



Effect of Geographical Differences on Production Performance of Goat in Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. Authors JB and FK designed the study. Authors JB and PB managed the literature review searches. All authors were involved in enumeration and its accompanied cost, read and approved the final manuscript.

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ABSTRACT

Bangladesh has a subtropical monsoon climate characterized by wide seasonal variations in rainfall, temperature and humidity which is suitable for goat rearing. The study was conducted to know the goat farm management and rearing system, feeding practices and productive performance in different geographical area of Bangladesh for the period of six months. The experiment was carried out during January to June in 2019. In this study data were collected from a total of 210 goat farmers in 28 different villages of north-western, north Bengal, south-western, and southern region of Bangladesh. It was observed that the feeding and management has great impact on goat production. Most of the farmers (80.5%) reared goats in semi-intensive system while, 12.2% farmers used free range system (extensive). The production rate and breeding performance was higher in semi-intensive system than that of extensive system. The main feeds for goats were green grass, tree leaves and main water source was pond though some farmers supplied concentrate feeds to

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their goats. The majority of goat farmers (83%) used village buck to bred their does and most of the farmers (89%) paid service charge to the buck keeper's while, most of them did not keep own buck for natural service. The kidding rate was higher in northern region than that of southern region. In contrast kid mortality was higher in southern region (21%) than that of other region. The northern region was free from salinity, which was favorable for goat rearing. In this region the average number of goat (4.13 ± 0.45), doe (1.17 ± 0.26), buck (0.76 ± 0.01) and kids (2.21 ± 0.22) was higher than that of any other region. The southern region was showed low kidding rate and high kid mortality. The average number of goat (2.57 ± 0.28), doe (0.75 ± 0.11), buck (0.52 ± 0.11) and kids (1.38 ± 0.16) was lower in southern region than that of any other region. It was observed that the variation on production performance of goat in different geographical area of Bangladesh due to topography and salinity. Moreover, it was indicated that the northern region of Bangladesh has the highest performance of goat production both in intensive and semi-intensive farming.

Keywords: Goat production; geographical differences; Bangladesh.

1. INTRODUCTION

There are nearly 1 billion goats around the world and more than 90 percent of these goats are located in Asia and Africa. Over the past 50 years, the goat population has multiplied 2.4 times while about 45 percent of the world's goats are located in four countries: Bangladesh, China, India and Pakistan [1]. The main products from goats are meat, milk and fiber [2]. Local goats in arid areas are usually used for meat production only, because the nutritional requirements for milk production cannot be met in such extreme environments [3]. However, in other areas with limited and seasonal sources of nutrients, farmers can manage dairy goats [4,5]. Many goats (dairy and other) are reared in arid areas. In these systems, most herds are of hardy indigenous breeds, adapted to grazing in degraded environments [6,7]. Bangladesh is a densely populated country having about 145 millions of people in its 147570 sq. km of area. About 49 percent of population of the country is female and most of the goat reared by rural people, especially by women and children [8]. In Bangladesh, goat population is about 25.77 million in the year 2015-16 of which about 90% are Black Bengal goat [9] and the rest 10% comprises of Jamunapari and different crossbred goats [10]. Approximately 65% of the households are connected with goat farming either as a primary or secondary occupation. In Bangladesh, the average number of goats per farm is 4 and up to 41% farm incomes come from goats in some parts of Bangladesh. There are about 56000 registered goat farms available in the country where about 281000 people work directly [11]. Goat plays an important role in livelihoods of smallholder farmers in Bangladesh. It has been described as a poor man's cow because of its

immense contribution to rural economy. It has not only supply the nutritious and easily digestible milk but also a regular source of additional income for poor and landless or marginal farmers. Being small-sized animals, goats can easily be managed by women and children. Feeding, milking and care of goats do not require much equipment and hard work. Capital investment and feeding costs are also quite low. The role of women in goat keeping is very significant in the rural families of Bangladesh as it helps them to contribute meaningfully to the cash needs for their family members. Moreover, goat rearing is the most useful way of income for the women who stay at home [12]. The contribution of the livestock sector to overall GDP was 1.66% for 2015-16 where, the share of livestock in total agricultural GDP was 14.21% [13]. Goat provides 20 million square feet of skins and skin obtained from the Black Bengal goats are of excellent quality. The national income from exporting leather and leather goods were 4.31% of the total export in 2012 [14]. The contribution of goat skin plays a significant role in this regards. Thus, goat farming plays an important and potential role for poverty reduction, income generation, contribution to food and nutrition security and employment generation [15]. The objective of the survey was to collect and analyze field level data relating to the variation of production performance based on different geographical area of Bangladesh.

