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A Study on Farming Conditions and Production Performance of Available Genotypes under Commercial Dairying of Chittagong Bangladesh

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ABSTRACT

Background: There are no in-depth research on commercial dairying management and performance of dairy cows under commercial dairying in Chittagong, Bangladesh. The good farming practice and cow's productivity leads the farm profitability. This study may assist to overcome the problems related to the profitability of dairy farms.

Methods: The study was conducted in 28 commercial dairy farms based on two types of data. Primary data: generated from stock inventory and farm management information using a pretested survey questionnaire and analyzed data of average production performance and quality of milk traits indifferent crosses collected directly four times season wise (summer, monsoon and winter) from each selected farms of Chittagong, Bangladesh from 2014 to 2015.

Result: Overall management system of irrespective categories of farms was in moderate condition with some exception. Highest number of milking animal was 50% HF × 50% L cross under all farm categories. Crosses of 75% HF × 25% L were highest in number under farm category A and lowest C. In terms of milk quality and quantity, farms with higher number of animals were in better condition. Daily average milk yield was significantly higher in monsoon followed by summer and winter. Therefore, this current study would be helpful for the dairy farmers to find out an expected solution to overcome the problems in this sector.

Key words: Farm category, Genotype, Lactating cow, Performance, Season.

INTRODUCTION

Agricultural sector is an important industry that ensures the livelihood, wellbeing and improved food security of many people living in Bangladesh in which livestock, particularly dairy plays an important role in the economic development Sikder *et al.* (2009). Private entrepreneurs and some Non-Government Organizations (NGOs) mainly operate the diary sector in Bangladesh. Chittagong is the second largest city of Bangladesh and a dense of dairy zone (Nath *et al.,* 2014). Not only that, Chittagong is one of the dairy producing emerged areas of Bangladesh, where dairy farming has been traditionally an important and major component. Therefore, the number of private dairy farms with crossbred cows has increased in this area over the last few years (Choudhury *et al.,* 2017). They also stated that development of this sub-sector may be considered as an important strategy for poverty alleviation in this area, which is also an objective of the government of Bangladesh, however more studies are required for identifying the factors influencing the profitability of dairy farms in Chittagong (Choudhury *et al*., 2017). Hossain and Dev, (2013) reported that awareness of demand for safe milk is a vital factor for food safety, increasing day by day in Bangladesh among consumer. Along with this, the demand has increased for nutritionally enriched milk, such as containing appropriate amounts of solids-not-fat, total solids, protein, lactose and fat by the consumer (Hoque *et al.,* 2018). These milk products are manufacturing by a number of NGOs. Nowadays both quality and quantity are the important concern for commercial dairying in Bangladesh.

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Annually about 18 million liter liquid milk is produced by the country of which only 7 percent is sold to milk processors and the rest amount is sold at the local market. Though commercial dairy farming is an emerging industry in Chittagong, but current milk production is inadequate to meet the demand. There are 400 farms operating in Chittagong area and produces approximately 60,000 liters of milk per day (Barua *et al*., 2018). Relationship between quality and quantity of milk with farming system is seriously neglected in this area (Choudhury *et al*., 2017). The dairy sector of Chittagong is facing a lot of problems in different

issues, including milk quality and quantity, as there are no data on relationship of farming management with milk quality and quantity of commercial dairying in Chittagong Therefore, the study was conducted with the objective to (i) increase the profitability of dairy farming by focusing on their problems under existing farm management system and (ii) identify the correlated problems with quality and quantity of milk produced by different crosses of Holstein under commercial dairying in Chittagong.

