PRESENT SCENARIO OF LIVESTOCK BREEDING AND MANAGEMENT PRACTICES IN THE NORTHERN PART OF BANGLADESH †

[ESCENARIO ACTUAL DE LAS PRÁCTICAS DE CRÍA Y MANEJO DEL GANADO EN EL NORTE DE BANGLADESH]

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SUMMARY

Background: Bangladesh has a rich heritage of livestock rearing. The management and breeding practices differ across the country. **Objectives:** To study the present scenario of breeding and management practices of livestock at northern Teesta river basin based Lalmonirhat district in Bangladesh. **Methodology:** Total 100 farmers were selected using random sampling technique from 5 upazilas of Lalmonirhat district during July to December, 2022. Data were analyzed using SPSS 23.0 statistical package. **Results:** Results showed that most of the farmers (65%) at the northern part of Bangladesh were middle-aged, 41% of them completed secondary education, and their occupation was mainly agriculture (55%). About 37.78% of respondents supplied roadside grass as roughage to their livestock. Maximum number of respondents (60.24%) supplied hand mixed feed as a source of concentrate whereas 39.76% of respondents used commercial feed. 96% of farmers practiced artificial insemination to inseminate their cows and heifers while in goat nearly all respondent farmers (98.41%) practiced natural mating. Among the breeding companies, 41.41% farmers preferred semen from the Bangladesh Rural Advancement Committee (BRAC), followed by Advanced Chemical Industries (ACI) (30.30%), Government (Department of Livestock Services (DLS) (22.22%), and others (6.07%). About 41.76% respondents used 50% Sahiwal - 50% local genotype bull to breed the cows whereas 23.08% respondents used 100% Sahiwal, 18.68% used 75% Holstein Friesian-25% local, 5.49% used 100% Holstein Friesian, 3.30% used 50% Holstein Friesian-50% Local and only 3.30% used 87.5% Holstein Friesian-12.5% Local genotype bull semen, respectively. On the other hand, most of the farmers (98.41%) chosen Black Bengal breeding buck during breeding and remaining used crossbred (Black Bengal Goat- Jamunapari) to breed their does. The actual price of bull semen from Govt. (DLS) was 30 Bangladeshi Taka (BDT) on average for all the breeds whereas, the price ranged 110-200 BDT depending on cattle breeds and bull/bucks Identification (ID) in different private enterprises. Farmers had to pay on an average 181.18 BDT for DLS originated semen in addition to that BRAC Artificial Insemination (AI) workers took an average of 425.61 BDT from farmers to inseminate their cows. The average milk yield/d was 1.82±0.14, 3.35±0.40, and 2.74±0.27 liters for local, HF crossbred and Sahiwal crossbred respectively in that region. The prevalence of repeat breeding incidences was 13.74%, 14.21%, and 15.17%, for Local, Sahiwal crossbred, and Holstein Friesian crossbred genotypes respectively. The highest incidence of disease was found as Lumpy Skin Disease (14.67%) followed by Foot and Mouth Disease (FMD) (11.98%) and other parasitic and metabolic diseases. In the study area, it was found that maximum number of the respondents (95%) faced excessive feed price problem along with some other problems. **Implications:** Government intervention is necessary to improve the situation of livestock production in the country. **Conclusion:** This study showed the overall scenario of livestock production, breeding, and management in the northern part of Bangladesh which could be helpful for the govt., Non-governmental organizations (NGO's) and policymakers to take realistic steps for the improvement of livestock production in the northern part of Bangladesh.

Key words: BRAC; ACI; DLS; Sahiwal; genotype.

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RESUMEN

Antecedentes: Bangladesh posee un rico patrimonio ganadero. Las prácticas de gestión y cría difieren de un país a otro. **Objetivo:** Estudiar la situación actual de las prácticas de cría y gestión del ganado en el distrito de Lalmonirhat, al norte de la cuenca del río Teesta, en Bangladesh. **Metodología:** Se seleccionó un total de 100 ganaderos mediante la técnica de muestreo aleatorio de 5 upazilas del distrito de Lalmonirhat entre julio y diciembre de 2022. Los datos se analizaron con el paquete estadístico SPSS 23.0. **Resultados:** Los resultados mostraron que la mayoría de los agricultores (65%) en la parte norte de Bangladesh eran de mediana edad, el 41% de ellos habían completado la educación secundaria, y su ocupación era principalmente la agricultura (55%). Alrededor del 37.78% de los encuestados suministraba hierba de la carretera como forraje a su ganado. El máximo número de encuestados (60.24%) suministraba piensos mezclados a mano como fuente de concentrado, mientras que el 39.76% utilizaba piensos comerciales. El 96% de los ganaderos practicaban la inseminación artificial para inseminar a sus vacas y novillas, mientras que en el ganado caprino casi todos los encuestados (98.41%) practicaban la monta natural. Entre las empresas de reproducción, el 41.41% de los ganaderos prefirió el semen del Comité de Fomento Rural de Bangladesh (BRAC), seguido de Advanced Chemical Industries (ACI) (30.30%), el Gobierno (Departamento de Servicios Ganaderos (DLS) (22.22%) y otros (6,07%). Alrededor del 41,76% de los encuestados utilizaron un 50% de toro de genotipo Sahiwal y un 50% de toro de genotipo local para criar las vacas, mientras que el 23.08% de los encuestados utilizaron un 100% de semen Sahiwal, el 18.68% un 75% de semen Holstein Friesian y un 25% de semen local, el 5.49% un 100% de semen Holstein Friesian, el 3.30% un 50% de semen Holstein Friesian y un 50% de semen local y sólo el 3.30% un 87.5% de semen Holstein Friesian y un 12.5% de semen local, respectivamente. Por otra parte, la mayoría de los ganaderos (98.41%) eligieron machos reproductores de raza Bengala Negra durante la cría y el resto utilizó cruces (cabra Bengala Negra-Jamunapari) para criar a sus hembras. El precio real del semen de toro del Gobierno (DLS) era de 30 Taka bangladeshíes (BDT) por término medio para todas las razas, mientras que el precio oscilaba entre 110 y 200 BDT dependiendo de las razas de ganado y de la identificación del toro o el macho en las distintas empresas privadas. Los ganaderos tuvieron que pagar una media de 181.18 BDT por el semen procedente de la DLS. Además, el personal de inseminación artificial del BRAC cobró una media de 425.61 BDT a los ganaderos por inseminar a sus vacas. El rendimiento lechero medio/d fue de 1.82±0.14, 3.35±0,40 y 2.74±0.27 litros para las razas locales, HF y Sahiwal, respectivamente, en esa región. La prevalencia de incidencias de repeticiones de celo fue del 13.74%, 14.21%, 15.17%, para genotipo local, cruzado Sahiwal y cruzado Holstein Friesian respectivamente. La mayor incidencia de enfermedades se registró en la dermatosis nodular contagiosa (14.67%), seguida de la fiebre aftosa (11.98%) y otras enfermedades parasitarias y metabólicas. En el área de estudio, se encontró que el máximo número de encuestados (95%) se enfrentaba a un problema de precio excesivo de los piensos junto con otros problemas. **Implicaciones:** Es necesaria la intervención del gobierno para mejorar la situación de la producción ganadera en el país. **Conclusión**: Este estudio muestra la situación general de la producción, la cría y la gestión del ganado en el norte de Bangladesh, lo que podría ser útil para el gobierno, las organizaciones no gubernamentales (ONG) y los responsables políticos para tomar medidas realistas para la mejora de la producción ganadera en el norte de Bangladesh.

