

*Article*

## **Population distribution and breeding practices of livestock in different districts of Bangladesh**

M. A. M. Yahia Khandoker\*<sup></sup>, Md. Younus Ali<sup></sup>, Tasmina Akter<sup></sup>, Mst. Mahomudha Akhtar<sup></sup>, Mst. Kamrunnahar Kona<sup></sup>, Nusrat Jahan Meki<sup></sup>, Marzia Rahman Sompa<sup></sup> and Israt Jahan Meem<sup></sup>

Department of Animal Breeding and Genetics, Faculty of Animal Husbandry, Bangladesh Agricultural University, Mymensingh, Bangladesh

\*Corresponding author: Professor Dr. M. A. M. Yahia Khandoker, Department of Animal Breeding and Genetics, Faculty of Animal Husbandry, Bangladesh Agricultural University, Mymensingh, Bangladesh. Phone: +8801711040178; E-mail: [yahiakhabg@bau.edu.bd](mailto:yahiakhabg@bau.edu.bd)

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**Abstract:** The objectives of this study were to determine the farmers' socio-economic characteristics, livestock population dynamics, and breeding practices followed by the farmers. Out of 1487 farmers, a major proportion (53.12%) of farmers was middle-aged. Most of the farmers (71.22%) were associated with agricultural activities and had low income per month (52.32%). Livestock keeping patterns of farmers were cattle, goats, buffalo, and combinations of these animals. Female animals were inferred to be more prevalent in different districts (cow 85.08%, doe 81.29%) than males (bull 14.92%, buck 18.71%). In case of cattle and goats, the highest number of farmers maintained a medium size herd, whereas buffalo farmers had a large herd size. In terms of breeding practices, the majority of the farmers (75.55%) performed artificial insemination (AI) in cattle and found it convenient to service their cows. When considering buffalo, and goat, the majority of the farmers (94.12% and 98.50%, respectively) practiced natural services. The findings also demonstrated that the majority of the farmers (73.8% and 82%, respectively) raised crossbreed cattle and buffalo, while just a tiny portion (26.18% and 18%, respectively) raised indigenous breeds. However, this situation was vice versa in case of goat. For choice of the breed according to the farmers, 39.17% of farmers preferred Black Bengal goat, 60.83% preferred cross breed. This study represents a comprehensive overview of livestock status and existing breeding practices employed by the farmers in different districts of Bangladesh, which may be utilized to implement relevant livestock improvement programs in Bangladesh.

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**Keywords:** cattle; buffalo; goat; population dynamics; breeding practice

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### **1. Introduction**

Livestock plays critical part within the financial advancement of agriculturists in Bangladesh. The farmer's livestock pattern was cattle, buffalo, goats, sheep or any combination thereof. It is estimated that there are about 24.55 million cattle, 1.5 million buffaloes, 26.60 million goats and 3.68 million sheep (DLS, 2021). Animals perform a variety of tasks, such as producing milk, meat and eggs, or fertilizing crop production. It makes a significant contribution to meet daily animal protein needs and also plays an important role in poverty reduction in Bangladesh. Being a critical component of agriculture, livestock is contributing 1.44% to gross domestic product (GDP) in Bangladesh at constant price and share of the livestock sector in agricultural GDP is 10.69% (BER, 2020). The GDP growth rate of livestock at a constant price is 3.8% (DLS, 2021). This development is

driven by quickly expanding request for animal products, which is driven by populace development, urbanization, and increased income in developing countries. About 20% of people in Bangladesh are directly dependent and 50% of people are partially dependent on the livestock sector (DLS, 2021). Over the last few decades, Bangladesh has undergone structural changes and the livestock sector has moved from subsistence to a business-oriented production system. As a result, a small portion of the cattle and poultry industry has been commercialized and the remaining livestock species are mainly landraces and are subject to the traditional subsistence system of mixed farming. Nowadays, farmers are interested in raising poultry and livestock for commercial purposes. There is scope for exploring livestock resources for its development. In spite of the fact that, the annual growth rate of milk, meat, and eggs has expanded significantly in recent years, the country still has an acute shortage of livestock products. The rate of shortage of milk, and eggs is 35.31% and 2.13% (BPC, 2020). To meet the growing demand, a significant increase in production level remains an important need in the case of Bangladesh. Such improvements can be achieved through a combination of improved breeding and careful use of existing livestock genotypes through planned breeding programs. An appropriate breeding program is an important part of the livestock development strategy. The breeding policy can be a major tool in the development of local herds and their production efficiency to a large extent. Breeding strategies generally aim to maximize production per head. Most developing countries have failed to sustainably improve the genetic resources of their livestock populations due to lack of proper breeding strategies. The genetic potential of native animals is very poor and most of the native animals are producing low amount of milk and meat. Genetic improvement of a large number of farm animals can be achieved through upgrading or selective breeding. Selective breeding is time consuming but by upgrading by superior males genetic improvement of livestock may be achieved within a short period. The introduction of artificial insemination (AI) will reduce the indiscriminate use of males and inbreeding in animals and will also reduce the risk of animal reproductive failure due to various sexually transmitted diseases (Siddiky, 2018). AI is an important means of improving the reproductive performance of existing livestock breeds by performing crossbreeding (Uddin *et al.*, 2010). Although AI is a widely recognized breeding tool, farmers in Bangladesh have not yet been able to apply it in the case of goats, sheep, and buffalo. The shortage of breeding buck is seen as a rural production restrictions (Khandoker *et al.*, 2011). However, bucks and rams are not available in some villages, regions, or localities. Therefore, the farmer has to travel a long distance to serve his does and ewes. Since the use of artificial insemination is not established in the field of goats and sheep, in some cases they failed to serve their heated does and ewes at the proper time. As a result of inbreeding, the lifetime efficiency of animals got to be diminished. From this perspective, the present study was conducted to know the farmers' socio-economic profile, population dynamics and breeding practices of livestock in different districts of Bangladesh.

