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Research Article

Production performance of Holstein crossbred cows under the existing farming system in a certain area of Bangladesh

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ABSTRACT
This study aimed to assess the effect of existing feeding system on milk yield and nutritional status and profitability of 75.0% and 87.5% Holstein crossbreed cows under existing farming system in an area of Bangladesh. In a milk pocket area (Keraniganj, Dhaka), three dairy farms termed F1, F2 and F3 were randomly selected having 34, 55 and 19 lactating cows, which 75% and 87.5% Holstein blood were 48 and 60, respectively. Using pretest questionnaire information like body weight, daily milk production, parity number, days in milking, blood percentage and feeding system of each animal were noted throughout a year. All data of three farms were subjected to analyze in one-way ANOVA in terms of 75% and 87.5% Holstein cows, separately. The body weight (kg) of 75% Holstein were F1 (296), F2 (497) and F3 (496) cows ($p<0.05$), while daily milk yield (kg) did not differ markedly among F1 (9.1), F2 (10.5) and F3 (13.9) ($p>0.05$), respectively. 75% Holstein of F1 offered almost, metabolizable energy (ME) and digestible crude protein (DCP), while cows of F2 and F3 fed daily insufficient DCP (-0.14kg) and over DCP (+0.47kg), respectively thus resulting in 37.2% less milk yield in F3 compared to F2 ($p<0.05$). Besides, 87.5% cows of F1, F2 and F3 had 365, 528 and 566kg body weight ($p<0.05$) and daily produced 10.5, 10.8 and 19.4kg milk ($p>0.05$), respectively. However, 87.5% cows of F1 daily offered almost balance ME and DCP, while the cows of F2 fed lower DCP (-0.2kg). Then, cows of F3 daily fed excessive DCP (+0.14kg) thus resulting in produced 8.6kg higher milk than cows of F2. Net return except depreciation cost from 75% cows of F1, F2 and F3 were 118, 170 and 145BDT, while 87.5% cows of F1, F2 and F3 were 189, 196, and 413BDT ($p>0.05$), respectively. It may be concluded that under existing feeding system and farming practices, cows from the F1, F2, and F3 of 75% and 87.5% Holstein blood daily produced 9.8, 10.7 and 16.7kg of milk per day with 330, 512, and 531kg body weight on average, generating 154, 183, and 279BDT in profit, respectively. Feeding lower nutrient to dairy cows resulted better milk yield and return at the sacrifice of cow fitness, while excessive feeding lead to higher milk yield but lower return, whereas optimum nutrition resulted in better milk yield and return.
Keywords: Crossbred, milk yield, nutritional status, body weight and profit.

INTRODUCTION

Crops, fisheries and livestock are the key agricultural sector of Bangladesh in which the dairy industry has emerged as a promising sub-sector. Earlier the rural people merely raised indigenous dairy cattle to meet their family's milk demands. However, the indigenous cows are low producer due to possess poor genetic makeup and provide low-quality crop residue mostly rice straw (Van Soest, 2006). Moreover, indigenous cattle and rice straw were the main drawback to get more milk for the nation (Hossain et al., 2005). To solve these problems, crossbreeding policy, well-balanced feeding and management have been recognized as a realistic approach to enhance the poor productivity of indigenous cattle, thus resulting in enhanced farm profitability (Xue et al., 2011; Buckley et al., 2014). Consequently, the Bangladeshi government, private and autonomous organizations took the necessary measures to upgrade the genetic potential of indigenous dairy cattle through artificial insemination (AI) of two or three generations of crossbred dairy cows (Uddin et al., 2014). Due to the widespread use of AI in both urban, peri-urban and rural areas, cow's genetic merit is changing towards Holstein blood which has resulted in a sharp rise in milk production in the nation (DLS, 2022). Another barrier for increasing milk production is lack of supply of accessible green fodder, since earlier the farmers did not allocate land for fodder production due to higher demand of human food (Islam et al., 2017). Recently fodder production has become a commercial trade in dairy pocket area (Roy et al., 2012).

Keraniganj is a dairy pocket area nearest to Dhaka city having roughly 2560 cattle farms, 70560 cows, 21.65 metric ton milk production per day (DLS, 2022). There is a tremendous demand for milk due to peak availability of consumers and easy access to the milk market.