Palabras clave: BRAC; ACI; DLS; Sahiwal; genotipo.

INTRODUCTION

Bangladesh is a hot humid tropical country where Livestock is one of the most important sub-sectors of agriculture (Sharma *et al.,* 2014) and contributed 1.44% to GDP in FY 2020-2022. This contribution is about 7-8 percent of the total GDP. More than 90 percent of animal protein comes from this sub-sector (MoFL, 2022). The livestock sub-sector provides full time employment for 20% of the total population and part-time employment for another 50% (Rahman *et al.,* 2014). However, the sector's actual contribution has been consistently underestimated as the value added in draught power used in farm operation, threshing, sugarcane and oilseed crushing, local transport, dung for cooking fuel and manure for fertilization of crop fields were not taken into account (Rahman *et al.,* 2014). Livestock population in Bangladesh is currently estimated to comprise 248.56 lakh cattle, 15.16 lakh buffaloes, 269.45 lakh goats, 38.27 lakh sheep, 3196.89 lakh chicken and 660.16 lakh ducks (DLS, 2022-23). The density of livestock population per acre of cultivable land is 7.37 (Banglapedia, 2021). This density has been increasing every year in the country. The country has a relative density of livestock population well above the averages for many other countries of the world.

The farming system in Bangladesh is mainly commercial and non-commercial or traditional. The livestock breeding and management scenario is differed from region to region. The productivity of indigenous animal is very low due to low genetic potential. Most of the indigenous animals are non-descriptive with poor genetic makeup for production. The genetic improvement of large number of livestock is possible through cross breeding/ selective breeding with superior quality male germplasm (Siddiky, 2018). Number of crossbred cattle is increasing day by day with the spread of artificial

insemination (AI) practices throughout the country. In developing countries, livestock keepers (farmers) usually keep cows of various genetic background viz., indigenous, cross-breed (particularly cross between indigenous and exotic) and exotic breed types (Marshall, 2014). Genotype has a significant effect on biological efficiencies of dairy cows (Khaton *et al.*, 2015). The intensity of production traits differs according to the genotype of breeds (Islam *et al.*, 2006). Differences in performance of breeds managed in the same environment provide more objective evidence that a trait is under genetic control (Haskell *et al.*, 2014).

In Bangladesh, AI services have been operated commercially by both government and private organizations whereas the autonomous organization provides the AI services within their research and extension strategy (Uddin *et al.*, 2014). The current major AI services providers are government, Milk Vita, BRAC, ACI, ADL, Lal Teer, and Ejab. It is imperative to know the overall status of livestock population, their breeding and management condition, AI coverage, preference of semen, condition of the seed (semen) producing breeding companies and prices of semen and challenges and constraints of livestock farming in Bangladesh. So far, a limited number of published research reports are available on livestock breeding and management practices in Bangladesh. Hence, the main objectives of this study are to disclose the present scenario of livestock breeding and management practices at northern part of Bangladesh, which is considered as a big hub for the livestock. This study will also evaluate the productive and reproductive performances of existing livestock species as well as their management practices under rural condition of Bangladesh.

MATERIALS AND METHODS

Study area

This study was conducted in five upazilas of Northern part of Bangladesh namely Lalmonirhat Sadar, Aditmari, Kaliganj, Hatibandha and Patgram of Lalmonirhat district. These areas are composed of sedimentary soil of the Teesta basin and a number of small char lands. The farming system of the study area was largely perceived by integrated livestock production system. The data were collected from 100 random farmers from 10 different villages under those upazilas. Lalmonirhat district is located between 25°46′ to 26°33′ North latitude and 89°01′ to 89°36′ East longitude, average high temperature 32.3°C and the average low temperature is 11.2°C and annual rainfall averages 2931 millimetres (Source: https://www.banglakosh.com/lalmonirhat-district/)

Data collection

Data from selected areas were collected through direct interview. A questionnaire was developed with a logical sequence, objective-based and rationally which was analyzed to present scientifically. The questionnaire was pre-tested from the farmers. Both quantitative and qualitative data were collected during July to December, 2022.

Data Analysis

Collected data were compiled and tabulated in a excel data sheet. After intensive processing and coding, data were analyzed using descriptive statistics with SPSS (Statistical Package for Social Science) 23 software.

RESULTS

Socio-economic status and categories of the respondent farmers

Table 1 displays the socio-economic characteristics of livestock farmers. The findings indicated that the highest proportion (65%) of farmers were middle aged (30-49) as compared to old aged (50 and above) category (25%) and young aged (15-29) category (10%). Among the farmers, 24% completed primary education (class I - class V), 41% farmers completed secondary education (class VI - class X) 14% completed higher education (class XI to MSc) whereas 21% were illiterate that means they didn't get any formal education. Most of the farmers (48%) had medium sized (5-7) family and 41% had small sized (up to 4) family, 11% farmers had large sized (8 and above) family members. The occupation of the farmers was mainly agriculture (55%) followed by business (14%), service (4%) and others (27%) like rickshaw or van puller, as a cook in the hotel at local market, mechanic, bamboo craftsman, quack, brick mason etc. Low income family (16-25 thousand taka/month) was prominent (60%). Based on the livestock rearing, most of the family (57.14%) reared a lower number of cattle (1-3) though 9.18% farmers reared high (7 and above) number of cattle. Similarly, maximum family (62.16%) had lower number of goats (1-3), though 22.97% farmers reared 4-6 goats and 14.86% farmers reared higher number of goats (7 and above). On the other hand, 83.33% respondents had lower number of sheep (1-3) whereas only 16.67% farmers were involved with high (7 and above) number of sheep rearing. However, no farmer reared buffalo in the study areas. Rearing 4-6 chicken was most common (60.46%) with only 20.93% farmers reared 1-3 chicken whereas 18.60% farmers reared 7 or more chicken. The number of ducks reared per family was mostly (42.11%) low (1-3), while 31.58% reared medium number (4-6) and 26.32% farmers were involved with high (7 and above) number of duck rearing (Table 1).