2. MATERIALS AND METHODS

The study was conducted in different geographical region of Bangladesh for the period of six months. The experiment was carried out during January to June in 2019. At first the survey was started from Mymensingh district,

where large number of farmers was found who were directly interrelated with goat rearing. The climate here is tropical. In winter, there is much less rainfall than in summer. Then the study was conducted in Gazipur district. This city has a tropical climate. The summers are much rainier than the winters. Gazipur area has more forage than that of Mymensingh. After that, the survey was continued in Bogra and Sirajganj district where the fast growing small scale goat rearing pocket is getting popular. It has a tropical wet and dry climate which is generally marked with monsoons, high temperature, considerable humidity and heavy rainfall. Then the study was conducted in Jhenidah and Bagerhat district. The climate is fond tropical. When compared with winter, the summers have much more rainfall. Finally, the survey was conducted in Barisal district. This region has tropical climate with grazing land throughout summer and rainy season. This study was conducted on twenty-eight villages of seven districts in Bangladesh where most of the villagers reared goat.

2.1 Questionnaire Design

A pre-structured questionnaire survey was used to collect relevant information through on farm visit. Data were collected by face to face interaction with the responded farmers, repeated questioning and observation of animal concerning the following points:

1. Breed
2. Age and sex
3. Housing pattern and floor

4. Feeding system (grazing or stall feeding or both)
5. Grazing (zero grazing/ moderate grazing/ free ranging)
6. Vaccination and deworming
7. Rearing system (intensive, semi-intensive, extensive)
8. Diseases, treatment, causes of death with mortality

2.2 Statistical Analysis

Data analyzed using appropriate statistical package and tabulated as per requirement.

3. RESULTS AND DISCUSSION

Table 1 shows the differences on breeds, geographical distribution and population of goat available in different geographical area of Bangladesh.

3.1 Black Bengal

Bangladesh has only one goat breed of its own, known as the Black Bengal. About 90% of goat population in Bangladesh is comprises of Black Bengal. It has a broad chest, ears are always on top and horn may smaller medium. It has black fur all over the body. Their body is tight and relatively shorter than other goat breed. The hair of the skin is smooth. An adult male goat weights about 25 to 30 kg and female 20 to 25 kg (Fig. 1).

Table 1. Breed, geographical distribution and population of goat

Breed	Geographical distribution	Population (%)
Black Bengal	All over the country, mainly southern part	90
Jamunapari	Western part and in some specific areas of central and eastern Bangladesh	8
Crossbreed (Black Bengal and Jamunapari)	Western part and in some specific areas of central and eastern Bangladesh	2



Fig. 1. Black Bengal goat

3.2 Jamunapari

The breed is originated from India but also found in Bangladesh. The number of this breed is not known but it has been estimated that about 8% goats are Jumunapari. It has comparative bigger body size, long leg, centrally ridged nose (parrot like nose), hanging log ears, short and flat horns are major physical features of this goat. This breed is characterized with whitish brown coat color. Adult Jamunapari buck weighs up to 45 Kg and doe weigh 38 Kg. At birth, kids weighs up to 4 kg in an average (Fig. 2).

3.3 Crossbred

Some crossbred goat also found in Bangladesh. It has been estimated that about 2% goats are crossbred goat found in Bangladesh. They are mainly Black Bengal and Jumunapari (Fig. 3). Currently, some other crosses are also found in the country. Bucks of some other exotic breeds are being imported from India and used for cross-breeding, especially in south-western region of Bangladesh. Although, according to the Livestock Development Policy 2007, cross breeding with Black-Bengal goat is not allowed.