## **2. Materials and Methods**

### **2.1. Ethical approval and informed consent**

Ethical approval was not required for this study. Verbal consent was obtained from the owners before the study.

### **2.2. Study area and periods**

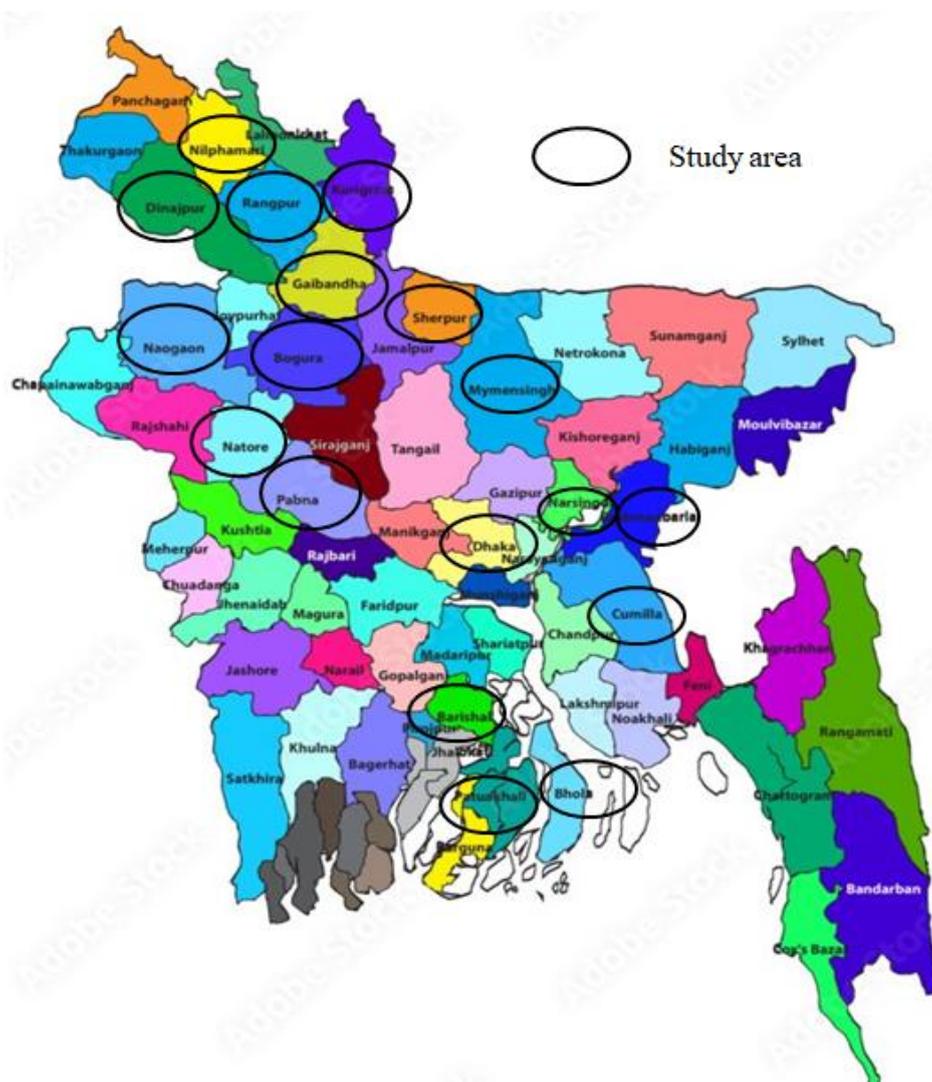
A total of 1487 farmers randomly selected from different upazilas of 18 districts (Figure 1) in Bangladesh were surveyed to know the current socio-economic characteristics of the farmers, population dynamics, and breeding practices for livestock in Bangladesh. Households in the area were randomly selected and interviewed. The data were collected from January 2020 to July 2021.