Table 1. Socio-economic status and categories of the respondent farmers at Lalmonirhat district in Northern part of Bangladesh.

Characteristics	Scoring unit	Categories	Respondent N=100	Percent %
Age	Years	Young (15-29)	10	10
		Middle (30-49)	65	65
		Old (50 and above)	25	25
Education	Year of Schooling	Illiterate (0)	21	21
		Primary (1-5)	24	24
		Secondary (6-10)	41	41
		Higher education (11 and above)	14	14
Family size	Number of members	Small (up to 4)	41	41
		Medium (5-7)	48	48
		Large (8 and above)	11	11
Occupation	Type	Agriculture (1)	55	55
		Business (2)	14	14
		Service (3)	4	4
		Others	27	27
Family Income	Thousand taka	Very low (up to 15)	31	31
		Low (16-25)	60	60
		Medium (26-50)	7	7
		High (51 and above)	2	2
Involvement in cattle rearing	Number of cattle/ Family	Low (1-3)	56	57.14
		Medium (4-6)	33	33.67
		High (7 and above)	9	9.18
Involvement in goat rearing	Number of goat/family	Low (1-3)	46	62.16
		Medium (4-6)	17	22.97
		High (7 and above)	11	14.86
Involvement in sheep rearing	Number of sheep/ Family	Low (1-3)	5	83.33
		Medium (4-6)	-	-
		High (7 and above)	1	16.67
Involvement in buffalo rearing	Number of buffalo/ Family	Low (1-3)	-	-
		Medium (4-6)	-	-
		High (7 and above)	-	-
Involvement in poultry rearing	Number of chicken/ Family	Low (1-3)	9	20.93
		Medium (4-6)	26	60.46
		High (7 and above)	8	18.60
Involvement in poultry rearing	Number of duck/ Family	Low (1-3)	8	42.11
		Medium (4-6)	6	31.58
		High (7 and above)	5	26.32

Number of available livestock Species

The total number of cattle population in the study areas was 409 of which crossbred were 244 and local were 165; goat 277, sheep 16 and poultry 350. In case of local cattle, higher numbers (29.09%) were pregnant cow followed bull (26.06%), milk cow (18.18%), heifer (13.33%), dry cow (4.24%), calves (9.10%). On the other hand, in case of crossbreed cattle, higher numbers (26.23%) were also pregnant cow. With regard to the local goat, maximum numbers (43.45%) were kids as well as buck 16.85%, doe 39.70% whereas crossbred goat number was minimum, of which 40% both buck and kids each as well as doe 20%. For sheep, farmers were involved mainly (50%) in local ram rearing. It was found that the farmers did not have any interest to rear buffalo in the study areas. In case of poultry, maximum numbers (75.14%) refer to the local chicken along with local duck 24.86% (Table 2).

Table 2. Available livestock species in respect to different categories at Lalmonirhat district.

Categories	Local		Crossbred	
	Number	%	Number	%
Cattle				
Milch cow	30	18.18	60	24.59
Pregnant cow	48	29.09	64	26.23
Dry cow	7	4.24	1	0.41
Heifer	22	13.33	29	11.89
Bull	43	26.06	33	13.52
Castrated	-	-	-	-
Calves	15	9.10	57	23.36
Sub-total	165		244	
Goat				
Buck	45	16.85	4	40
Doe	106	39.70	2	20
Kids	116	43.45	4	40
Sub-total	267	-	10	-
Sheep				
Ram	8	50	-	-
Ewe	5	31.25	-	-
Lamb	3	18.75	-	-
Sub-total	16	-	-	-
Buffalo	-	-	-	-
Poultry				
Chicken	263	75.14	-	-
Duck	87	24.86	-	-
Sub-total	350	-	-	-

Types of feed and fodder supply

This study reveals that 37.78% respondents supplied roadside grass, 28.89% supplied kitchen/vegetable waste, 14.07% supplied cultivated fodder and 19.26% supplied grass collected from TEESTA char land, weeds, Mature Maize leaves as the source of roughages. For the concentrate supply, maximum number of respondents (60.24%) supplied hand mixed feed using local ingredients and rest of the respondents (39.76%) supplied commercial feed from different feed companies. Among all the farmers studied, 53% supplied vitamin and minerals as a supplement while 99% farmers did not supply any type of feed additives and growth promoters for their livestock (Table 3).

Amount of roughage and concentrate supply to the animal

On an average 5 kg/d roughage was supplied to milking cow, pregnant cow, dry cow and bull respectively and for buck, doe and ram, farmers supplied ad-libitum amount of roughages. In case of concentrate supply, highest (1.57±0.08 kg/d) amount was supplied to the dry cow and lowest (0.54±0.02 kg/d) for doe (Table 4).

Housing and management system

Maximum number of the respondents at the northern part of Bangladesh reared their livestock in the tin shed house (75%) followed by half building (24%) and straw based shed housing (1%) (Figure 1a). The pattern of most of the tin shed and straw based shed houses were closed house (75%) and remaining were semi-closed house (25%). The respondent farmers were unwilling to keep their livestock in an open house (Figure 1b).

Breeding method followed by respondent

Most of the farmers (96%) at the northern part of Bangladesh adopted artificial insemination in cattle whereas 98.41% and 100% farmers practiced natural insemination to breed their goat and sheep, respectively (Figure 2).