Consequently, a large number of specialist dairy farms have been established, using high producing crossbred cows such Holstein Friesian, Jersey, and Sahiwal crossbred, who are fed roughage and concentrate mixture for maintenance and production. However, giving cows an excessive or inadequate amount of nutrients, particularly energy and protein, causes imbalanced performance in dairy cows and decreased farm profitability (Erickson and Kalscheur, 2020). So, feeding system is the foremost factor in farming system as it drives the productivity and covers more than 65% of cost related to farming. But, still now the feeding system and constraints for profitability have not studied among the existing specialized farmers where dairying has gaining popularity. Considering Keranigonj as promising peri-urban dairy the study has conducted among the farmers targeted to characterize the feeding system and determine the productivity, nutritional performance and profitability of farms.

MATERIALS AND METHODS

Study area and farm's selection

The current survey was executed on crossbred dairy cows rearing in different specialized dairy farms at Keraniganj Upazila (Location 23°70′06.5″ N, 90°39′73.0″E), in Dhaka, Bangladesh. Arbitrarily three specialized crossbred dairy farms were chosen and presented as F1, F2 and F3, respectively. In F1, F2, and F3, there were 101, 155, and 44 cattle, respectively, with 42, 70, and 22 lactating cows.

Data collection

The data linked to crossbred lactating cows of F1, F2, and F3 were collected using a well-structured pretest questionnaire from June 2020 to July 2021 through face-to-face interview and herd record. At first from herd record, the genetic excellence of the crossbred lactating cows was documented properly from three farms. In F1, F2 and F3, there were 13, 26 and 9 number of 75% Holstein blood lactating cows and 21, 29 and 10 number of 87.5% Holstein blood lactating cows, respectively. Data on body weight of each lactating cow of three farms were calculated in accordance with Schaeffer's formula (Wangchuk et al., 2018). Data on milk yield, body weight, parity number, days in milking, pregnancy status of individual lactating cows of each farm were accurately documented for the calculation of nutrients requirement of specific lactating cows. The amount of roughage and concentrate supplied and leftover for the specific lactating cows were documented each day and the intake was measured by subtracting the feed supplied from leftover. In each farm, specific lactating cow was offered in a common range of roughage and concentrate feed on the basis of milk yield, pregnancy status and body weight in two feeding monsoons namely January to July and August to December in a year (Table 1).

The proximate components of different feed ingredients fed to animals were measured in terms of few ingredients (local concentrate mix and local grass) by AOAC, (2005); and rest ingredients value were used from referred value. Then the nutrients concentration of roughage and concentrate feed were calculated from the analyzed and book value (Table 2).

Nutrient requirements supply and balance

Dry matter (DM) requirements for specific animal were calculated on the basis of Thumb rule using body weight of animal (DM- 3.0% of body weight). In each farm, metabolizable energy (ME) for maintenance and production were calculated for specific animals, while digestible crude protein (DCP) for each animal were designed by adopting the equation of ARC, (1980).

The nutrients supply for each animal was calculated from the roughage and concentrate intake and using their nutrient concentration. Finally, the nutrients balance for each animal was calculated by subtracting the nutrient supply from nutrient leftover.

Economic and statistical analysis

In F1, F2 and F3 feed supplied through roughage cost daily almost 34.0, 30.0 and 33.0BDT for each cow, respectively. Concentrate price almost 36.0BDT/kg and other cost also included for each dairy cows. Milk sold price 70 BDT/kg from farm gate.

All data were subjected to one-way ANOVA, and the significance of differences among mean was determined using the Duncan multiple range test in IBM SPSS 2021 (Version 20.0; IBM Corp., Armonk, New York, USA) and the differences at $p<0.05$ were considered statistically significant.

Table 1. Feeding strategy practiced in different specialized farms

Feed description	Time frame	F1	F2	F 3
Roughage	January-July	Jumbo grass (15-20 kg) and local grass (1-2 kg)	Jumbo or maize grass (13-18 kg) and molasses treated rice straw (1.5-2.5 kg)	Water hyacinth (25-30 kg)
	August-December	Water hyacinth (20-25kg) and local grass (1-2 kg)	Local grass and water hyacinth (10-12 kg)	
Concentrate	January-July	Mixed bran (4-5 kg) and boiled concentrate mixture (5.5-6.9 kg)	Mixed bran (5.5-8.5 kg) and compound feed (1.0- 3.0 kg)	Mixed bran (11.5-16.5 kg)
	August-December		Mixed bran (6.5-10.5 kg) and compound feed (1.9-3.0 kg)	
Total roughage	January-July	16-22 kg	14.5-20.5 kg	25-30 kg
	August-December	21-27 kg	10-12 kg	
Total concentrate	Year round	9.5- 11.9 kg	14.9- 25 kg	11.5-16.5 kg