### **2.3. Data collection**

Information was collected through an organized survey and face-to-face interviews with the farmers in selected regions. Farmers' responses were recorded directly on the questionnaire. The questionnaires were designed to collect detailed information on the socio-economic characteristics of the respondents, livestock population and their distribution, breeding practices followed by farmers, service availability, choice of the breed by farmers, and production constraints of livestock. Several variables were selected to access the socioeconomic profile of respondents, including age, education, family size, occupation, household income, and participation in cattle, goat, sheep and buffalo rearing. The respondents were classified into three categories of ages; young (20-29 years), middle (30-49 years), and old (50 years and above). Their educational level was categorized as illiterate (only can sign), primary (1-5 class), secondary (6-10 class) and higher education (11 class to above).

Whereas their family size was categorized as small (up to 4 members), medium (5-7 members) and high (8 members to above), and their occupation type was categorized as agriculture, business and service. Their involvement in animal rearing was categorized as low (1-3 animals), medium (4-6 animals) and high (7 animals)

to above). In term of family income low (6-10 thousand taka/month), medium (11-20 thousand taka/month) and high (21 to above thousand/month) category was used. Distance of breeding service between service provider and farmers for cattle, goat and buffalo was divided into low (within 1 km), medium (>1-<3 km) and high (>3 km).



**Figure 1. Surveyed districts of Bangladesh.**

#### 2.4. Data management and statistical techniques

During data collection different data sheets were maintained for different upazilas. The data sheets were checked and verified after every interview to be sure that the responses of the livestock farmers were recorded properly. Then necessary data collected from the study were coded and recorded in Microsoft Excel 2016. Analysis was done through the tabular and graphical form. Descriptive statistics such as number, percentage distribution, etc. were used in describing the variables.

### 3. Results

#### 3.1. Socio-economic profile of the farmers

The socio-economic profile of farmers of different upazilas in the 18 districts of Bangladesh indicated that the highest proportion (53.12 %) of the farmers in the surveyed areas was in the middle-aged category compared to 11.09% young aged and 35.78% old aged category (Table 1). The education level of the respondents, were 22.25% illiterate, 31.61%, 35.31% and 10.83% were completed primary, secondary and higher education respectively. In the study, the majority (49.16%) of the respondents was having a medium family size, 40.55% was having a small family size and 10.28% was having a large family size. The occupation of the farmers was mainly agriculture (71.22%). The farmers are also involved with other occupations such as business (22.26%)

and service (6.52%). The monthly income of most of the farmers (52.32%) was low whereas 40.82% and 6.86% of farmer's income were medium and large, respectively.

The result revealed that most of the farmers (41.11%) reared a medium number of cattle whereas 44.54% and 14.35% of farmers were involved with a low and high number of cattle. On the other hand, in case of goat, most of the farmers (44.45%) reared a low number of goat and 34.56% and 20.99% of farmers were involved with medium and high number of goat rearing. Whereas 52.94% of farmers were involved with high numbers of buffalo rearing (Table 1).

**Table 1. Socio-economic status of the respondent farmers with categories in different district of Bangladesh.**

Parameters	Scoring unit	Categories	Percent
Age	Years	Young (20-29)	11.09 (165)
		Middle (30-49)	53.12 (790)
		Old (50 and above)	35.78 (532)
Education	Schooling	Illiterate (0)	22.25 (331)
		Primary (1-5)	31.61 (470)
		Secondary (6-10)	35.31 (525)
		Higher education (11 and above)	10.83 (161)
Family size	Number of members	Small (up to 4)	40.55(603)
		Medium (5-7)	49.16 (731)
		Large (8 and above)	10.28 (153)
Occupation	Type	Agriculture	71.22 (1059)
		Business	22.26 (331)
		Service	6.52 (97)
Involvement in cattle rearing	Number of cattle/family	Low (1-3)	44.54 (208)
		Medium (4-6)	41.11 (182)
		High (7 and above)	14.35 (67)
Involvement in goat rearing	Number of goat/family	Low (1-3)	44.45 (108)
		Medium (4-6)	34.56 (84)
		High (7 and above)	20.99 (51)
Involvement in buffalo rearing	Number of buffalo/family	Low (1-3)	5.88 (1)
		Medium (4-6)	41.18 (7)
		High (7 and above)	52.94 (9)
Family Income	Thousand taka/month	Low (6-10)	52.32 (778)
		Medium (11-20)	40.82 (607)
		High (21 and above)	6.86 (102)

Values in the parenthesis indicates the number of observation

### 3.2. Cattle and goat population in different districts of Bangladesh

The total number of cattle and goat population in different Upazilas of 18 districts was 4068 and 1582 in which the percent of bulls, cows, bucks and doe was 14.92%, 85.08%, 18.71% and 81.29% respectively. The study showed that there were cow, bull, doe and buck in almost all districts but no bull was found in the study area of Kurigram, Nilphamari, Bogura and Cumilla and no buck was found in the survey area of Bogura (Table 2).