Availability of breeding services

Almost all the respondent farmers (96%) practiced Artificial Insemination (AI) and they assured that this process was easy for them (Table 5). Only 1% farmers used their own bull for insemination of cows. On the other hand, in case of goat breeding, 7.94% farmers used own bucks, 53.97% used others bucks within 1 km, 33.33% used other bucks within 1-3 km,

3.17% used other famers bucks more than 3 km distance for natural insemination. But only 1.59% farmers used AI in goat breeding which was very negligible.

Decision making for AI service, farmers' preference and source of bull semen

This study revealed that 14.71% farmers depend on service provider decision to choose the genotype of bull semen for breeding their cows. Besides this, 37.25% farmers preferred 50% Sahiwal-50% local type of semen for their cow followed by 100% Sahiwal (20.59%), 75% HF-25% local (16.67%), 100% HF (4.90%), 87.5% HF-12.5% Local (2.94%), 50% HF-50% local (2.94%) (Table 6). The respondents believed that overall management was relatively easier and diseases incidence was lower for 50% Sahiwal-50% local type cattle.

In the current study, it was observed that farmers used semen from different AI service providing companies. Maximum number of farmers preferred semen from BRAC (41.41%) followed by ACI (30.30%), Govt. Department of Livestock Services (DLS) (22.22%) and American Dairy Ltd (ADL) (6.06%) (Figure 3).

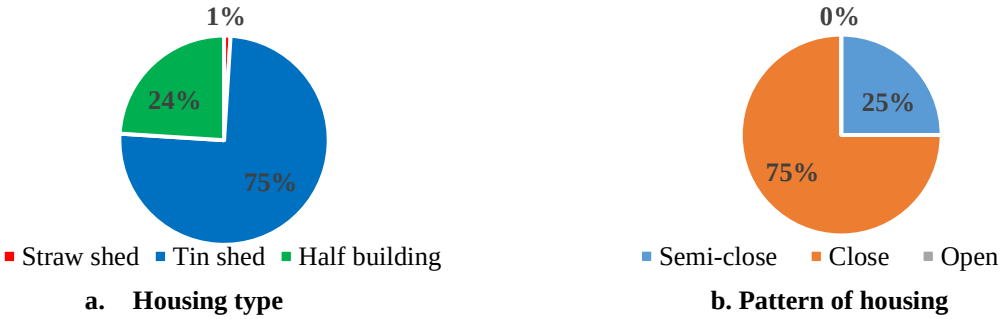
Table 3. Types of feeds and fodders supplied to the livestock by the farmers at Lalmonirhat district.

Parameters	Categories	Number of respondents	Percent of total respondents (%)
Roughages	Roadside grass	51	37.78
	Cultivated fodder	19	14.07
	Kitchen/vegetable waste	39	28.89
	Tree leaves and cultivated fodder	-	-
	Others*	26	19.26
Concentrate	Commercial feed	66	39.76
	Hand mixed feed	100	60.24
	No	-	-
Vitamin, mineral supplement	Yes	53	53
	No	47	47
Feed additives and growth promoter	Yes	1	1
	No	99	99

*****Others= Grass collected from TEESTA char land, weeds, Mature Maize leaves.*

Table 4. Amount of roughage and concentrate supplied to the different categories of livestock at Lalmonirhat district.

Species	**Roughages (kg/d)** (Mean ± SE)	**Concentrate (kg/d)** (Mean ± SE)
Milking cow	5.31±0.25	1.53±0.05
Pregnant cow	5.50±0.29	1.48±0.05
Dry cow	5.50±0.30	1.57±0.08
Bull	5.43±0.24	1.30±0.05
Buck	Ad- libitum	0.55±0.01
Doe	Ad- libitum	0.54±0.02
Ram	Ad- libitum	-



a. Housing type **b. Pattern of housing**

Figure 1. a) Housing type and b) pattern of livestock housing at Lalmonirhat district.

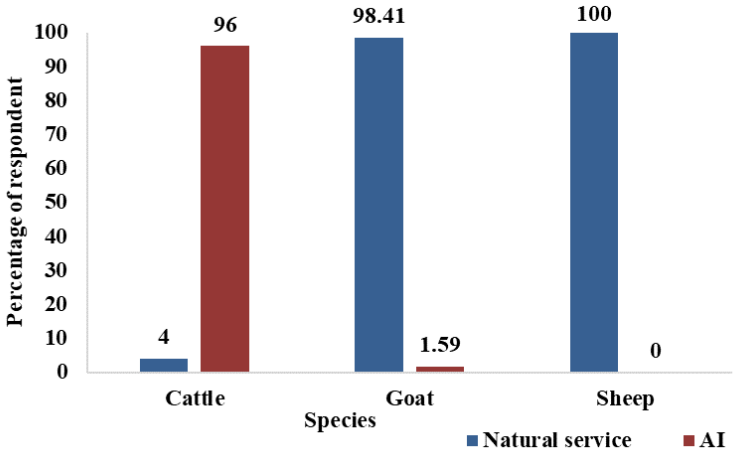


Figure 2. Breeding methods followed by respondent farmers at Lalmonirhat district.

Table 5. Availability of breeding service at northern part of Bangladesh.

Species	Natural insemination								Artificial Insemination			
	Own bull/buck		Within 1 km		1-3 km		More than 3 km		Easy		Difficult	
	Number	%	Number	%	Number	%	Number	%	Number	%		%
Cattle (100)	1	1	2	2	1	1	-	-	96	100	-	-
Goat (63)	5	7.94	34	53.97	21	33.33	2	3.17	1	1.59	-	-

Number in the parenthesis indicate the number of observations

Table 6. Decision making and farmers preference on genotype of bull semen in study area.

Categories	Number of observation (102)	Percentage (%)
Depend on service provider	15	14.71
Own choice		
50% HF-50% local	3	2.94
75% HF-25% local	17	16.67
87.5% HF-12.5% Local	3	2.94
100% HF	5	4.90
50% Sahiwal-50% local	38	37.25
100% Sahiwal	21	20.59

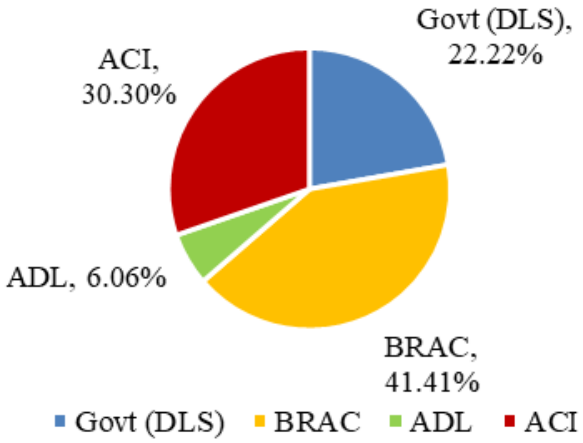


Figure 3. Farmers preference on source of semen.

