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Factors affecting the cost of production of milk and milk products of crossbred cows

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ABSTRACT

The experiment was carried out with10 Jersey crossbred and 10 Holstein-Friesian crossbred cows during each of the four seasons viz. Pre-monsoon, Monsoon, Post-monsoon and Winter during the year 2016-17 to study the effect of feeding practice, genetic group and season on the cost of production of milk and milk products such as paneer and curd (*dahi*) of crossbred lactating cows reared under organized farm condition. The overall mean cost of production of milk, paneer and and curd (*dahi*) was ₹ 31.73±0.55, 266.47±2.89 and 84.17±0.75 per kg, respectively. There was highly significant difference ($p<0.01$) of all the factors on the cost of per kg milk and its products, except the cost of per kg paneer which did not differ significantly between the two genetic groups. The cost of per kg milk production (₹ 30.46±0.55) and curd (*dahi*) preparation (₹ 82.91±0.65) was significantly lower on TMR than conventional feeding practice. The Holstein-Friesian crossbred had significantly lower cost of per kg milk production (₹ 29.98±0.64) and curd (*dahi*) preparation (₹ 82.43±0.62) than the Jersey crossbred cows. Of all the four seasons, lowest cost was found during winter in respect of all the parameters. The cost of per kg paneer preparation was significantly lower on TMR feeding (₹ 249.48±2.80) and higher in Holstein-Friesian crossbred cows.

Key words: Cost, Crossbred, *Dahi*, Milk production, Paneer, Season, TMR feeding.

Cost of milk production includes all the expenses (fixed and variable cost) incurred in rearing of milch cow. The feed cost accounts for about 64.43 percent of the total maintenance cost of crossbred milch cow[19]. The important factors influencing cost of milk production are FCR, feeding practice, season and genotype of the milch cow. In spite of remarkable increase in milk production, the milk and milk products are out of reach of the vulnerable groups of weaker section of society due to its higher cost[13]. On the basis of information of the factors responsible for increased cost of production, suitable feeding and management practices may be adopted to minimize the production cost. It also helps in fixing the optimum price of the milk and milk products. Therefore, present investigation was carried out to study the effect of feeding practice, genetic group and season on the cost of production of milk and milk products.

MATERIALS AND METHODS

Ten Jersey crossbred (G1) and 10 Holstein-Friesian crossbred (G2) having similar lactation order and stage were divided randomly into four groups in each season of the year 2016-17 comprising of 5 animals in each group. The whole year was divided into four seasons such as Pre-monsoon (S1): March to May, Summer-monsoon (S2): June to September, Post-monsoon (S3): October to November and Winter (S4): December

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to February[1] There were 10 cows (5 G1 and 5 G2) on TMR (F1) and another 10 cows (5 G1 and 5 G2 on conventional feeding practice (F2). The animals were fed as per the requirement of NRC[1] with concentrate ration consisting of crushed maize 25 parts, wheat bran-20 parts, ground nut cake-20 parts, mustard oil cake-7 parts, rice polish-15 parts, rice bran-10 parts, mineral mixture (Agrimin forte)-2 parts and common salt-1 parts. The green fodder provided to the experimental cows consisted of Paragrass (*Bracharia mutica*), Napier (*Pennisetum purpureum*), Guinea grass (*Panicum maximum*) and Maize (*Zea mays*) in the ratio of 40:20:20:20 on DM basis and paddy straw was fed as dry fodder. The paddy straw and wilted green fodder were chaffed before feeding. The TMR was prepared with mixed grass, paddy straw and concentrate mixture at the ratio of 40:20:40 on DM basis. The experimental ration with the same feed constituents was kept separate for feeding lactating crossbred cows by conventional feeding practice. The experimental animals were allotted the respective feed @ 2.5 percent of body weight on DM basis and fed *ad libitum* twice daily at 8:30 a.m. and 3:30 p.m. in each season. The feeding trial was done for two months including 15 days of pre-experimental feeding followed by 7 days of digestive trial. The average cost of production of milk and milk products were estimated including all the fixed and variable cost as per prevailing market rate at an interval of every 10 days. The fixed cost included depreciation on the value of the animal and equipments @ 10 percent and building @ 5 percent per year for estimation of cost of milk production. The variable cost included feed, labour, veterinary aids, water and electricity as per prevailing rate. In case of paneer and curd (*dahi*) the fixed cost included depreciation on the building @ 5 percent and equipments @ 10 percent per year and the variable cost included cost of raw materials, fuel, labour including coagulant in case of paneer and starter culture and earthen ware in case of curd (*dahi*). The experiment was conducted in the Instructional Livestock Farm (Cattle), Faculty of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-22. The experimental cows were kept under standard management condition. The experiment was carried out in factorial Randomized Block Design (RBD). The statistical analysis was performed using the generalized linear model (proc GLM) with the help of SAS 9.3