**Table 2. Distribution of cattle and goat in different districts of Bangladesh.**

Districts	Percentage of livestock			
	Cow (%)	Bull (%)	Doe (%)	Buck (%)
Rangpur	85.17 (270)	14.83 (47)	91.97 (229)	8.03 (20)
Gaibandha	94.12 (208)	5.88 (13)	84.62 (55)	15.38 (10)
Dinajpur	85.47 (147)	14.53 (25)	91.40 (85)	8.60 (8)
Kurigram	100 (56)	-	90 (27)	10 (3)
Nilphamari	100 (346)	-	86.42 (70)	13.58 (11)
Bogura	100 (144)	-	100 (73)	-
Naogaon	90.90 (160)	9.09 (16)	91.04 (61)	8.95 (6)
Natore	79.49 (31)	20.51 (8)	85.71 (60)	14.28 (10)
Pabna	74.29 (52)	25.71 (18)	51.67 (31)	48.33 (29)
Sherpur	91.38 (53)	8.62 (5)	80.39 (41)	19.61(10)

**Table 2. Contd.**

Districts	Percentage of livestock			
	Cow (%)	Bull (%)	Doe (%)	Buck (%)
Patuakhali	72.43 (473)	27.57 (180)	62.43 (108)	37.57 (65)
Bhola	79.63 (512)	20.37 (131)	82.35 (84)	17.65 (18)
Mymensingh	87.83 (267)	12.17 (37)	79.17 (76)	20.83 (20)
Dhaka	84.38 (81)	15.62 (15)	73.68 (14)	26.31 (5)
Brahmanbaria	71.03 (76)	28.97 (31)	71.43 (20)	28.57 (8)
Narsingdi	94.08 (143)	5.92 (9)	80.28 (57)	19.72 (14)
Cumilla	100 (57)	-	88 (44)	12 (6)
Barishal	84.25 (385)	15.75 (72)	74.02 (151)	25.98 (53)
<b>Pooled</b>	<b>85.08 (3461)</b>	<b>14.92 (607)</b>	<b>81.29 (1286)</b>	<b>18.71 (296)</b>

Values in the parenthesis indicates the number of observation

### 3.3. Breeding strategy followed by the respondent in different districts of Bangladesh

The result showed that in the case of cattle breeding, the farmers preferred to use AI than natural service to breed their cows and in the selected area of Nilphamari and Cumilla, natural service for cattle was absent. Most of the farmers (75.55%) practiced AI, 19.33% of farmers practiced natural service, and 4.09% of farmers use both AI and natural services for cattle whereas the majority of farmers (94.12%) and (98.5%) used natural service than AI (5.88%) and (1.5%) for buffalo and goat respectively (Table 3, 4). Buffalo was not available in the study area of other districts except Bhola, therefore only in that region the percentage of farmers those were used natural service and AI for buffalo is shown (Table 3). On the other hand, among the survey areas only in Mymensingh and Narsingdi districts, farmers practiced AI to a certain extent in goats (Table 4).

**Table 3. Breeding practices for cattle and buffalo in different districts of Bangladesh.**

Districts	Cattle			Buffalo	
	NS (%)	AI (%)	Both (%)	NS (%)	AI (%)
Rangpur	10.53(10)	83.16(79)	6.31 (6)	-	-
Gaibandha	6.06 (6)	84.85 (84)	9.09 (9)	-	-
Dinajpur	61.11 (55)	38.88 (35)	-	-	-
Kurigram	50 (18)	50 (18)	-	-	-
Nilphamari	-	100 (47)	-	-	-
Bogura	20.93 (9)	76.74 (33)	2.32 (1)	-	-
Naogaon	17.07 (7)	82.93 (34)	-	-	-
Natore	4.54 (1)	95.45 (21)	-	-	-
Pabna	9.52 (4)	90.48 (38)	-	-	-
Sherpur	12.19 (5)	87.80 (36)	-	-	-
Mymensingh	12.63 (12)	84.21 (80)	3.16 (3)	-	-
Dhaka	2.04 (1)	85.71 (42)	12.24 (6)	-	-
Brahmanbaria	2.7 (1)	97.30 (36)	-	-	-
Narsingdi	14.44 (13)	84.44 (76)	1.11 (1)	-	-
Cumilla	-	100 (45)	-	-	-
Barishal	1.35(2)	98.65 (146)	-	-	-
Patuakhali	26.24 (37)	51.77 (73)	21.98 (31)	-	-
Bhola	56.41(66)	36.75 (43)	6.84 (8)	94.12 (16)	5.88 (1)
<b>Pooled</b>	<b>19.33 (247)</b>	<b>75.55 (966)</b>	<b>4.09 (65)</b>	<b>94.12 (16)</b>	<b>5.88 (1)</b>