Price of semen in different companies

The price of Govt. semen (DLS) was 30 BDT on an average for the entire breed. While the price in BRAC was 200 BDT for 100% HF and 100% Sahiwal; 120 BDT for 50% HF-50% Local and 50% Sahiwal-50% local; 140 BDT for 75% HF-25% local and 87.5% HF-12.5% Local; 160 BDT for 87.5% SL-12.5% Local, respectively.

In American Dairy Ltd. (ADL) the price was 155 BDT for 100% HF and 100% Sahiwal; 150 BDT 75% HF-25% local and 75% SL-25% local; 130 BDT for Red Chittagong Cattle (RCC), respectively.

In ACI 175-200 BDT (Varies depends on bull ID) for 100% HF and 100% Sahiwal; 160 BDT for 93.5% HF; 145 BDT for 87.5% HF-12.5% Local, 87.5% SL-12.5% Local and 100% RCC; 130 BDT for 75% HF-25% local, respectively.

In EJAB, 150 BDT 100% HF and 100% Sahiwal; and 110 BDT for 87.5% HF-12.5% Local, 75% HF-25% local, 87.5% SL-12.5% Local, 75% SL-25% local and 93% SL, respectively (Table 7).

Farmers had to pay on an average 181.18 BDT for DLS originated semen that is much lower than other private companies (Table 7). Among the semen providing companies in the Lalmonirhat district, BRAC AI worker takes an average of 425.61 BDT from farmers to inseminate their cows (Table 7).

Repeat Breeding incidence of cattle

This study showed that the prevalence of repeat breeding incidences in different genotype cows were 11.0%, 14.0% and 17.75% for Local, Sahiwal crossbred and HF crossbred, respectively (Figure 4).

Table 7. Types of semen and semen price of available semen providing organizations at Lalmonirhat district.

Organization	Type of semen	Price of semen in BDT (set by company,)	Average price (BDT) paid by farmers to AI technicians
Govt. (DLS)	50% HF-50% Local	30/-	181.18
	75% HF-25% local	30/-	
	87.5% HF-12.5% Local	30/-	
	62.5%HF-37.5% Local	30/-	
	RCC	30/-	
BRAC	100% HF	200/-	425.61
	50% HF-50% Local	120/-	
	75% HF-25% local	140/-	
	87.5% HF-12.5% Local	140/-	
	100% Sahiwal	200/-	
	50% Sahiwal-50% local	120/-	
	87.5% SL-12.5% Local	160/-	
ADL	100% HF	155/-	433.33
	75% HF-25% local	150/-	
	100% Sahiwal	155/-	
	75% SL-25% local	150/-	
	RCC	130/-	
ACI	100% HF	175-200/- (Varies depend on bull ID)	393.33
	87.5% HF-12.5% Local	145/-	
	75% HF-25% local	130/-	
	93.5 HF-6.5% Local	160/-	
	100% Sahiwal	175-200/- (Varies depend on bull ID)	
	87.5% SL-12.5% Local	145/-	
	RCC	145/-	
EJAB	100% HF	150/-	-
	87.5% HF-12.5% Local	110/-	
	75% HF-25% local	110/-	
	100% Sahiwal	150/-	
	87.5% SL-12.5% Local	110/-	
	75% SL-25% local	110/-	
	93% SL-7% Local	110/-	

Prevalence of diseases

Livestock suffered from various types of diseases including FMD 11.98%, B.Q. 0.49%, mastitis 6%, metabolic disease 7.34%, venereal disease 1.47%, parasitic disease 7.09% and lumpy skin disease 14.67%, respectively (Table 8).

Vaccination status in the study area

The percentage of the vaccinated livestock in relation to the total number of livestock owned by the respondent farmers against different diseases were FMD 38.60%, BQ 8.19%, Anthrax 4.68%, PPR 30.99%, BCRDV 5.26%, RDV 10.53% and Cholera 1.75% respectively (Figure 5).

Performance of cattle in the study area

In the northern part of Bangladesh, the average milk production (liter/day) of Local, HF cross, Sahiwal cross were 1.82±0.14, 3.35±0.40, 2.74±0.27, respectively. On the other hand, average lactation length of Local, HF cross, Sahiwal cross were 173.2±6.60, 190.77±6.49, 187.78±8.76 days, respectively (Table 9).

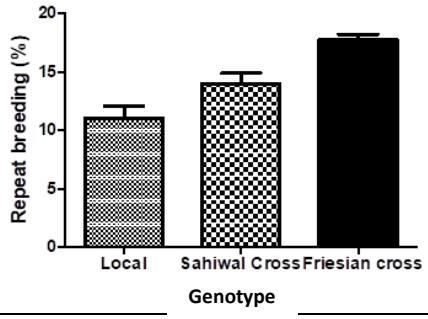


Figure 4. Repeat breeding incidence of different genotypes of cows.

Table 8. Prevalence of livestock diseases at Lalmonirhat district.

Disease Name	No. of positive	Percentage (%)	Total cattle
FMD	49	11.98	409
Anthrax	-	-	
B.Q.	2	0.49	
Mastitis	6	1.47	
Rabies	-	-	
Hemorrhagic septicemia	-	-	
Metabolic disease*	30	7.34	
Venereal disease*	6	1.47	
Parasitic disease*	29	7.09	
Lumpy skin disease	60	14.67	

***Metabolic disease**- Milk fever, nitrate poisoning, Blot, Diarrhea. **venereal disease-** early embryonic death, abortions. **parasitic disease**-Endoparasites, Lice infestation, tick infestation.*

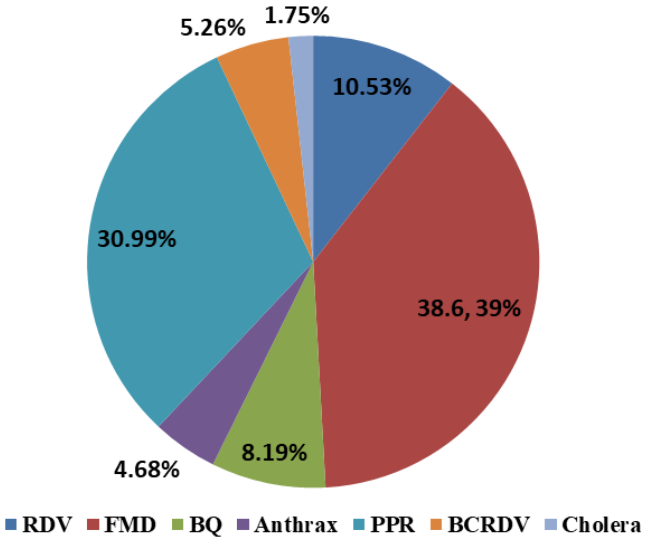


Figure 5. Vaccines used by the farmers for their livestock.