RESULTS AND DISCUSSION

Cost of milk production

The mean cost of per kg milk production was ₹ 30.46±0.55 and 32.99±0.69 in F1 and F2 feeding practices; ₹ 33.47±0.84 and 29.98±0.64 in G1 and G2 genetic groups and ₹ 31.01±1.35, 34.17±1.12, 31.70±0.81 and 30.03±0.95 in S1, S2, S3 and S4 seasons respectively, with overall mean of ₹ 31.73 per kg (Table 1).

Table 1. Mean±S.E. Cost of production of milk and milk products

Sources of variation	Cost (₹ / kg)		
	Milk	Paneer	Curd (Dahi)
Feeding practice (n=48)			
F_1	30.46±0.55^a	249.48±2.80^a	82.91±0.65^a
F_2	32.99±0.69^b	283.45±3.15^b	85.43±0.61^b
Genetic group (n=48)			
G_1	33.47±0.84^a	262.98±4.12	85.90±0.73^a
G_2	29.98±0.64^b	269.95±3.55	82.43±0.62^b
Feeding season (n=24)			
S1	31.01±1.35^a	262.47±6.53^a	83.45±1.65^a
S2	34.17±1.12^b	278.30±5.27^b	86.61±1.22^b
S3	31.70±0.81^a	267.32±4.72^{ab}	84.14±0.51^a
S4	30.03±0.95^a	257.78±4.49^a	82.47±0.55^a
Overall (μ) (n=96)	31.73±0.55	266.47±2.89	84.17±0.75

n=Number of observations in each group. Means with at least one common superscript within a column do not differ significantly.

The analysis of variance revealed highly significant effect (p<0.01) of feeding practice, genetic group and season on the cost of per kg milk production. The mean cost of per kg milk production was significantly higher in F2 than F1feeding practice and also higher in G1 than G2 genetic group. In regard to season, significantly highest cost of per kg milk production was observed during S2 season and lowest cost was during S4 season. Previous author[10] reported that cost of per litre milk production was ₹ 33.82, ₹ 33.19 and ₹ 33.03 in small, medium and large herd respectively, with overall mean of ₹ 33.50 for local cow. The overall cost of per litre of milk production was more compared to present findings. On the other hand, overall lower cost of per liter milk production from various milch cows than the present study was observed by[9].

The cost of per kg milk production was significantly lowest in Holstein-Friesian crossbred cows as observed in the present investigation. This might be due to higher milk yield and lower FCR in Holstein-Friesian crossbred cows. In support of the present experimental finding, according to the scientist[5] Holstein-Friesian cows were more profitable in all the seasons of the year. Highest cost of milk production in buffalo followed by local, Jersey and Holstein-Friesian cow, respectively by[9]. Contrary to the present findings,[11] reported maximum cost incurred for production of per litre milk in crossbred cow than the other type of animal. On the other hand, [19] observed that the cost of production of milk was higher in local milch cow than that of buffalo cow.

In agreement with present findings, [14]observed that total feed cost differed significantly (p< 0.05) between the cattle breeds as well as calving seasons. The total costs also showed the same trend of variable costs between breeds and calving seasons. The total cost for the crossbred cows calved in summer was greater than those calved in winter. In the present study also cost of per kg milk production was significantly higher during monsoon than the winter season. In conformity with present investigation, [16]reported that cost of feeding per kg milk production was lower in TMR than conventional feeding practice. The variation in the cost of milk production was mainly due to feeding cost, FCR and milk yield along with the market price of raw materials. The cost elasticity proved negative relationship between per unit cost and the yield[10]

Cost of paneer preparation

The mean cost of per kg paneer preparation was ₹ 249.48±2.80 and 283.45±3.15 in F1 and F2 feeding practices; ₹ 262.98±4.12 and 269.95±3.55 in G1 and G2 genetic groups and ₹ 262.47±6.53, 278.30±5.27, 267.32±4.72 and 257.78±4.49 in S1, S2, S3 and S4 seasons, respectively, with overall mean of ₹ 266.47±2.89 per kg (Table 1).