Values in the parenthesis indicates the number of observation, NS= natural service, AI= artificial insemination

**Table 4. Breeding practices for goat in different districts of Bangladesh.**

Districts	Goat	
	NS (%)	AI (%)
Rangpur	100 (59)	-
Gaibandha	100 (28)	-
Dinajpur	100 (45)	-
Kurigram	100 (21)	-

**Table 4. Contd.**

Districts	Goat	
	NS (%)	AI (%)
Nilphamari	100 (20)	-
Bogura	100 (21)	-
Naogaon	100 (18)	-
Natore	100 (28)	-
Pabna	100 (23)	-
Sherpur	100 (14)	-
Mymensingh	85.37 (35)	14.63 (6)
Dhaka	100 (10)	-
Brahmanbaria	100 (5)	-
Narsingdi	92.59 (25)	7.41 (2)
Cumilla	100 (26)	-
Barishal	100 (49)	-
Patuakhali	100 (53)	-
Bhola	100 (61)	-
<b>Pooled</b>	<b>98.50 (526)</b>	<b>1.50 (8)</b>

Values in the parenthesis indicates the number of observation

### 3.4. Distance of breeding service between service providers and farmers

From the study area, it was noticed that most of the farmers practiced AI than natural service for cattle. In terms of natural service, it was estimated that a total of 22.41% of farmers used their bull, whereas 20.69%, 25.86% and 31.03% of farmers went for a long, medium and low distance to serve their cows respectively. On the other hand, almost all farmers (95.1%) in 18 districts got AI services easily and it was difficult for only few farmers (4.9%). Among this high number of farmers (17.14%) faced difficulties in Dinajpur district (Table 5).

**Table 5. Distance of cattle breeding service from service provider to farmer holders.**

Districts	Distance of breeding service					
	Own (%)	NS			AI	
		Low (Within 1 km) (%)	Medium (>1-<3 km) (%)	High (>3 km) (%)	Easy (%)	Difficult (%)
Rangpur	30 (3)	-	-	70 (7)	97.06 (33)	2.94 (1)
Gaibandha	-	100 (6)	-	-	98.81 (83)	1.19 (1)
Dinajpur	12.73 (7)	14.54 (8)	29.09 (16)	43.64 (24)	82.86 (29)	17.14 (6)
Kurigram	-	15.79 (3)	84.21 (16)	-	94.74 (18)	5.26 (1)
Nilphamari	-	-	-	-	100 (47)	-
Bogura	-	55.56 (5)	44.44 (4)	-	100 (33)	-
Naogaon	42.86 (3)	28.57 (2)	28.57 (2)	-	100 (34)	-
Natore	-	100 (1)	-	-	100 (21)	-
Pabna	25 (1)	75 (3)	-	-	100 (38)	-
Sherpur	40 (2)	60 (3)	-	-	100 (36)	-
Mymensingh	41.67 (5)	50 (6)	-	8.33 (1)	92.5 (74)	7.5 (6)
Dhaka	-	100 (1)	-	-	97.62 (41)	2.38 (1)
Brahmanbaria	-	100 (1)	-	-	100 (36)	-
Narsingdi	-	7.69 (1)	15.38 (2)	76.92 (10)	93.42 (71)	6.58 (5)
Cumilla	-	-	-	-	100 (45)	-
Barishal	-	-	-	-	100 (149)	-
Patuakhali	45.94 (17)	24.32 (9)	24.32 (9)	5.41 (2)	95.89 (70)	4.11 (3)
Bhola	21.21 (14)	62.12 (41)	15.15 (10)	1.52 (1)	83.72 (36)	16.28 (7)
<b>Pooled</b>	<b>22.41 (52)</b>	<b>31.03 (72)</b>	<b>25.86 (60)</b>	<b>20.69 (48)</b>	<b>95.10 (912)</b>	<b>4.90 (47)</b>

Values in the parenthesis indicates the number of observation

In case of natural service of goat, it was estimated that a total of 12.43% of farmers used their own buck, whereas 11.63%, 30.18% and 45.76% of farmers went for a long, medium and low distance to serve their does, respectively. On the other hand, only few percentages of farmers of Mymensingh (14.63%) and Narsingdi

(7.4%) districts were got AI service to serve their does. It was also found that most of the farmers (75%) faced difficulties to obtained AI service for their does (Table 6).