Table 9. Productive and reproductive performance of cattle at Lalmonirhat district.

Performance	Parameter	Local (25)	HF cross (26)	Sahiwal cross (45)
Productive performance	Milk yield (L/d)	1.82±0.14	3.35±0.40	2.74±0.27
	Lactation length (day)	173.2±6.60	190.77±6.49	187.78±8.76
	Age at First Service (months)	28.93±0.77	22.92±0.70	25.47±0.73
Reproductive performance	Gestation Period (days)	300.74±0.75	295.08±1.24	296.89±1.31
	Service per conception (no.)	1.89±0.19	1.77±0.19	1.67±0.16
	Calving Interval (days)	459.26±5.33	453.47±9.52	450.38±6.70
	Days open (days)	150.37±4.17	130.39±5.54	129.67±4.67

The average age at first service (22.92±0.70 months) and gestation period (295.08±1.24 days) were comparatively lower in HF cross cows (Table 9). In this study, the average number of services per conception were 1.89±0.19, 1.77±0.19, 1.67±0.16 for Local, HF cross and Sahiwal cross cows, respectively. In this study, the average calving interval of Local, HF cross and Sahiwal cross cows were 459.26±5.33, 453.47±9.52, 450.38±6.70 days, respectively.

In this study, the average Days Open length of Local, HF cross and Sahiwal cross cows were 150.37±4.17, 130.39±5.54, 129.67±4.67 days, respectively. This study reported that among the other cows the length of days open of the local cows were larger (Table 9).

Challenges of livestock rearing

Various challenges like lack of capital, excessive feed price, lack of fodder land, lack of training and some other problems like technician demand higher charge for AI, higher price of drugs, scarcity of feed in rainy season, frequent flood, high price of straw interrupt the livestock production. Maximum farmers (95%) faced excessive feed price followed by 54% faced lack of capital, 43% faced lack of fodder land, 32% faced lack of training and others faced (8%) (technician demand higher charge for AI, higher price of medicine, scarcity of feed in rainy season, frequent flood, high price of straw*)* in Bangladesh. Most of the farmers faced multiple problems which are shown in ranking in Table 10.

DISCUSSION

Our present study focuses the present livestock breeding and management status at northern part of Bangladesh. The findings obtained from this study are similar with the previous result of Islam *et al.* (2021) where they observed that highest proportion (44.44%) of the farmers in the study area was in the middle-aged category compared to young (31.11%) and old (24.44%) aged category. The result of the study is also consistent with the study of Rahim *et al.* (2018) where most of the farmers were also middle aged category (47%) with the age range of 36 to 50 years, young 33% and 20% farmers were old. It is quite natural that middle aged farmers are more active, energetic and enthusiastic in livestock rearing.

Regarding educational status of the farmers, the result of the study differs from Hossain *et al.* (2018), where highest number of farmers (63%) had primary education and Hossain *et al.* (2021) also found that most of the farmers belong to primary education (46.70%). It is assumed that due to low level of education it's difficult for them to adopt new technologies in livestock for income generation activities. Education plays an important role to understand and apply modern technologies in livestock production. It is expected that educated people could perform better in livestock production.

This study reported that medium sized family was prominent (48%). The result of this study also similar with Karim *et al.* (2020) who stated that 56.7% of the farmers had medium sized family, 26.7% had small-sized family, and 16.7% had large sized.

Table 10. Challenges of livestock rearing faced by the farmers at Lalmonirhat district.

Sl. No.	Challenges in livestock keeping and raising	Proportion (%)	Ranking
1	Excessive feed price	95	1st
2	Lack of capital	54	2nd
3	Lack of fodder land	43	3rd
4	Lack of training	32	4th
5	Others*	8	5th

**Others= Technician demand higher charge for AI, Higher Price of Medicine, Scarcity of feed in Rainy season, Frequent flood, High price of straw.*

Agriculture (55%) was the main occupation of the farmers along with business (14%), service (4%) and 27% of the total respondent involved with occupation beyond these categories like rickshaw or van puller, cook in the hotel at local market, mechanic, bamboo craftsman, quack, brick mason etc. in the northern part of Bangladesh. Rahim *et al.* (2018) stated that 80% of the respondents were involved in farming, 13% in business and 7% in government job, respectively. Nowadays, agriculture alone cannot provide employment for all of the household labor and households are diversified into non-farm sector. The expansion in the industrial and service sector owing to the structural change is pulling some of this excess labor out of agriculture (Salam and Bauer, 2018).

Regarding monthly income of the farmers, majority (60%) of family income was low i.e. (16-25 thousand taka/month). Moreover, the income of other categories ranged very low (31%) to high (2%). The result is similar with Islam *et al.* (2021) where they found that majority (74.4%) of the respondent belonged to low-income group followed by the medium (16.7%) and high (8.9%) income group.

Hamid *et al.* (2017) reported that cattle, buffalo, goat, sheep, chicken and duck as major components of farm animals in Bangladesh. Huque *et al.* (2011) found that average number of cows per household varied from 1.75 to 2.47. Khondoker *et al.* (2023) stated that 44.54% and 44.45% farmer reared low number (1-3) of cattle and goat respectively, while 52.94% farmer reared higher number (7 or above) of buffalo.

In a study, on crossbred of Pabna and Sirajgonj districts in Bangladesh, Shahjahan *et al.* (2017) observed 43%, 27%, 16% and 14% of Local × Holstein Friesian, Local × Holstein Friesian × Sahiwal, Local × Holstein Friesian × Jersey and Local × Jersey genotypes, respectively that is slightly higher than the present study. Islam *et al.* (2016) reported that only four breeds/types of cattle were found in the villages of Chapai Nawabganj district and most of the households reared Deshi cattle but few of them kept crossbred cattle that are consistent with the present study.