MATERIALS AND METHODS

This study was conducted for a period of a year from 2014 to 2015 at Chittagong, Bangladesh to know a scenario of commercial dairying. For this study a total of 28 commercial dairy farms in three categories A (dairy farm with <50 lactating cow), B (dairy farm with 31>50 lactating cow) and C (dairy farm with 11 >31 lactating cow) according to Directorate of Livestock Services (DLS), Bangladesh with a number of 1328 dairy milking cows of different parity were chosen randomly. The farms were selected based on availability of farms category and the Holstein genotypes those are located in the Chittagong Metropolitan area, Potiya, Mirsharai and Fatikchari upazilla (sub district) of Chittagong district. The specific number of farms was 7, 8 and 13 under each category. The year was divided into three seasons; summer (March to June); Monsoon (July to October) and winter (November to February). Two types of data: (i) primary data and (ii) data obtained from analyzing the quality and quantity of milk of different genotype for three seasons was considered for the study. Primary data was based on stock inventory and overall management of the farms generated using survey. On the basis of overall management activities (floor management, drainage system and condition of the floor; calf rearing practices; ownership of fodder land; feed supply to animal; grazing of animal and other management system of farms) of farms under different categories were classified into good, moderate and poor category. The genotypic characteristics of crossbreds were identified by the artificial insemination (AI) card supplied by DLS and maintained by the farmers. The average quantity of milk produced by the herd and identified crossbreds were taken from the written records of individual farm. Quality of raw milk were obtained by analyzing the milk samples from bulk source of individual farm monthly for fat, protein, lactose, minerals and SNF using milk scanner (Lactostar, Model no. 3510, Funke Gerber, Germany) in the Laboratory of Dairy Science of CVASU. A total of twelve milk samples in a year and at least four for each season were collected from each farm.

The primary data of farming condition were analyzed by Microsoft Excel and milk yield and composition were analyzed by the PROC GLM of SAS (SAS, 2009), following the model as:

$$Y_{ijkl} = \mu + F_i + G_J + S_K + e_{ijkl}$$

Here, μ = Overall mean.
F_i = i^{th} Farm effect [i- 1 to 3, (A, B and C type farm)].
G_j= j^{th} Genotype effect (j = 1 to 5 Holstein grade).
S_k= k^{th} Season effect [k = 1 to 3 (summer, monsoon and winter)].
e_{ijk}= Random error, which is distributed normally as N (0, σ2).

The studied parameter mean differences were compared using the least significant different (LSD) test at 5% level of significance (P<0.05).

RESULTS AND DISCUSSION

Management conditions of the farms

Different management conditions of the farm are presented in Table 1. It was observed, that the floor condition was good in 32.08%, medium in 25.63% and poor in 42.29% farms irrespective of category under commercial dairying of Chittagong. Appropriate cleaning of cattle housing and

Table 1: Different management condition of the farms.

Variable	Level/Criterion	Percentage (%)
Floor management (drainage system and condition of floor)	Good	32.08
	Medium	25.63
	Poor	42.29
Calf rearing practices (Calf feeding including colostrums, calf housing)	Very Good	10.71
	Good	39.29
	Fair	46.43
	Poor	03.57
Ownership of sufficient fodder land		
Yes	6	21
No	22	79
Feeding (Amount of feed supply)	According to animals requirement	25.00
	According to farmer choice	75.00
Types of grazing	Zero	100
	Other	00
Routine and management activities (On the basis of feeding and cleaning of barn and cows)	Good	21.43
	Moderate	67.86
	Poor	10.71

environment around the cows can increase both quantity and quality of milk produced.

Feeding and housing practices in the case of calf rearing have a significant effect on health status and production performance of a farm. Study showed that most of the farm belongs to fair (46.43), followed by good (39.29%), very good (10.71%) and poor (3.57%) condition for this characteristics. Matondi *et al.* (2014) stated that effect of improper housing and feeding of calf affects their productive life and total farm production. A very limited number, 21% (n=6) dairy farms had sufficient own fodder land for cultivation and most of the farmers (79%, n=22) were dependent on purchased green forage. Many researches work (for example, Basset *et al*., 2010; Faruk *et al*., 2015) have shown relation to the ownership of fodder land of dairy farmers. For routine management, regularity of feeding with other routine activities such as regularity in cleaning of barn and cows at least twice a day was considered for the farm. Most of the farms irrespective of categories were under moderate condition (67.86%) followed by good (21.43%) and poor (10.71%) for this activities. That might be related to hard size, adaptation of technologies in management and socioeconomic condition of the farmers. It was seen that farms with large herd size were strictly maintained the routine and management activities. These findings were supported by Mariammal *et al*. (2018).

Farm classification according to the overall management

Classification of farms based on management type is shown in Table 2. It was observed that the highest percentage (42.86%) of farms under category A were following good management practices whereas the lowest were under category C and vice versa.

Table 2: Farm classification according to the overall management.