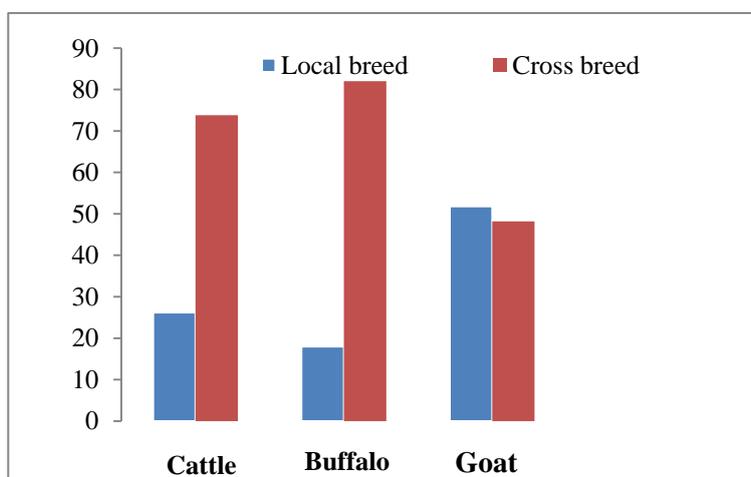
**Table 6. Distance of goat breeding service from service provider to farmer holders.**

District	Distance of breeding service					
	NS				AI	
	Own (%)	Low (Within 1 km) (%)	Medium (>1-<3 km) (%)	High (>3 km) (%)	Easy (%)	Difficult (%)
Rangpur	15.79 (3)	47.37 (9)	31.58 (6)	5.26 (1)	-	-
Gaibandha	3.57 (1)	50 (14)	35.71 (10)	10.71 (3)	-	-
Dinajpur	17.78 (8)	22.23 (10)	15.56 (7)	44.45 (20)	-	-
Kurigram	-	28.57 (6)	66.67 (14)	4.76 (1)	-	-
Nilphamari	25 (5)	60 (12)	15 (3)	-	-	-
Bogura	-	52.38 (11)	47.62 (10)	-	-	-
Naogaon	27.78 (5)	44.45 (8)	27.78 (5)	-	-	-
Natore	10.71 (3)	42.86 (12)	46.43 (13)	-	-	-
Pabna	17.39 (4)	78.26 (18)	4.34 (1)	-	-	-
Sherpur	28.57 (4)	64.29 (9)	7.14 (1)	-	-	-
Mymensingh	20 (7)	68.57 (24)	11.43 (4)	-	16.67 (1)	83.33 (5)
Dhaka	10 (1)	60 (6)	30 (3)	-	-	-
Brahmanbaria	-	60 (3)	40 (2)	-	-	-
Narsingdi	16 (4)	24 (6)	24 (6)	36 (9)	50 (1)	50 (1)
Cumilla	7.69 (2)	38.46 (10)	53.85 (14)	-	-	-
Barishal	6.12 (3)	10.20 (5)	36.73 (18)	46.94 (23)	-	-
Patuakhali	9.62 (5)	55.77 (29)	34.61 (18)	-	-	-
Bhola	18.03 (11)	59.02 (36)	21.31 (13)	1.64 (1)	-	-
<b>Pooled</b>	<b>12.43 (63)</b>	<b>45.76 (232)</b>	<b>30.18 (153)</b>	<b>11.6 (59)</b>	<b>25 (2)</b>	<b>75 (6)</b>

Values in the parenthesis indicates the number of observation

### 3.5. Distribution of livestock genotypes in different districts of Bangladesh

The study reveal that majority of the farmers (73.8% and 82%, respectively) raised crossbreed cattle and buffalo, while just a tiny portion (26.18% and 18%, respectively) raised indigenous breeds but more than 50% farmers were reared Black Bengal native goat (51%) (Figure 2).



**Figure 2. Distribution of livestock in different district of Bangladesh.**

### 3.6. Choice of the breed by the farmers

Various breeds of different species are available in Bangladesh. Due to yield focused on production system, the choice to exotic breeds is increasing as farmers have considered milk yield as the most important criterion for the choice of breed for cattle. The collected data showed that more than 60% farmers (60.83%) preferred crossbred cattle (Figure 3).

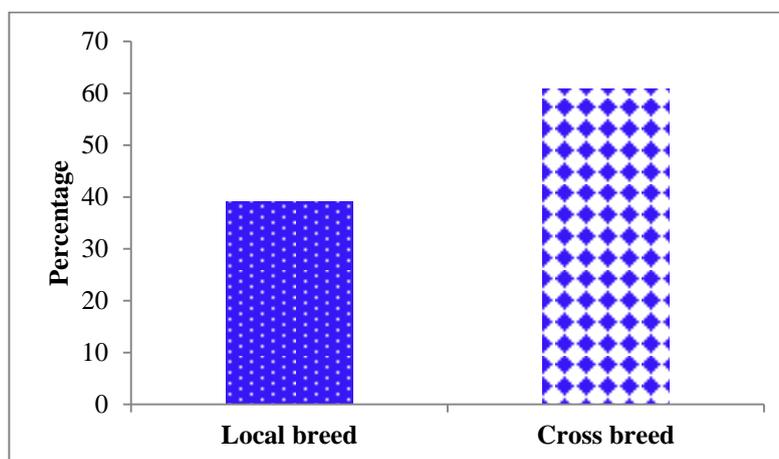


Figure 3. Choice of breed according to the farmers.