3.4 Farming Practices

Table 2 shows the per cent of goat farmers reared their goats in intensive, semi-intensive and extensive system in Bangladesh.

In Bangladesh, goat generally reared through subsistence, smallholder and small-scale commercial operations. Most of the farmers (80.5%) reared goats in semi-intensive system but few farmers (7.3%) used confinement system of rearing while 12.2% farmers used free range system. About 75.6% farmers kept goat at night in the goat house. In subsistence condition farmers rear 2-5 goats with or without other large ruminants along with other agricultural operation or other non-agricultural professions. In this case animals are reared by women and children. In rural area, about 73.20% goat is reared under low input production system (only natural grass and tree leaves) and the rest (26.80%) are supported by the medium inputs (natural grass+some concentrate). About 6.20%, 8.10% and 12.5% of goats supported by medium inputs are reared in the subsistence, smallholder and small-scale commercial operations, respectively.



Fig. 2. Jamunapari goat



Fig. 3. Crossbred goat

Table 2. Rearing system of goat

Rearing system	Farmers (%)
Intensive	7.3
Semi-intensive	80.5
Extensive	12.2

**Fig. 4. Small scale rooftop goat farm in city area****Fig. 5. Goat sheltered with cattle at night**

In recent times, the medium scale-semi intensive (20-25 does) and large intensive/semi-intensive farms (≥ 100 does) also gaining popularity due to demand and profit from goat farming and private entrepreneurs are coming forward to invest in this sector. Some urban and semi urban area, it is also observed some rooftop small scale goat farm that gaining popularity (Fig. 4).

3.5 Housing

Housing for goat rearing depends on the rearing system. In rural area, most of the goat reared landless farmers and women and they don't provide separate housing for their goat. Goats were housed in a part of their living house or kitchen or houses used for other large ruminant

or storing of goods. For medium scale semi-intensive system farmers used a house where there were facilitated to shelter and to supplied feed [(grass+concentrate (rice polish and broken rice etc.)). These types of houses were prepared with bamboo and galvanized tin. In this system farmers cultivate some grasses in their own land or rented land. Large intensive and semi-intensive farm houses were made with concrete structure where different types of facilities necessary for rearing goat. They had own lands for grazing and cultivation of grasses. This type of housing was present in different government farms, research institute, universities and also in some commercial private farms. Figs. 5, 6, 7 and 8, shows different types of goat houses available in Bangladesh.



Fig. 6. A rural goat house made with bamboo



Fig. 7. A rural goat house for shelter at night



Fig. 8. A small scale commercial semi-intensive goat house



Fig. 9. Goat feeding in rural area

Table 3. Breeding system of goat

Breeding system	Farmers (%)
Natural service	83
Artificial insemination	17

**Fig. 10. Natural service of goat**

3.6 Feeding

Under traditional feeding systems, the goats are grazed on harvested or fallow lands, roads, river and canal sides etc. In normal practice and/or in adverse weather condition different tree leaves are also used to feed the goats (Fig. 9). The important fodder trees are Jackfruit (*Artocarpus heterophyllus*), Mehgoni (*Trichilia emetic*), Bamboo (*Bambusa spp.*), Babla (*Mangifera indica*), Banana (*Musa spp.*), Babla (*Acacia nilotica* and *Acacia planifrons*), Tetul (*Tamarindus indica*), Koroi (*Albizi alebbek*), Aswatha (*Fiscus religiosa*) etc. In the rural area, goats are reared in fallow lands, roads and river side. It is a convenient means of rearing goats from the stand point of control, minimum labor input and utilization of feed. A variation of this method is combining tethering with grazing up to 5 goats at a time, led by ropes held by women and children. In low input farms goats depend on only natural grass and tree leaves where the medium input farms also provide some concentrate (rice polish and broken rice etc.).

3.7 Breeding

Table 3 shows the per cent of goat farmers inseminate their goats under natural service and artificial insemination system in Bangladesh.

