Study on Effect of Seasons on the Milk Production of Different Holstein-Friesian Crossbred Cows

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List of Abbreviations

Abbreviation	Elaboration
%	Percentage
Avg.	Average
e.g.	Example
et. al	And his associate
HF	Holstein Friesian
L	Local
HSC	Higher secondary school certificate
SSC	Secondary school certificate
CVASU	Chattogram Veterinary and Animal Sciences University

ABSTRACT

Background: In Chattogram, Bangladesh, farmers are dissatisfied with the performance of several crossbred Holstein-Friesian (HF) cows in terms of yield. Therefore, a study was conducted in Chattogram, Bangladesh, to find out the impact of the seasons on various Holstein-Friesian (HF) crossbreds.

Methods: From April 2023 to June 2023, this study was carried out in Patiya Chattogram, Bangladesh. A total of 407 dairy cattle of 85% HF15% L, 75% HF 25% L, and 70% HF 30% L crossbred were recruited for this study from fourteen (14) commercial dairy farms divided into three separate groups as A (>31 milking cows), B (21 to 31 milking cows), and C (11 to 20 milking cows). Based on similarities in feeding and other management practices, farms in the same group were chosen.

Result: The same and distinct HF crossbreds were found to have significantly varying milk yields ($P<0.05$) during various seasons. In various crossings of farms, the highest daily average milk yield was noted during the monsoon season, but their performances gradually declined over the summer. The results of this study will assist commercial dairy farmers in understanding how the seasons affect distinct Holstein-Friesian (HF) cow hybrids.

Keywords: Category A (> 31 milking cows), Category B (21-31 milking cows), Category C(11>20 milking cows), Holstein crosses, Milk yield.

CHAPTER 1: INTRODUCTION

Many people living in Bangladesh depend on the agricultural sector for their livelihood, well-being, and improved nutrition. In livestock, especially in the development of the economy, the role of dairy is vital (Chanda et al., 2021). The total livestock population of Bangladesh is 4428.47 lakh in number of which 248.56 lakh are cattle (DLS, 2022-2023). The contribution of Livestock to Gross Domestic Product (GDP) is 1.85% (DLS, 2022–2023). The demand and production of milk for our country are 158.50 Lakh Metric tons and 140.68 Lakh Metric tons respectively (DLS, 2022–2023). The majority of farmers in Bangladesh raise indigenous cattle breeds including Munshiganj, Pabna, RCC, and North Bengal grey. At this time, crossbreeding improvement is taking place and helping to improve productive traits (Hossain et al., 2021). Usually, crossbred cows produce 600 to 800 liters during each lactation, which lasts between 210 and 240 days (Islam et al., 2017). Exotic breeds are used to produce more milk in commercial herds where intensive techniques were used due to the low milk production of local breeds (Famous et al., 2021). The various seasons of the year are frequently associated with distinct dietary patterns for cows, influencing their feed consumption and the type of fodder they receive. These feeding differences also impact the cows' milk production (Zaman et al., 2021). While dairy in Bangladesh remains considered a major source of income, it is shifting from livelihood-oriented dairy toward enterprise-driven dairy, offering a living for millions of people (Uddin et al., 2020). Dhaka is the first-largest city in Bangladesh. The second-largest city in Bangladesh is Chattogram, which is also a dairy-heavy region (Chanda et al., 2021). In addition, Chittagong is one of Bangladesh's major dairy-producing regions, where milk production has historically played a significant role. As a result, over the past few years, there have been more private dairy farms in this region with crossbred cows (Choudhury et al., 2017). The two major crossbred cattle used in commercial dairying in Bangladesh are Holstein crossbred (Holstein × local zebu) and Sahiwal crossbred (Sahiwal × local zebu), however, the Holstein crosses prevail (Chanda et al., 2022). Over time, (Holstein × local zebu) crossbred cows' milk production efficiency under Bangladesh's conditions greatly increased (Chanda et al., 2022). According to (Chanda et al., 2022), Bangladeshi farmers will benefit from having a suitable blood percentage of the exotic if they want to produce more milk in peri-urban areas.