## 4. Discussion

### 4.1. Socio-economic profile of the farmer

Farmers' socioeconomic conditions are important for better policy options. Many factors such as age, educational level, family size, occupation and involvement of farmers in animal rearing have influence on socioeconomic characteristics of farmers. Among which livestock rearing is a major concern of the agricultural sector to change some parts of the socio-economic situation, mainly in rural areas.

The present study indicates that most of the respondents (53.12%) were a middle-aged group which is similar to a study from Karim (2020) where highest proportion (56.7%) of farmers was reported in the middle-aged. The above result is also in agreement with the findings of Shahjahan and Bhuiyan (2016), Sarker *et al.* (2017), and Girish *et al.* (2020). Overall, the majority of the respondents belonged to the middle-aged. This may be due to young people being more attracted to non-agricultural occupations than others age group. In this study, it was found that 22.25% were illiterate, 31.61%, 35.31% and 10.83% completed primary, secondary and higher education, respectively. Asaduzzaman *et al.* (2009) reported almost similar result. On other hand, present finding strongly supported by Islam *et al.* (2016) and Karim (2020). Education has a great impact on the livestock industry and educated people may contribute more for ideal livestock farming. Increasing household size also means more workers engaged on farming and livestock rearing activities, which can positively affect on household output and income. Another reason could be that rural farming activities require more workforce to carry out various farming activities. In this study it was found that the majority of the respondents (49.16%) were having a medium family size. The findings of Karim *et al.* (2020) and Girish *et al.* (2020) supported the present results whereas the findings of Rahman *et al.* (2012) were contradictory. It was observed that farmers were involved in various occupations such as in agriculture, business, and services. This result indicates that peoples have their personal choice on their occupation and the results found similar to Sarker *et al.* (2014) and Kamal *et al.* (2012). Most of the farmers were involved in agricultural activities though their educational level and monthly income was found low.

This study resulted that most of the family income (52.32%) was low i.e.72-120 thousand/year. which is contradictory with Khandoker *et al.* (2011). They reported that the income of most of the farmers was low i.e. 21-50 thousand taka/year that is lower than present study this could be due to the change in income over time. On other hand, this study similar with Islam *et al.* (2021) and he reported that the majority (74.4%) of the respondent belonged to the low-income group followed by the medium (16.7%) and high (8.9%) income group. Most of the farmers were engaged in livestock production system as a source of extra income. In Bangladesh, about 80% to 85% of households have livestock in rural areas (Banerjee, 2011). In this study, it was found that most of the farmers (41.11%) had (4-6) cattle per family. According to Islam and Oliuzzaman (1992), the average numbers of indigenous cattle were, 3.03, 3.49, and 3.1 per family in Trisal, Gouripur, and Mymensingh Sadar Upazila and which were almost similar to the present study. From the study, it was found that most of the farmers (34.56%) were reared a medium number of goats. According to Khandoker *et al.* (2011), the most of the farmers (52%) reared low (1-3) number of goat/ family.

#### 4.2. Distribution of livestock at the study area

The current study was reported that the total number of cattle in different Upazilas of 18 districts was 4242 where the number of cows was 3587 and the number of bulls was 655 but all of these were not used for breeding purposes because most of the farmers were reared bull for meat purpose without castration as they are not aware about the advantages of castration. For cattle breeding, most of the farmers were practiced AI to improve the productivity. As farmers used to keep cattle for milk and meat production and this helps to improve their economic condition. On the other hand, in the term of natural services, the rate of improvement in productivity is slow. It was reported that the total number of goats in 18 districts was 1676 where the number of doe was 1362 and the number of buck was 314 but all of these were not breeding bucks. Some of those animals were immature, which may be castrated later. Khandoker *et al.* (2011) observed that the average buck and doe ratio was 1:128 which is much higher than the normal buck and doe ratio and more than 70% of farmers faced a severe shortage of breeding bucks for serving their does in different districts of Bangladesh.

#### 4.3. Breeding strategy followed by the respondent in different districts of Bangladesh

It was found that most of the farmers (75.55%) practiced AI for cattle. The findings of the present study were in conformity with the findings of Hossain *et al.* (2005) and Begum *et al.* (2018). AI technology not only maximizes animal productivity but also reduces the risk of sexually transmitted infections. In the case of goat and buffalo, most of the farmers (98.5% and 94.12%, respectively) follow natural service and it might be due to lacking of AI facilities and which is in agreement with the findings of Islam *et al.* (2016) and Kumar *et al.* (2018). This is because people still paid less attention on systematic goat breeding. This situation is directly threatening the goat population and farmers need to be aware about the benefits of systematic goat breeding. For sheep breeding, 100% of farmers practiced natural service in the study area which is similar with the study of Sarker *et al.* (2014). Many underlying factors can influence a farmer's decision regarding a particular breeding method. Few of these factors could be mitigated to improve service access and delivery to rural farmers.