Management type	Farm category		
	A (N=7)	B (N=8)	C (N=13)
Good (%)	42.86	0	7.69
Moderate (%)	28.57	25	0
Poor (%)	28.57	75	92.31

These results suggested that farmers with long time experience likely had a better understanding and know how to appropriately manage their dairy herds under harsh climatic and economic conditions than less experienced farmers. These characteristics might be the cause of being difference in the management condition of the farms in Chittagong. Our finding is supported by Yeamkong *et al*. (2010).

Average herd size and herd composition under different category of farms

Average herd size and composition under different categories of farms are presented in Table 3.The average herd size of category A, B and C farms was 217.14, 52.88 and 28.38 number of animals, respectively, which was differed significantly ($P<0.05$).

In the present study the herd composition was found as, milking cows were 48%, dry cows with pregnant 14%, heifer 10%, yearling bull 11%, breeding bull 3% . These findings are supported by the report Heifer International. (2013).

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

The distribution of average percentage of milking cows in different crossbreds among farm category of farms is depleted in Table 4.

Among the five types of crosses, 50% HF × 50% L crossbred was found to be higher irrespective of farm category. The highest percentage of 75% HF × 25% L cross was found in category A and lowest in category C farms. The cross of 75 percentage Holstein performed significantly lower than the 50 percentage crosses in tropical wet and dry climatic zone (Gaulkande *et al.,* 2013). This may be cause for higher number of 50% HF × 50% L crossbred present irrespective of farm category. According to Yeamkong *et al*. (2010) more experienced farmers are able to provide cows with better management and better nutrition; this may be cause of rearing highest percentage of 75% HF × 25% L crosses in larger size farm.

Milk quality and quantity in different category of farms

Quantity and quality of milk production in different category of farms are presented in Table 5. Results showed, that there

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

Farm category	Milking cow (%)	Dry and pregnant cow (%)	Bull calf (%) (under 2 years)	Heifer calf % (up to 6 months)	Heifer (%)	Bull (%)	Herd average
A	41.28	15.74	9.54	15.79	11.80	5.85	217.14
B	55.31	14.18	11.58	9.46	8.51	0.96	52.88
C	47.70	11.92	11.92	15.99	10.30	2.17	28.38
Avg.	48.09	13.94	11,01	13.75	10.20	2.99	99.47

Table 4: Distribution of average number of milking cows of different crossbreds among different category of farms.

Farm category	50% HF×50% L	75% HF×25% L	50% HF×50% S	50% HF×25% L×25% S	50% S×50% L
A	43.71%	23.40%	23.79%	7.93%	1.17%
B	64.96%	22.65%	11.54%	0.85%	0
C	69.27%	11.98%	9.38%	9.37%	0

Table 5: Quantity and quality of milk production in different category of farms.

Farm category	Milk yield (Lit/day/cow)	Milk fat (%)	Milk protein (%)	Lactose (%)	Ash (%)	SNF (%)
A	14.03±3.600	3.90±0.263	3.43±0.094	4.52±0.209	0.77±0.322	8.62±0.148
B	13.71±2.699	3.89±0.331	3.39±0.100	4.52±0.134	0.73±0.066	8.60±0.163
C	12.87±3.105	3.78±0.298	3.33±0.112	4.54±0.320	0.76±0.488	8.58±0.211
Level of significance	**	**	**	NS	NS	NS

(**=significant at P<0.05).

Table 6: Average quantity and quality of milk production of different genotypes.

Genotypes	Milk yield	Milk fat %	Milk protein %	Lactose %	Ash %	SNF
50% HF × 50% L	11.92±2.588	3.87±0.279	3.40±0.114	4.51±0.220	0.77±0.348	8.70±0.157
75% HF × 25% L	16.60±2.613	3.74±0.266	3.40±0.106	4.52±0.758	0.75±0.067	8.68±0.760
50% HF × 50% SH	13.54±2.199	3.84±0.283	3.39±0.103	4.56±0.578	0.75±0.064	8.70±0.579
50% HF × 25% SH × 25% L	11.61±4.403	3.94±0.310	3.36±0.101	4.52±0.121	0.74±0.470	8.62±0.172
50% S × 50% L	10.75±5.232	3.67±0.096	3.45±0.716	4.48±0.152	0.81±0.050	8.72±0.120
Level of Significance	**	**	NS	NS	NS	NS

(**= significant at P<0.05).