Selecting an appropriate cross of HF crosses for increased milk production is a difficult task for the rural people of Chattogram, Bangladesh. And it is necessary to study how weather and farm management practices affect the performance of milk production in dairy crossbred (Holstein × local zebu) cattle reared by Bangladeshi commercial dairy farmers. In order to increase farm profit, a study was conducted with the objectives of

(i) to know the dynamics of Holstein crossbreds under different farm categories;

(ii) to know the seasonal effect on the milk production of different Holstein-Friesian crossbred cows

CHAPTER 2: MATERIALS AND METHODS

To better understand the commercial dairying situation, this study was carried out in Chittagong, Bangladesh, for a three-month period between April 2023 to instead of and June 2023. Based on the availability of target crossbreds, the same feeding, housing, method of milking, disease prevention measures, and other management practices, a total of 15 farms were randomly chosen, with 5 belonging to category A (>31 milking cows), 4 belonging to category B (21-31 milking cows), and 6 belonging to category C (11- 20 milking cows) according to the Department of Livestock Service (DLS, 2014) Bangladesh the group of farms was chosen and 407 dairy milking cows of various parities selected at random.

2.1 Data Collection : For the study, two types of data were taken into consideration: (i) primary data and (ii) data obtained from evaluating the amounts of milk produced by various genotypes over the course of this period. Primary data was collected by a survey. The farms were divided into good, moderate, and poor categories based on the overall management activities (floor management, drainage system, and condition of the floor, ventilation system, vaccination, de-worming, rearing system of animal, feeding system, farm cleaning, ownership of fodder land, feed supply to animals, animal grazing, biosecurity of the farm, and other management system of farms).

Good: Farms that maintain more than 80% of routine activities

Moderate: farms that maintain more than 50% of routine activities.

Poor: farms that maintain less than 50% of routine activities

The artificial insemination (AI) card provided by DLS and kept up by the farmers served as a means of identifying the genotypic traits of crossbred animals. From the written records of each farm, the average amount of milk produced by the herd and the names of the crossbreds were extracted.

2.2 Statistical Analysis : Excel table sheets were used to tabulate all of the data that was gathered. In order to find any unexpected or excessive values reported and summarized in the sheet, tabulated data were thoroughly examined and evaluated before to analysis. The Statistical Analysis System (SAS, version 9.1) was used to analyze the data and determine descriptive statistics including mean, standard error, standard deviation, and percentage.

CHAPTER 3: RESULT AND DISCUSSION

Irrespective of category within Chattogram's commercial dairying, it were found that the floor and ventilation quality was good in (21.43, N=3) % of farms, medium in(35.71, N=5) %, and poor in (42.86, N=6) % of farms. The amount of milk produced can be increased by properly cleaning the area around the cows and the housing for the livestock.

Table 1: Different management condition of the farms

Floor and ventilation management	level	Percentage (%)
	Good	21.43 (3)
	moderate	35.71 (5)
	poor	42.86 (6)
Ownership of sufficient fodder land	yes	35.71%
	no	64.29%
Feeding	According to farmer choice	71.42%(10)
	According to animal requirement	28.58(4)
Type of grazing	zero	100%(14)
	other	00%
Routine and management activities	Good	28.57%(4)
	Moderate	57.14%(8)
	Poor	14.29%(2)

Only (35.71% ,n = 5) of dairy farms had enough land to grow their own fodder, while the majority of farmers (64.29%, n = 9) relied on green forage acquired from other sources. Regularity of feeding was taken into consideration for routine management, along with other daily tasks like regularity in cleaning the barn and the cows at least twice a day. For these activities, the majority of farms, irrespective of category, were in intermediate condition (57.14%, N = 8), followed by good (28.57%, N = 4), and poor (14.29%, N = 2). That may be connected to the size of the farm, the management's application of technology, and the socioeconomic status of the farmers. It was observed that farms with large herd sizes strictly adhered to management and routine tasks. Mariammal et al.'s (2018) research backs up these findings.

3.1 Farm classification according to the overall management

Table 2 displays a classification of farms according to management approach. It was shown that category A farms had the highest percentage (60.00 %) of good management practices, while category C farms had the lowest percentage, and vice versa. These findings revealed that more experienced farmers likely understood and knew how to manage their dairy herds under challenging climatic and economic conditions than less experienced farmers. These traits may be the reason why Chittagong's farms have different management conditions. Yeamkong et al. (2010) confirm our findings.

Table 2: Farm classification according to the overall management

Management type	**Farm category**		
	A (N= 5)	B (N=4)	C (N= 6)
Good (%)	60.00	50.00	16.66
Moderate (%)	40.00	50.00	16.66
Poor (%)	0.0	0.0	66.67

3.2 Average herd size and herd composition under different category of farms

Table 3 displays the average herd size and composition for various types of farms. The average herd size for farms in categories A, B, and C was 45.00, 30.00, and 17.83 animals, respectively. These numbers differed considerably ($P<0.05$) from one another.