F1=Farm-1, F2=Farm-2, F3=Farm-3, kg=kilogram

Table 2. Calculated nutrient composition of roughage and concentrate from supplied feedstuff

Farm	DM%		CP%		ME (MJ/Kg DM)	
	Roughage	Concentrate	Roughage	Concentrate	Roughage	Concentrate
January- July						
F1	17.00	87.5	9.78	13.21	7.94	12.43
F2	21.89	89.6	8.56	13.34	7.59	12.15
F3	11.50	89.2	12.34	13.54	7.32	12.19
August- December						
F1	12.45	87.5	11.25	13.21	7.32	12.43
F2	87.12	89.6	3.87	13.34	7.18	12.15
F3	11.50	89.2	12.34	13.54	7.32	12.19

F1=Farm-1, F2=Farm-2, F3=Farm-3, DM=Dry matter, CP=Crude protein, ME=Metabolizable energy, MJ/kg=Mega-joule per kilogram

RESULTS AND DISCUSSION

Performance of 75% Holstein crossbred cows (Table 3)

Cows bearing 75% Holstein blood had 296, 497 and 496kg BW ($p<0.05$) and produced daily 9.13, 10.52 and 13.92kg milk ($p>0.05$) in F1, F and F3, respectively. Cows of F1 showed 68% lower BW but daily produced 37-46% higher milk than F2 and F3.

Nutritional status of 75% Holstein crossbred cows (Table 4)

75% Holstein cow daily required 8.8, 14.9, and 14.8kg of DM, but were fed 10.2, 11.3, and 18.6kg of DM in F1, F2, and F3, respectively which varied differently ($p<0.05$). In F1, F2 and F3 the cows offered correspondingly, 62, 66, and 75% DM through concentrate and 38, 34, and 25% DM through roughage. Cows of F1 (+3.7kg) and F3 (+9.0kg) received excess DM, but F2 got less DM (-0.7kg) than was required. Total metabolizable energy (TME) and ME for maintenance varied significantly among the farms, whereas ME for production did not. Cows were given 2.64, 3.12, and 4.96 times ME through concentrate in the F1, F2, and F3 compared to roughage, respectively. Cows of F1 (28MJ), F2 (16MJ) and F3 (83MJ) received extra ME, respectively. Digestible crude protein requirement, supply and balance differed substantially among the farms ($p<0.05$). Cows consumed 27 and 73% of DCP through roughage and concentrate in F1, 17 and 83% in F2, and 19 and 81% in F3 ($p<0.05$).

Performance of 87.5% Holstein crossbred cows (Table 5)

Cows with 87.5% Holstein blood had BWs of 365, 528, and 566 kg ($p=0.051$) and daily milk yield of 10.5, 10.8, and 19.4 kg ($p>0.05$) in the F1, F2 and F3, respectively. About 85 and 82% higher milk was produced by cows of F3 than by F3 and F2, respectively.

Nutritional status of 87.5% Holstein crossbred cows (Table 6)

For the 87.5% Holstein cows in the F1, F2 and F3, the daily DM requirement was 10.9, 15.8, and 16.9 kg, respectively ($p<0.05$), whereas the cows consumed daily feed of 10.7, 11.2 and 18.4 kg of DM from roughage and concentrate. Moreover, the dry matter balance in F1 and F2 were negative, but F3 was surplus. ME requirement for maintenance, supplied through roughage and concentrate, and positive balance differed substantially among the farms ($p<0.05$). The cows fed ME through roughage and concentrate feed were 27 and 73% in F1, 24 and 76% in F2, and 12 and 88% in F3, respectively. Daily DCP requirements per cow did not differ among farms ($p<0.05$), while daily DCP supplied through concentrate and roughage varied across farms ($p<0.05$). However, the cow from F3 received almost daily two times DCP compared to F1 and F2 cows. ME supplied through roughage and concentrate were at a rate of 26 and 74% in F1, 17 and 83% in F2 and 14 and 86% in F3, respectively. Daily DCP balance was negative in F1 and F2, while it was positive in F3; this difference was substantial ($p<0.05$).