#### 4.4. Distance of breeding service between service providers and farmers

In the case of natural service, it was estimated that a total of 22.41% of farmers used their own bull, whereas 20.69%, 25.86% and 31.03% of farmers went for a long, medium and short distances to serve their cows respectively. Distance is often accompanied by increased costs, which are essentially barriers for farmers to access natural services. Alternatively, longer distances may mean no access to quality breeding bulls. As a result, farmers choose to use AI services because they do not have access to natural services and now-a-days AI service is readily available throughout the country. People are concerned about the production of cattle and they easily adopt AI because there are some advantages of AI such as genetic improvement of livestock, disease control mechanism, the possibilities to increase fertility and decrease breeding expense. For AI, almost all districts farmers got AI services easily (95.1%) and it was difficult for only 4.9% of farmers. Most of the farmers communicate with the AI technicians to get services via phone and rarely do the farmers come to the service center for cattle breeding if the distance is low. In the case of goats, from the study area, it was found that most of the farmers preferred natural service to AI because goat AI is not available. In case of natural service, it was estimated that a total of 12.43% of farmers used their own buck and rest of them have to pass different distances to mate their does. The findings of the present study were in agreement with the finding of Kamal *et al.* (2012). This indicates that the breeding bucks are not easily available for the village farmers. The farmers are not interested in rearing buck due to some social taboos. In most cases, bucks were being kept by only a few lower cast people and animals are often genetically very poor and of unknown pedigree. From an economic point of view, castration helps to improve meat quality, so most farmers want to earn more money by castrating the male goats (Werdi *et al.*, 2004) which have a high demand in the market. Farmers do not find it economically feasible to rear buck for one or two doe (s). As a result, the availability of breeding bucks becomes decreases day by day. In the case of goat AI, only Mymensingh (14.63%) and Narsingdi (7.4%) districts started to use AI and most of the farmers (75%) faced difficulties to serve their does in the study area. The findings of the present study were in corroboration with the finding of Khandoker *et al.* (2011). AI has not yet been received such universal acceptance in the goat breeding industries like cattle. Because people are not aware of goat production like cattle production and the government has not yet adopted a policy to make AI available. Therefore, most of the farmers of Mymensingh (85.37%), Narsingdi (92.6%) and 100% of other districts had to depend on natural breeding for their does.

#### 4.5. Distribution and choice of breeds of livestock in different districts of Bangladesh

In case of cattle and buffalo, the majority of the farmers prefer crossbreed (cattle 73.8% and buffalo 82%) for their higher productivity. In recent days, farmers are interested in rearing high-yielding crossbreds instead of low yielding native cattle (Quddus *et al.*, 2010). According to Jabbar *et al.* (2010), the constant development of breeds will depend on what breeds and breeding materials will be sponsored and disseminated and how farmers will practice breeding in their herds. On the other hand, in case of goat, most of the farmers prefer native breed (goat 51%) for easy management and high resistance to diseases. The present study showed that most of the farmers (60.83%) preferred crossbred as though this program productivity of animals is increased.

#### 5. Conclusions

Livestock farming, an integral part of agriculture, makes multiple contributions to the growth and development of agriculture in Bangladesh. The present study revealed that most of the livestock owners are below the poverty levels regarding socio-economic condition. It was found that in case of breeding practices most of the farmers practiced AI in cattle but not yet practiced in buffalo and goat. In terms of service availability, most of the time farmers have to go far distances for their breeding services. It was also found that maximum farmers preferred crossbred cattle rearing and cross-breeding is getting more popular day by day. This survey may help to translate farmers' needs in a way that they get access to their required services adequately and also will help in livestock policy making.

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#### Data availability

All relevant data are within the manuscript.

#### Conflict of interest

None to declare.

#### Authors' contribution

Conceptualization: [M. A. M. Yahia Khandoker]; Methodology: [M. A. M. Yahia Khandoker]; Data collection: [Mst. Mahomudha Akhtar, Mst. Kamrunnahar Kona, Nusrat Jahan Meki, Marzia Rahman Sompa and Israt Jahan Meem]; Writing-original draft preparation: [Md. Younus Ali, Tasmina Akter, Mst. Mahomudha Akhtar]; Writing-review and editing: [M. A. M. Yahia Khandoker, Md. Younus Ali, Tasmina Akter, Mst. Mahomudha Akhtar]. All authors have read and approved the manuscript.

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