Table 3: Average herd size and herd composition under different categories of farm

Farm category	**Milking cow %**	**Dry and pregnant %**	**Heifer calf % up to 6 months**	**Heifer %**	**Bull %**	**Herd average**
A	46.11	46.67	8.33	19.44	1.66	45
B	50.00	22.50	9.17	19.17	1.67	30
C	50.46	26.17	12.15	19.63	1.87	17.83
Avg.	48.86	31.78	9.88	19.41	1.73	30.94

3.3 Average percentage of identified crossbred milking cows under different categories of farms

Table 4 shows a summary of the average percentage of milking cows across various crossbreeds among farm categories.

Table 4: Distribution of the average number of milking cows of different crossbreeds among different categories of farms

Farm category	**70 % HF × 30 % L**	**75 % HF × 25 % L**	**85 % HF × 15 % L**
A	0 %	48.91%	35.67%
B	0 %	31.52%	34.83%
C	100%	19.56%	29.50%

More experienced farmers can handle and care for cows with better nutrition; this may be the reason larger-scale farms raise the highest proportion of 75% HF× 25% L crosses (Yeamkong et al., 2010).

3.4 Milk yield of different crosses on the basis of climate conditions and farm categories

The quantity of milk produced by various types of farms is shown in Table 5. The findings revealed that the average milk production varied significantly ($p<0.05$) depending on the crossbreed genotype (Table 5).

Table 5: Milk yield of different crosses on the basis of climate condition and farm category

Breed composit-ion	**season**							
	summer				**monsoon**			
	A	**B**	**C**	**Avg.**	**A**	**B**	**C**	**Avg.**
85%×15%	15.00^{c} ± 0.707	14.50^{c}± 0.707	13.50^{c} ±0.707	14.33± 0.707	18.00^{c} ±1.414	17.25^{c} ±1.061	16.25^{c} ±0.354	17.17± 0.943
75%×25%	13.50^{b} ± 2.121	13.00^{b} ±1 .414	12.00^{b} ±1.414	12.83± 0.983	15.50^{b} ±2.121	15.00^{b} ±1.414	13.75^{b} ±1.061	14.75± 1.532
70%×30%	0.0 ^{a}± 0.00	0.0^{a} ± 0.00	10.50^{a} ±0.707	10.50± 0.707	0.0^{a} ± 0.00	0.0^{a} ± 0.00	12.00^{a} ±0.707	12.00± 0.707
Average	14.25± 1.414	13.75± 1.061	12.00± 0.942		16.75± 1.768	16.13± 1.238	14.00± 0.707	

The highest milk production was recorded for 85% HF × 15% L (17.17±0.943) and (14.33±0.707) in the monsoon and summer seasons, respectively. The lowest for 70%HF × 30% L crosses (12.00±0.707) and (10.50±0.707) in monsoon and summer seasons, respectively (Table 5). Khair et al. (2007) agreed with our findings.

Table 5 also provides information on the seasonal variation in milk production. Milk yield showed significant ($p<0.05$) seasonal fluctuation. In monsoon season, the daily average milk production for 85%HF×15%L is 17.17±0.943, and in summer, it is 14.33±0.707, which is lower than monsoon season for category A (table 5). Again In monsoon season, the daily average milk production for 75%HF×20%L is 14.75±1.532, and in summer, it is 12.83±0.983, which is lower than monsoon season for category B (table 5). Category C showed the same result. This can occur as a result of the monsoon season having more green grasses available than other times of the year. The findings were in line with those of Chanda et al., 2021) and (Harisha et al., 2015).

CHAPTER 4: CONCLUSION

This study has shown that farmers use a variety of Holstein crosses and are motivated to raise a greater percentage of Holstein crosses for farm profitability. Additionally, it was shown that farms under A had better overall management practices and higher milk production than other farms. However, selecting the right genotypes and feeding the cattle a balanced diet throughout the year faced significant challenges for all farms in various categories. The quantity of milk produced by the same crosses under the various climatic conditions likewise showed a considerable difference. Farms with greater genotype percentages than other farms produced more milk overall, and when compared to other crossings, the 85%H×15%L crossbred had the best daily average milk output per cow. However, farm categories had less influence on milk production within the same genotype. The majority of Bangladesh's industrial dairy farms are in category C. As a result, it can be concluded that beginning a commercial dairy farm with the crossbreed 70%HF×30%L would be suitable for their profitability as the higher genotype did not require better management. A higher percentage of 85%H×15%L crossbreds were found in A-category farms. This study found that raising 70%HF×30%L crossbred animals can be advantageous for small farms because it requires less careful management than 85%×15% crossings. This study discovered that higher genotypes produce a higher amount of milk production and also revealed the seasonal effect on different genotypes, which showed more milk production in the monsoon season than in the summer. The findings of the study will aid researchers in identifying a vital aspect of dairying.

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BIOGRAPHY

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