Table 7: Average milk quality and quantity in different seasons.

Season	Milk yieldLit./ cow/day	Fat (%)	Protein (%)	Lactose (%)	Ash (%)	SNF (%)
Summer	13.66±3.372	3.94±0.314	3.36±0.887	4.68±0.864	0.80±0.234	8.89±0.285
Monsoon	13.96±3.403	3.64±0.133	3.37±0.112	4.46±0.154	0.74±0.216	8.57±0.128
Winter	13.37±2.978	4.01±0.304	3.45±0.096	4.46±0.129	0.73±0.498	8.64±0.190
	**	**	**	**	**	NS

(**= significant at P<0.05).

were significant differences (p<0.05) in average milk yield, fat and protein content among different category of farms but no differences were found for other components of milk (Table 5). Daily average milk yield(cow/liter), fat and protein and SNF% were the highest for category A farm followed by B and C. Overall performance ware better in farms under category A followed by B and C. This might be due to different level of knowledge of dairy farmers in different farm category.

The farmers under category A had a better knowledge on overall management of dairy farming in terms of quality and quantity of milk production. This finding was concords with Yeamkong *et al.* (2010) who stated that different levels of knowledge, learning ability, adaptation of technological advices and accurate decission are important factors for of improving milk production quality and quantity.

Average milk quality and quantity of different crossbreds

The average milk production/cow/day of different crossbreds was differed significantly (p<0.05) (Table 6). The highest milk production was recorded for 75% HF × 25% L (16.60±2.613) and the lowest for 50%S × 50% L (10.75±5.232) crosses (Table 6). Our findings were supported by Khair *et al*. (2007). The milk fat% was differed significantly (p<0.05) among different crossbreds of cattle. Cow milk fat is influenced by numerous factors such as genetics of the cows, nutrition, milking time and interval. Similar finding was reported by Simoes *et al*. (2014) and Lee *et al*. (2014). The average milk protein, ash and lactose percentage didn't differ significantly among crossbreds. This finding was agreed with the findings of Shibru *et al*. (2019), Wangdi *et al*. (2016) and Adesina (2012).

Average milk quality and quantity in different seasons

The seasonal difference of milk quality and quantity are given in the Table 7. Significant (p<0.05) seasonal variation was found in milk yield, fat, protein, lactose and ash % among different seasons, but no difference was observed for SNF%.

The daily average milk yield was significantly higher (p<0.05) in monsoon (13.96±3.403) followed by summer and winter. This might be due to availability of green grasses during monsoon compared to other seasons. The findings were similar to the findings of Harisha *et al*. (2015). Average fat and protein content was higher in winter but lactose, ash and SNF were higher during summer that might be due to seasonal effect that was similar with the findings of Diego and Hélio (2011).

This study also indicated that most of the dairy farmers with some exception, often supply excess amount of concentrate instead of green specially in the season when roughage is low, to obtain maximum amount of milk, this might be the major cause of affecting quality and quantity of milk in different season.

CONCLUSION

From this study it reveals, that the overall management condition is not good enough to ensure the quality and quantity of milk production for commercial dairying of Chittagong. The farmers are using a variety of Holstein crosses and they are interested in rearing higher percentage of Holstein crosses for the profitability of farms; but most of the cases, their management condition is not supportive to rearing higher blood percentage Holstein. It was also seen that the overall management activities and milk quality with quantity was best in farms under A than others. However, all farms under different category were facing a lot of problems related to choosing correct genotypes, supplying balanced feed to the cattle in different seasons of a year. It was also seen that that feeding problem, especially high nutritional quality roughage supply is the major problem for commercial dairying. Therefore, awareness of dairy farmers should be developed about the selection of Holstein cross, supply of feed as per the animal's requirement, with proper roughage concentrate ratio, improvement of calf rearing system and farm management could solve the problems exist in the commercial dairy farms of Chittagong, Bangladesh and that might lead to the operate a profitable dairying. On the other hand, the quality and quantity of milk in different seasons are correlated with feed supply of the farm. Routinely training on dairy cattle nutrition and management to the dairy farmers by government and NGOs, would assist them to manage the farm as profitable.

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