88±0.09 and 12.97±0.10) and followed by Kishoreganj (8.00±0.12 and 12.18b±0.20) and Sunamganj (7.55±0.07 and 11.61±0.08).

In triplets, kids at Dhaka (1.08a±0.06) born with higher weight and significantly lower at Kishoreganj (0.88b±0.04) and Sunamganj (0.77b±0.04) (Table 4.3 and Figure 4.7). At the age of 3 and 12 months, body weights were significantly different among 3 districts. It was higher in Dhaka (5.56±0.08 and 13.12±0.25) followed by Kishoreganj (5.07±0.13 and 12.33±0.17) and Sunamganj (4.48±0.11 and 11.50±0.11). However, there was no statistical difference among 3 districts at the age of 6 months. Numerically higher weight was found in Dhaka (8.40±0.21) followed by Kishoreganj (7.97±0.12) and Sunamganj (7.82±0.23).

Kids of Dhaka were found better in all parity of dam, Kishoreganj in middle and Sunamoganj with lower growth.

First parity kids in Dhaka (0.96±0.04 and 5.47±0.12) were with higher body weight during birth and 3 months of age, Kishoreganj (0.84±0.03 and 5.09±0.14) on middle and Sunamganj (0.83±0.03 and 4.90±0.15) with the lower body weight (Table 4.4 and Figure 4.9). They differed significantly (p<0.05) when Kishoreganj was related to other two districts. At the age of 6 months, kids in Dhaka (8.71±0.17) have grown significantly better than both Kishoreganj (8.26±0.11) and Sunamganj (7.59±0.12). Body weights were significantly differed in all three districts at the age of 12 months. Here, it was higher in Dhaka (13.16±0.11) and followed by Kishoreganj (12.52±0.19) and Sunamganj (11.59±0.10).

Second parity kids born with numerically higher body weight in Dhaka (0.95±0.04) than Kishoregabj (0.94±0.04) and Sunamganj (0.85±0.03) but they were statistically same (Table 4.4 and Figure 4.10). At the age of 3 and 6 months, kids in Dhaka (5.59±0.05 and 8.91±0.11) have grown significantly better than both Kishoreganj (4.94±0.11 and 8.00±0.11) and Sunamganj (4.97±0.13 and 7.72±0.11). Body weights were significantly differed in all three districts at the age of 12 months. Here, it was higher in Dhaka (13.00±0.11) and followed by Kishoreganj (12.20±0.17) and Sunamganj (11.61±0.08).

Third parity kids were also higher in Dhaka (0.99±0.03) and Kishoreganj (0.91±0.05) but significantly lower in Sunamganj (0.75±0.03) (Table 4.4 and Figure 4.11). They followed similar trend in the mean of weight at 3 and 6 months. Higher body weights were found in Dhaka (5.45±0.09 and 8.50±0.14) and significantly lower in Kishoreganj (4.95±0.16 and 7.98±0.13) and Sunamganj (4.90±0.12 and 7.58±0.09).

The effect of kidding season was studies and noted that, kids in Dhaka grown well and mixed trend recorded in other two districts.

In winter, higher birth weights were found in Dhaka (0.95±0.03) and Kishoreganj (0.95±0.04) whereas significantly lower in Sunamganj (0.78±0.03) (Table 4.5 and Figure 4.13). At the age of 3 months, the weight was higher in Dhaka (5.44±0.08) and significantly lower in Kishoreganj (4.90±0.09) and Sunamganj (4.86±0.12). Body weights were recorded as same trend at 6 and 12 months of age. The higher weight was found in Dhaka (8.69±0.11 and 13.07±0.11), medium at Kishoreganj (8.23±0.11 and 12.33±0.17) and lower in Sunamganj (7.63±0.11 and 11.50±0.08). The differences were statistically significant.

In summer, kids at Dhaka (0.98±0.03) born with higher weight followed by Kishoreganj (0.89±0.03) and Sunamganj (0.83±0.03) (Table 4.5 and Figure 4.14). The means were statistically different whereas Kishoreganj was related to other two districts. At the age of 3 months, the weight was higher in Dhaka (5.61±0.05) and significantly lower in Kishoreganj (5.22±0.10) and Sunamganj (5.00±0.10). Body weights were recorded as same trend at 6 and 12 months of age. The higher weight was found in Dhaka (8.88±0.12 and 12.96±0.11), medium at Kishoreganj (8.14±0.08 and 12.55±0.13) and lower in Sunamganj (7.65±0.08 and 11.63±0.08). The differences were statistically significant.

In rainy season, there were no statistical differences (p<0.05) among mean of birth weight and weight at 12 months of age at 3 districts (Table 4.5 and Figure 4.15). Numerically it was higher in Dhaka (1.00±0.04 and 12.58±0.21)

followed by Sunamganj (0.97±0.07 and 11.93±0.03) and Kishoreganj (0.83±0.04 and 11.67±0.31). Body weight at the age of 3 and 6 months followed the same trend. It was higher in Dhaka (5.46±0.23 and 8.20±0.23), medium in Sunamganj (4.85±0.43 and 7.60±0.15) and lower in Kishoreganj (4.42±0.17 and 7.48±0.14). The differences were statistically significant (p<0.05) and Sunamganj was related to other two districts.

According to above discussion, growth performance is better in Dhaka by geography, sex, type of birth, parity of dam and season than Kishoreganj and Sunamganj.

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APPENDICES

Appendix 1: Questionnaire of the study

Questionnaire on Growth Performance of Black Bengal goat in Different Region in Bangladesh

Date: Serial number:

Name of the owner:		
Name of the area/ Village:		
Occupation:		
Types and source of breed:	Black Bengal	Cross
Number of goat:	Doe:	Buck:
Age at puberty		
Types of service :	Natural	Artificial
No. of service per conception		

Parity	**Types of birth**	**Season of kidding**	**Body wt.**				**Litter size**	
			birth	**weaning**	**6 month**	**365 days**	**birth**	**weaning**
First	**Single**	**Winter**						
		Summer						
		Rainy						
Second	**Twins**	**Winter**						
		Summer						
		Rainy						
Third	**Triplet**	**Winter**						
		Summer						
		Rainy						
Sex of kid			Male			Female		

Data collect by : **Sign:**