In Bangladesh most of the farmers uses natural mating system to service their goats (Fig. 10). Although, some NGO's were started artificial insemination to inseminate their goats with very limited scale (Fig. 11). Majority of the goat

keepers (83%) used village buck to bred their goats and most of the farmers (89%) paid service charge to the buck keepers while, most of them did not keep own buck for breeding. On the other hand 17% goat keepers used artificial insemination system to bred their goats. Bangladesh Livestock Research Institute (BLRI) trying to improve the performances of Black Bengal goat through selective breeding and open nucleus breeding system (ONBS). Beside distribution of improved buck to the farmers for breeding their does, BLRI also conserve Black Bengal goats. There are five government owned goat development farms, which have been established in different parts of the country (Dhaka, Sylhet, Rajshahi, Chuadanga and Jhenaidah). These farms are also involved in conservation and extension of Black Bengal breed, buck production and its distribution to poor and distressed women at low price.

The Table 4 indicates the differences on feeding and rearing systems of goats under different geographical area of Bangladesh. The Table 5 indicates the average number of goat, doe, buck and kids per farmer under different geographical area of Bangladesh. The north-west region was free from salinity, which was favorable for goat rearing. In this region the average number of goat (4.13 ± 0.45), doe (1.17 ± 0.26), buck (0.76 ± 0.01) and kids (2.21 ± 0.22) was higher than that of other region. In north Bengal region having tropical wet and dry climate, high temperature, considerable humidity, heavy rainfall and free from salinity. Here mean kidding rate was high and the growth rate

Table 4. Feeding and rearing system of goat

Region	Area	No. of farmers	No. of goat	No. of Doe	No. of Buck	No. of Kids	Kidding rate	Feeding system	Rearing system
North-western (Mymensingh)	Dokkhinchorkalibari	10	41	13	8	20	2.5	Roughage+ Concentrate	Semi-intensive +extensive
	Boira	10	52	15	7	30	2.5	Roughage+ Concentrate	Semi-intensive
	Dapunia	10	47	14	8	25	2.6	Roughage+ Concentrate	Semi-intensive
	Digharkanda	10	40	13	7	20	2.4	Roughage+ Concentrate	Semi-intensive
North-western (Gazipur)	Shreepur	8	33	9	7	17	2.4	Roughage+ Concentrate	Semi-intensive
	Mauna	5	17	5	3	9	2.4	Roughage+ Concentrate	Semi-intensive
	Vangahati	6	21	5	4	12	2.4	Roughage	Semi-intensive
North Bengal (Bogra)	Bagher Bazar	6	23	5	5	13	2.5	Roughage	Semi-intensive
	Mohipur	10	33	10	6	17	2.4	Roughage+ Concentrate	Semi-intensive
	Talpotti	5	15	4	3	8	2.4	Roughage+ Concentrate	Semi-intensive
	Magurgari	5	14	3	3	8	2.4	Roughage+ Concentrate	Semi-intensive
	Sherpur	5	16	4	3	9	2.5	Roughage+ Concentrate	Semi-intensive
North Bengal (Sirajganj)	Nokali	5	14	3	3	8	2.4	Roughage+ Concentrate	Semi-intensive+ extensive
	Uttorpara	5	15	4	3	8	2.5	Roughage	Semi-intensive
	Baghabari	10	35	8	7	20	2.6	Roughage+ Concentrate	Semi-intensive +extensive
	Sahajadapur	5	14	3	3	8	2.6	Roughage+ Concentrate	Semi-intensive +extensive

Table 4. Feeding and rearing system of goat (Contd.)

Region	Area	No. of Farmers	No. of Goat	No. of Doe	No. of Buck	No. of Kids	Kidding rate	Feeding system	Rearing system
Southern (Barisal)	Baherchar	6	15	5	3	7	2.3	Roughage	Semi-intensive
	khuddrokati	6	17	5	4	8	2.2	Roughage	Semi-intensive
	Dahergati	8	22	6	4	12	2.4	Roughage	Semi-intensive
	Rahmatpur	5	11	3	2	6	2.3	Roughage+ Concentrate	Semi-intensive
South-western (Jhenaidah)	Chandipur	10	33	8	7	15	2.5	Roughage+ Concentrate	Semi-intensive
	Dudshar	10	45	13	7	25	2.5	Roughage+ Concentrate	Semi-intensive
	Sundarpur	10	42	12	7	23	2.5	Roughage	Semi-intensive
South-western (Bagherhat)	Raigram	10	40	11	7	21	2.5	Roughage	Semi-intensive
	Attaki	10	36	10	8	18	2.6	Roughage+ Concentrate	Semi-intensive
	Mulghor	8	24	7	5	12	2.5	Roughage+ Concentrate	Semi-intensive
	Sutal	7	20	6	4	10	2.5	Roughage	Semi-intensive +extensive
	Afra	5	15	3	3	9	2.5	Roughage	Semi-intensive +extensive