In case of fodder cultivation, Rahman *et al.* (2014) reported that 73.80% farmers in Sylhet, Faridpur, Pirozpur and Kishorgonj region did not cultivate grass and only 1.90% farmers cultivated high yielding grass. According to the livestock need and prevailing environmental condition proper grass cultivation will provide best nutrition for better performance of livestock. In a study, Talukder *et al.* (2017) reported that the cattle feeding system were mostly intensive (77%) followed by semi-extensive (23%) in the surveyed households, beside ad libitum feeding system (7%) HHs for straw and (18%) HHs for green grass restricted or controlled feeding was practiced in straw, green grass and concentrate feeds for 60%, 49% and 98%, respectively.

In case of housing, maximum number of farmers at the northern part of Bangladesh reared their livestock in tin shed house (75%) followed by half building (24%) and straw based shed housing (1%) in the present study. Khan *et al.* (2010) reported that only 10% of the farmers had half building and rest 90% farmers used tin shed and straw shed to house their cattle which coincides with the findings of the present study. The highest number of semi pakka and katcha cattle sheds were at Rajshahi district (21.43% and 40.48%), the highest numbers of full tin cattle sheds were at Banderban district (60%) and the highest numbers of shabby cattle sheds were at Jeshore district (79.25%) (Amin *et al.*, 2020).

Artificial insemination (AI) speeds up genetic progress, reduces the risk of disease transmission and expands the number of animals that can be bred from a superior parent (Yitayih *et al.*, 2017). Majority of farmers practiced AI in case of cattle whereas in goat and in sheep the scenario was just opposite. Sorowar *et al.* (2021) observed that 81% farmers were practicing artificial insemination system to inseminate their cows in Mymensingh districts, which is slightly lower than the present study. On the contrary, Islam *et al.* (2016) observed most of the farmers (73.10%) in Chapai Nawabganj district used village breeding bull to inseminate their cattle and a few of them kept breeding bulls of their own for their cow.

In case of goat, nearly all respondent farmers practiced natural insemination process and in sheep all ewes were naturally inseminated found in the present study. The failure to develop a simple, non-surgical insemination procedure has prevented extensive exploitation of the technology in sheep (Robinson and McEvoy, 1993). Islam *et al.* (2016) and Kumar *et al.* (2018) found that 100% farmers used natural service for their doe that is similar with the present study. Khandoker *et al.* (2011) found that 12% farmers practiced AI services to breed their doe and 74% farmers had to pass a long distance (more than 3.0 km) to breed their does whereas 18% farmers need to pass a medium distance (1.0-3.0 km) and only 8% have to pass a low distance (0.1-0.9 km) in Mymensingh districts. Design and implementation of clear policies for AI, economic incentives to farmers, regular training should be given to animal owners and AI technicians, increasing awareness will help to spread AI (Yitayih *et al*., 2017).

According to Karim *et al.* (2020) there are 70% cross breed and 30% indigenous type present in

Mymensingh district. On the other hand, Quddus *et al.* (2008) reported that 40.3% households kept local cows, 44.3% households kept exotic and 15.4% households kept crossbred cows. Since selection among indigenous breeds is too big and too slows a task to bring about the desired genetic change quickly, crossbreeding has long been practiced to combine the high productivity of European and better adaptability of indigenous breeds in the crossbreds (Negussie *et al*., 1998). Crossbreeding has been proposed as a means to improve production under different environmental conditions and utilizes diverse breed resources and heterosis (Mahbubul *et al*., 2020). In a study at Mymensingh district, Sorowar *et al*. (2021) stated that 56% farmers choose their desired genotype for artificial insemination of cows while 44% farmers depend on inseminator choice which is different than the present study. However, 50% Sahiwal- 50% Local was most popular among the farmers in the present study areas. This agreed with Saadullah (2001) who found Sahiwal and Holstein crossbred cattle are very popular and contribute major portion of milk in a particular way.

According to Barua *et al*. (2006) BRAC sells semen to AI workers at the rate of Tk. 70 for the first service and at Tk. 60 for repeat service. AI workers further sell semen straw at Tk. 100 for the first service and at Tk. 90 for the repeat service to the beneficiaries however, this has increased by many folds with the passage of time which is reflected in present study.

Repeat breeding (RB) means a cow not to conceive after three regular artificial insemination (AI) services by an inseminator or natural services by a breeding bull. The reasons for lower occurrence of repeat breeding at the study area in local cows (11%) can be explained by the respondents that local cows are more tolerant to prevailing environment of Bangladesh than that by crossbred cows (14% for Sahiwal cross and 17.75% for HF cross). Moreover, they performed two times AI in a single heat to improve the conception rate in cows. Asaduzzaman *et al.* (2017) reported that the lowest (9.5%) occurrence of repeat breeding in local cows and the highest (11.7%) occurrence was observed in Friesian cross cows. Higher prevalence of repeat breeding has also been reported in cross breed cows than those of local breed counterpart (Mandefro and Negash, 2014). It is likely that the cows of herds with low BCS suffer more from negative energy balance resulting in inadequate secretion of reproductive hormones causing fertilization failure or early embryonic death followed by repeat breeding (Asaduzzaman *et al.* 2017). The incidence of RB in lactating dairy cows varied among regions, environments, management and breeds (Souza *et al.*, 2016). Still, it is hard to know the cause of RB, but cows submitted to a stressful situation can become RB, because the function of the hypothalamus-pituitary-gonadal axis may be disrupted during stress (Dobson and Smith, 2000). Dystocia was the most significant risk factor directly associated with RB (Lafi *et al*., 1992). Fertilization failure and early embryonic death (Amiridis *et al*., 2009), non-infectious causes like bad management, chromosomal aberrations, hormonal imbalance, anatomical defects of reproductive tract, improper timing of insemination, inadequate estrus detection, improper semen handling, infertile bulls, poor nutrition and heat stress (El-Khadrawy *et al.*, 2011),anovulation and luteal insufficiency with the incidence of delayed ovulation (Kapse *et al*., 2017), endometritis (Gilbert, 2011) may cause repeat breeding. This can be improved by applying proper nutrition, improve the estrus detection and using insemination protocol that can increase the pregnancy rate.