Cost analysis of three farms of 75% and 87.5% Holstein crossbred lactating cows (Table 7)

Daily feed cost, other cost and total cost for dairy production significantly varied from farm to farm ($p<0.05$), whereas daily sale milk price and profit did not show any significant variation among the farms ($p<0.05$) in terms of cows bearing 75% and 87.5% Holstein blood. In both Holstein blood, daily feed cost, other cost and total cost for dairy operation was obtained higher in F3 and then F2 and F1, no significant variation was obtained between F1 and F2. Profit for cows with both Holstein blood was inconsequent among the farms ($p<0.05$) but better profit was obtained in F2 (170 BDT) and F3 (413 BDT) in 75% and 87.5% Holstein blood, respectively.

Body weight and milk production

The body weight of lactating cows varied significantly among F1, F2, and F3, but the milk yield was consistent. Previous research suggested that cows with 92% and 52% Holstein blood showed 602 and 603 kg body weight, respectively, which is greater and contradicts the results of the current study (Buckley et al., 2014). This lower body weight of lactating cows among the three farms of 75% and 87.5% Holstein blood due to fed imbalanced and different level of nutrition caused lower growth rate of calves and heifers (Roche et al., 2009; Erickson, and Kalscheur, 2020). Additionally, the lower and diverse body weights of the lactating cows in the current study might be attributed to the differing weights of crossbred cows that were bred using semen from Holstein or Sahiwal at various farms. The current study's milk yield was slightly influenced by the cows' poor nutrition and lower body weight. The average milk production of local cows were daily 2.26kg (Miazi et al., 2007), but we found higher milk yield in three farms of 75% and 87.5% Holstein blood, which is aligned to the previous finding (Sae-tiao et al., 2019). However, Miazi et al. (2007), stated that milk yield of crossbred Holstein and Sahiwal was about 6.0kg under village condition of Bangladesh which is lower compared to current study. This higher milk yield of both Holstein blood might be attributed due to genetic up-gradation, nutritional balance, and proper management of cows.

Table 3. Performance of 75% Holstein crossbred cow of three farms

Variables	F1	F2	F3	SEM	p-value
Body weight (kg)	295.6b±61.5	496.5a±65.4	496.2a±59.7	37.99	0.011
Milk yield (kg)	9.13±1.8	10.52±2.9	13.92±2.8	1.03	0.144
% milk yield relative to Farm 1	100	115.2	152.43		
% milk yield relative to BW	3.09	2.12	2.80		

F1=Farm-1, F2=Farm-2, F3=Farm-3, Number of cattle in F1=13, F2=26, F3=9, kg=Kilogram, MY=Milk yield, a-c Means in the same row with no common superscript differ significantly (p<0.05).

Table 4. Comparison of nutritional status of three farms of 75% Holstein crossbred cows

Variables	F1	F2	F3	SEM	P-value
Requirements					
Dry matter (kg/cow/day)	8.8^{b}±1.8	14.9^{a}±1.9	14.8^{a}±1.7	1.14	0.011
ME (MJ/cow/day)	74.0^{b}±12.3	102.9^{ab}±18.3	121.2^{a}±19.4	8.45	0.039
Maintenance (MJ/cow/day)	35.2^{b}±5.6	53.4^{a}±5.9	53.4^{a}±5.4	3.46	0.011
Production (MJ/cow/day)	38.8^{b}±9.1	49.4^{ab}±16.3	67.8^{a}±14.9	5.82	0.105
DCP (kg/cow/day)	0.72^{b}±0.13	1.02^{ab}±0.19	1.21^{a}±0.20	0.09	0.038
Intake					
Dry matter (kg/cow/day)	10.2^{b}±0.5	11.3^{b}±0.7	18.6^{a}±0.4	1.34	<0.001
Roughage (kg/cow/day)	3.8^{b}±0.2	3.8^{b}±0.2	4.6^{a}±0.4	0.16	0.036
Concentrate (kg/cow/day)	6.3^{c}±0.5	7.4^{b}±0.6	13.9^{a}±0.0	1.21	<0.001
ME (MJ/cow/day)	107.4^{b}±25.6	119.0^{b}±8.0	203.9^{a}±2.9	16.35	<0.001
Roughage (MJ/cow/day)	29.8±1.8	28.9±1.6	34.2±3.2	1.06	0.073
Concentrate (MJ/cow/day)	78.6^{b}±6.6	90.1^{b}±7.3	169.7^{a}±0.8	14.42	<0.001
DCP (kg /cow/day)	0.83^{b}±0.05	0.88^{b}±0.06	1.68^{a}±0.02	0.14	<0.001
Roughage (kg /cow/day)	0.22^{b}±0.01	0.15^{c}±0.01	0.31^{a}±0.02	0.02	<0.001
Concentrate (kg /cow/day)	0.61^{c}±0.05	0.72^{b}±0.05	1.36^{a}±0.00	0.12	<0.001
Balance					
DM (kg/cow/day)	3.7^{b}±0.1	-0.7^{c}±0.0	9.0^{a}±0	1.41	<0.001
ME (MJ/cow/day)	28.4^{b}±2.1	16.0^{c}±0.5	82.6^{a}±0.3	10.23	<0.001
DCP (kg/cow/day)	0.11^{b}±0.0	-0.14^{c}±0.0	0.47^{a}±0.0	0.08	<0.001