Fig. 11. Artificial insemination of goat

Table 5. Average number of goat, doe, buck and kid/farmer

Region	No. of Goat (Mean \pm SD)	No. of Doe (Mean \pm SD)	No. of Buck (Mean \pm SD)	No. of Kid (Mean \pm SD)
North-western	4.13 \pm 0.45	1.17 \pm 0.26	0.76 \pm 0.01	2.21 \pm 0.22
North Bengal	3.09 \pm 0.17	0.77 \pm 0.11	0.62 \pm 0.04	1.71 \pm 0.11
South-western	3.56 \pm 0.54	0.97 \pm 0.17	0.68 \pm 0.06	1.87 \pm 0.29
Southern	2.57 \pm 0.28	0.75 \pm 0.11	0.52 \pm 0.11	1.38 \pm 0.16

Table 6. Kidding rate, rearing system and kid mortality in different region of Bangladesh

Region	Kidding rate (Mean \pm SD)	Rearing system	Kid mortality (%)
North-western	2.46 \pm 0.07	Semi-intensive (95%) +extensive (5%)	8
North Bengal	2.48 \pm 0.09	Semi-intensive (90%) +extensive (10%)	11
South-western	2.51 \pm 0.04	Semi-intensive (95%) +extensive (5%)	10
Southern	2.30 \pm 0.08	Semi-intensive (100%)	21

was also higher. The climate of south-western was fond tropical with little salinity. Southern region has tropical climate with grazing land throughout summer and rainy season with high salinity, that's why low kidding rate and high kid mortality. The average number of goat (2.57 \pm 0.28), doe (0.75 \pm 0.11), buck (0.52 \pm 0.11) and kids (1.38 \pm 0.16) was lower in southern region than that of other region. It was indicate the variation on production performance of goat in different geographical area of Bangladesh.

Table 6 shows the kidding rate, rearing system and kid mortality % in different geographical region of Bangladesh. It was observed that the average kidding rate was higher in north-western, north Bengal, and south-western region as compared to southern region. It was also observed that the kid mortality rate was also higher in Southern region than that of other region. It was showed that rearing system of goat in Bangladesh was mostly semi-intensive system irrespective of different geographical area of Bangladesh. In northern part most livestock were vaccinated and dewormed, but in the southern

part especially in Barisal division farmers are less conscious about vaccination and deworming. Goat contributes significantly in rural economy and nutrition of Bangladesh.

4. CONCLUSION

This study showed that among small ruminants, goats are the first preference to rear in Bangladesh. Most of the rural families keep Black Bengal along with some Jamunapari and crossbred. Goats were primarily reared as a source of meat at home or during festivals. Goats are adopted to be reared throughout the seasons, thriving on indigenous browses growing in compound bushes and farm fallows with additional supplementation from kitchen wastes. Prophylactic management of common infectious diseases is rarely practiced. The results indicates that based on the geographical and climatic distribution the north region of Bangladesh showed better performance in goat production both in free grazing and intensive farming than that of the southern region. On the other hand, southern region of Bangladesh is comparatively

less potential for goat rearing due to excessive salinity, unavailability of grass and tree leaves. Farmers are also unconscious about scientific goat rearing system in this area. Moreover heavy rainfall and low land in southern region causes flooding. That's why goat rearing is more suitable in northern region than that of southern region. Being a developing country based on agriculture, goat sector is an important part of Bangladesh agriculture. It can be well performed by every category of farmers whether they are poor or rich to earn income in regular basis. Thus this sector brings an overall benefit for the micro as well as macro aspect of economies of the country.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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