Besides these, regarding disease incidence, FMD, Limpy skin disease, parasitic infestation and nutritional deficiency disorders were found in the study area. Sarker *et al.* (2013) reported FMD 7.02% and Badruzzaman *et al.* (2015) recorded 4.74% which is lower than our study. Lucky *et al.* (2016) recorded that mastitis is the highest among the all metabolic and nutritional diseases. Ullah *et al.* (2015) reported in his study that the prevalence of parasitic diseases was showed 26.79% comparing to all clinical cases among these 10.13% cases of parasitic infections recorded in cows, 5.22% in bulls and 11.43% in calves. They also reported that the metabolic disorder was recorded as diseases occurrence in cows 1.96%, in bulls 1.63% and in calves 0.65 % in their study. Vaccination on time and proper Schedule, as preventive measure and regular deworming to break the parasite cycles.

Maximum number of the respondent farmers used FMD (38.60%) vaccine followed by PPR in the study areas. Sarker *et al.* (2011) reported that the livestock vaccination campaign against anthrax was only 44% coverage of the total cattle population.

Regarding performance, highest milk yield was found in Holstein Friesian cross 3.35±0.40 liters and lowest milk yield was recorded 1.82±0.14 liters in Local cows in present study. Rahman *et al.* (2016) reported that daily milk yield mean 14.38±0.2 for Local, 17.63±0.2 for Local×Friesian and 19.5±0.3 for Local×Friesian×Friesian that indicated far difference from the present study that might be due to genetic potentiality, environment/regional difference, feeding and management. Lactation length was highest for Holstein Friesian cross (190.77±6.49 days) and lowest for Local (173.2±6.60 days). The result of the study is almost similar with Rahman *et al.* (2016) who reported that 197.5±5.3, 232.1±2.4, 266.7±2.7 day Lactation length for Local, Local×Friesian and

Local×Friesian×Friesian. Hossen *et al.* (2012) have stated that season of calving had a significant effect and sire, parity and year of calving had a non-significant effect on lactation length. Miazi *et al.* (2007) reported that the average lactation length of Holstein-Friesian x Sahiwal and Holstein- Friesian x Local were 270±15 and 234.0±24.0 days, respectively and these results have difference with the present study. The difference of the present result from the authors reported elsewhere could be associated with animal management system followed by farms such as quality and quantity of feed ingredients provided, disease manifestation on each location, its control and prevention, type of breeds involved for crossbreeding and difference in level of exotic gene inheritance being studied in each location. Climate factors in which animals were managed might be also other source of variation among these studies (Getahun *et al*., 2020).

The estimates obtained from the study is almost similar with Rahman *et al.* (2016) who reported that 286.2±1.5, 279.0.6±0.6, 277.8±0.4 days of gestation length for Local, Local×Friesian and Local×Friesian×Friesian respectively. Rahman *et al.* (2014) demonstrated the gestation length for Sahiwal x indigenous and Friesian x indigenous was 281.1 and 282.7 days, respectively. With the exception of breed group and parity (age), year of calving, season of calving and sex of the calf carried had a significant effect on the length of the gestation period (Negussie *et al*.,1998).

The number of services per pregnancy of the study is also similar with Rahman *et al.* (2016) reported 3.02±0.2, 1.4±0.2, 1.2±0.1 for Local×Friesian and Local×Friesian×Friesian respectively. Rahman *et al.* (2016) who found that the number of services per pregnancy of Desi cows was 1.5.

The present findings showed that local cows are more or less similar to their contemporary crosses in this trait. The result of the study is also similar with Rahman *et al.* (2016) who reported 481.3±0.8, 462.1±2.6, 435.6±2.4 calving interval for Local×Friesian and Local×Friesian×Friesian respectively. Hossen *et al.* (2012) found the shortest calving interval (414.90 days) in Pabna milking cows. This indicates that under optimal feeding and management conditions local cows could be as fertile as their crosses with the improved breeds.

On the other hand, crossbred cows show superiority over local cows in days open. Famous *et al.* (2021) stated the average days open of L×F, L×SL and L×S crossbred cattle were 135, 146 and 145 days, respectively. Longer days open of indigenous cows is also in line with literature reports supporting the view that a prolonged postpartum anestrus interval is a characteristic of Zebu cattle, and is one of the major causes of prolonged periods of days open (Negussie *et al*.,1998).

A host of interrelated factors such as technical, institutional, and social, are constraining development of the livestock sector in Bangladesh (Rahman *et al.*, 2014). Islam *et al.* (2016) reported that many of the householders (22.40%) observed that main constraints of cattle rearing at homestead were lack of grass land, high feed cost, vaccination worker not available and lack of reasonable price of raw milk that is almost similar to this study. Previous research studies (Ahmed, 1985; Islam and Shahidullah, 1989; Rahman *et al.*, 1999; Rahman *et al.*, 2000; Begum, 2008) also have pointed out and recognized many areas of concern that constrain realization of the full potential of the livestock sector, such as lack of capital, outbreak of diseases, inadequate availability of inputs, inadequate institutional credit, guaranteed and profitable markets for output etc.

It is suggested that government and private sectors should work hand in hand to improve the scenario of livestock breeding and management practices in the northern part of Bangladesh. One of the great challenges to improve breeding practices is precisely to improve good management practices. Academia and universities must have a little more influence on this type of activities, to guide young people (because it is precisely this age, the most suitable) to improve management techniques, and adoption of new technologies. The use of protocols prior to fixed-time insemination is one of the options to increase pregnancy percentages in wombs, and obviously there is an impact on training for the management of offspring, from diets with local resources, and phytosanitary management.

CONCLUSIONS

This study revealed that the farmers in the northern part of Bangladesh reared livestock as a source of income who mostly practiced AI in cattle but natural insemination in sheep and goat. A large number of farmers choose 50% Sahiwal-50% local type of semen for AI and they mostly choose private company semen (BRAC) instead of govt. produced semen. A large number of problems hinder the livestock rearing in the northern part of Bangladesh of which excessive feed price was more common.

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Compliance with ethical standard: This study was conducted according to the institutional guidelines of the Animal Welfare and Experimentation Ethics Committee (AWEEC) and obtained the ethical approval No. (AWEEC/BAU/2024 (21)).

Data availability: Data are available with Md. Ahsan Habib (Email: ahsanripon15@gmail.com) upon request.

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