F1=Farm-1, F2=Farm-2, F3=Farm-3, Number of cattle in F1=13, F2=26, F3=9, DM =Dry matter, Kg=Kilogram, MJ=Mega-joule, DCP=Digestible crude protein, $^{a-c}$ Means in the same row with no common superscript differ significantly (p< 0.05)

Table 5. Performance of 87.5% Holstein crossbred cows of three farms

Variables	F1	F2	F3	SEM	P-value
Body weight (BW)	365.4^{c}±72.7	528.4^{ab}±60.8	565.9^{a}±105.4	38.79	0.051
Milk yield	10.5±3.0	10.8±4.1	19.4±6.4	2.00	0.103
% milk yield relative to Farm 1	100.0	103.0	185.0	-	-
% milk yield relative to BW	2.88	2.04	3.43	-	-

F1=Farm-1, F2=Farm-2, F3=Farm-3, Number of cattle in F1=21, F2=29, F3=10, kg=Kilogram, $^{a-c}$ Means in the same row with no common superscript differ significantly (p<0.05).

Table 6. Comparison of nutritional status 87.5% Holstein crossbred cows of three farms

Variables	F1	F2	F3	SEM	p-value
		Requirements			
Dry matter (kg/cow/day)	10.9^{c}±2.1	15.8^{ab}±1.8	16.9^{a}±3.1	1.16	0.050
ME (MJ/cow/day)	89.6±20.1	108.1±24.5	154.79±39.3	12.85	0.080
Maintenance (MJ/cow/day)	41.5^{c}±6.6	56.3^{ab}±5.5	59.8^{a}±9.6	3.53	0.049
Production (MJ/cow/day)	48.0±16.6	51.7±21.2	94.9±32.4	10.30	0.101
DCP (kg/cow/day)	0.88±0.21	1.08±0.25	1.56±0.41	0.13	0.079
		Intake			
Dry matter (kg/cow/day)	10.7^{b}±0.8	11.2^{b}±0.7	18.4^{a}±1.5	0.88	<0.001
Roughage (kg/cow/day)	4.0±0.3	3.8±0.2	3.4±0.2	0.11	0.097
Concentrate (kg/cow/day)	6.7^{b}±0.7	7.4^{b}±0.6	14.9^{a}±1.3	1.35	<0.001
ME (MJ/cow/day)	114.6^{b}±9.9	118.8^{b}±8.8	207.4^{a}±17.8	15.57	<0.001
Roughage (MJ/cow/day)	31.0^{a}±2.6	28.9^{ab}±1.5	25.44^{b}±1.6	1.00	0.038
Concentrate (MJ/cow/day)	83.6^{b}±9.3	89.9^{b}±8.3	181.9^{a}±16.6	16.27	<0.001
DCP (kg /cow/day)	0.88^{b}±0.07	0.88^{b}±0.07	1.71^{a}±0.14	0.14	<0.001
Roughage (kg /cow/day)	0.23^{a}±0.02	0.15^{b}±0.00	0.24^{a}±0.01	0.01	0.001
Concentrate (kg /cow/day)	0.64^{b}±0.07	0.72^{b}±0.06	1.46^{a}±0.13	0.13	<0.001
		Balance			
DM (kg/cow/day)	0.2^{b}±0.0	-4.5^{c}±0.0	1.4^{a}±0.2	0.90	<0.001
ME (MJ/cow/day)	25.0^{b}±0.6	10.7^{c}±0.6	52.6^{a}±2.3	6.16	<0.001
DCP (kg/cow/day)	-0.005^{b}±0.008	-0.20^{c}±.007	0.14^{a}±0.02	0.05	0.001

F1=Farm-1, F2=Farm-2, F3=Farm-3, Number of cattle in F1=21, F2=29, F3=10, DM=Dry matter, Kg=Kilogram, MJ=Mega-joule, DCP=Digestible crude protein, $^{a-c}$ Means in the same row with no common superscript differ significantly (p<0.05).