The analysis of variance revealed highly significant effect of feeding practice and season on the cost of per kg paneer preparation. The mean cost of per kg paneer preparation was significantly higher in F2 than F1feeding practice. In regards to season, significantly highest cost of per kg paneer preparation was observed during S2 season and lowest cost was during S4 season.

Various workers [4, 8, 2, 18 & 7] reported less cost of paneer production than the present investigation. The variation among the previous workers might be due to market price of raw materials used for preparation of paneer in different period and the yield of paneer as per the quality of milk might had also influenced the cost of paneer production. As per the reports of [4,2] the share of raw materials accounts maximum cost of paneer production which was 84.76 and 94.37, respectively. In the present study, significantly lower cost of per kg paneer preparation in TMR feeding group was due to higher milk production with lower cost of production along with higher yield of paneer. Lower mean cost of per kg paneer preparation from the milk of Jersey crossbred cow than the Holstein-Friesian crossbred cow was due to higher paneer yield as the total solids content of milk of Jersey crossbred cow was higher than the Holstein-crossbred cow. Significantly lower cost of per kg paneer preparation during winter than monsoon season might be due to higher yield of paneer and lower cost of milk production during winter season.

Cost of curd (*dahi*) preparation

The mean cost of per kg curd (*dahi*) preparation was ₹ 82.91±0.65 and 85.43±0.61 in F1 and F2 feeding practices; ₹ 85.90±0.73 and 82.43±0.62 in G1 and G2 genetic groups and ₹ 83.45±1.65, 86.61±1.22, 84.14±0.51 and 82.47±0.55 in S1, S2, S3 and S4 seasons, respectively with overall mean of ₹ 84.17±0.75 per kg (Table 1).

The analysis of variance revealed highly significant effect of feeding practice, genetic group and season on the cost of per kg curd (*dahi*) preparation. The mean cost of per kg curd (*dahi*) preparation was significantly higher in F2 than F1feeding practice as well as in G1 than G2 genetic group. In regards to season, significantly highest cost of per kg curd (*dahi*) preparation was observed during S2 season and lowest during S4 season.

The various authors[17], [15] and [13] reported lower cost of production of curd (dahi) than the present investigation. The variation of cost of production of curd (*dahi*) amongst the various workers might be due to types of milk used and its market price. [3]reported that the cost of producing soymilk yoghurt from soymilk fermented with maize steep water was least, while the cost of producing cow milk yoghurt from cow milk fermented with commercial starter was highest. [17]revealed 2.53 percent higher cost for curd (*dahi*) prepared form protein enriched milk. [20]found that the cost of production of curd from recombined milk was cheapest to manufacture. All these report suggested that the cost of curd (*dahi*) production mainly depended on types of milk used as raw material.

In the present study the cost of preparation of curd (*dahi*) differed significantly due to feeding practices, genetic group and season. This might be due to variation in quality and quantity of milk yield leading to difference in cost of production. Various workers [15, 6, 21].reported that the cost of curd (*dahi*) preparation differed due to types and quality of milk.

The cost of per kg curd (dahi) was significantly higher in conventional feeding practice than TMR feeding and significantly higher in Jersey crossbred cow than the Holstein crossbred cow due to higher cost of milk production in the respective groups. In regards to season significantly lowest cost was found during winter season, because of lowest cost of milk production. 6 reported that curd (dahi) is not easily available at a reasonable cost throughout the year because its raw material milk is not produced at the same level in all the season.

CONCLUSION

It is concluded from the present study that the cost of production of milk and milk products were influenced by feeding practice, genetic group and season. The cost of per kg milk and milk products were significantly reduced on TMR feeding. The milk and curd (*dahi*) were significantly less costly when produced from Holstein-Friesian crossbred cow. During winter season cost of milk and milk products were significantly decreased. Feeding and management interventions will improve the quantity and quality of milk. This will be helpful in bringing uniformity in cost of production round the year to avoid fluctuation in the profit level of dairy farmers.

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