Table 7. Comparison of economic analysis of three farms of 75% and 87.5% Holstein crossbred cows

Variables (Cost in BDT)	F1	F2	F3	SEM	p-value
		75% Holstein			
Total feed cost	359.4b±27.6	390.3b±28.5	657.0a±17.3	47.78	<0.001
Other cost	161.7b±12.4	175.6b±12.8	209.0a±7.7	7.72	0.006
Total cost (I)	521.1b±40.0	566.0b±41.4	866.0a±10.5	54.99	<0.001
Milk sale price (II)	639.1±128.8	736.4±205.1	1011.0±147.2	73.02	0.073
Profit (II-I)	117.9±88.7	170.3±163.6	145.0±136.7	39.23	0.893
		87.5% Holstein			
Total feed cost	378.9b±38.5	389.6b±31.1	654.1a±56.5	46.70	<0.001
Other cost	170.5b±17.3	175.3b±14.0	294.3a±25.4	21.02	<0.001
Total cost (I)	549.4b±55.9	565.0b±45.2	948.4a±82.0	67.72	<0.001
Milk sale price (II)	738.5±214.0	760.9±287.0	1361.5±449.0	139.96	0.103
Profit (II-I)	189.0±158.2	195.8±242.4	413.0±367.3	86.20	0.547

F1=Farm-1, F2=Farm-2, F3=Farm-3, Number of 75.0% Holstein blood cows in F1=13, F2=26, F3=9, and 87.5% Holstein blood, F1=21, F2=29, F3=10, Other cost =Feed additive, medication, vaccination, labor, miscellaneous, a-c Means in the same row with no common superscript differ significantly (p<0.05). Considering 69% feed cost and 31% other cost.

Nutritional status of dairy cows

Three farms had different requirements and supplies for DM, total ME, ME for maintenance and DCP in lactating cows with 75% and 87.5% Holstein blood. This noteworthy outcome was mostly brought about by differences in dairy cow's body weight and milk yield status among the three farms with both Holstein blood. Since earlier research demonstrated that lactating cows' requirements for DM, ME for production and maintenance, and DCP supply are mostly related to body weight and milk yield (Kearl et al., 1982; Erickson and Kalscheur, 2020). Greater amounts of DM, ME for production and maintenance, and DCP were required for animals with higher body weight and milk yield, and vice versa. The milk production of three farms was varied but not significant in the current investigation, which led to negligible ME requirements for production among three farms. Furthermore, it was found that 75% and 87.5% lactating cows fed surplus ME of three farms which was essential for pregnancy maintenance.

Economic analysis

Better profit was obtained in F2, F3 and F1 of 75% Holstein blood, while higher profit was found in F3, F2 and F1 of 87.5% Holstein blood, respectively. This variation may be due to following reasons: (i) poor feeding knowledge to dairy cows, (ii) higher milk production, and (iii) use of higher concentrate feed in dairy operation among the three farms. Lactating cows of F1 of both Holstein blood showed lower profits but did not lose body weight since they were well-fed and did not lack in ME and DCP. In the farm F2, both Holstein-blood percent of cows displayed better profit than others. Cows of F2 lost body weight by breaking down their muscles to meet their nutritional needs since they consumed less ME and DCP through feed (Roche et al., 2009). In F3, cows of both Holstein blood with higher body weight produced highest milk but failed to afford better return due to overfeeding of ME and DCP which resulted in higher nutrients loss through feces and caused environmental pollution (VandeHaar and St-Pierre, 2006).

CONCLUSION

It may be concluded that under the existing farming and feeding practices, cows with 75% and 87.5% Holstein blood from the F1, F2, and F3 had an average body weight of 330, 512, and 531kg, and daily milk production of 9.8, 10.7, and 16.7kg, which produced returns of 154, 183, and 279BDT, respectively. Therefore, it is logical to assume that body weight and milk production positively correlated. Better cow performance and return are driven by optimal nutrition; less feeding produced better return but at the sacrifice of cow health, whereas overfeeding produced lower returns.

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