Research Article

A COMPARATIVE ECONOMIC ANALYSIS OF LOCAL BREED AND CROSS BREED COWS IN A SELECTED AREA OF SIRAJGANG DISTRICT

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Abstract

The present study was undertaken to analyze the relative profitability of dairy cows. The focus of the present study was to quantify the cost and returns and to explore the interrelationship of factors affecting yield, cost and net return. It also attempted to examine the rural employment and income generation potentials of dairy enterprise. Dairy farming was studied in 5 villages of Tarash upazila in Sirajganj district from the study areas sixty farmers were selected randomly, based on the availability of which 30 were local breed raisers and 30 were cross breed raisers. Dairy cow rearing was found to be a profitable enterprise. The per day total cost of rising per cross-breed dairy to be profitable enterprise- The per day total cost of rising per local breed and cross-breed dairy cow was estimated at Tk. 22.65 and 64.40, respectively. Feed cost was the largest single cost item of raising dairy cows. The estimated gross return per cow per day stood at Tk. 57.56 for local breed cows while it amounted to Tk. 229.76 for cross breed cows. In this study, the net returns per dairy cow per day were Tk. 17.62 and Tk. 134.55 for local breed and cross breed dairy cows, respectively. The average milk productions per day per cow were 1.25 litre and 5.60 litre for local breed and cross breed dairy cows, respectively. The study identified some crucial problems such as milk marketing problem, scarcity of feed and fodder, lack of improved breed, lack of veterinary care and services, lack of institutional credit and high price of concentrate feed. The major remedial measures as suggested by farmers is to assurance of supply feeds and fodder, veterinary care and services, supply of institutional credit at low interest, availability of concentrate feeds, improved breeding and marketing facilities. Finally following the summary of the study some policy implications are suggested and scopes for further studies are indicated.

Keywords: Dairy cow, cost, return, profitability, resource use efficiency.

Introduction

Dairy is the most important livestock product produced by smallholder crop-livestock farmers in Bangladesh. The crop sector in agriculture has largely been dependent on livestock, in addition to draft power and leather, it provides manure, meat and milk to the vast majority of the people. Development of this sub-sector may be considered as an important strategy for poverty alleviation which is a major objective of the Government of Bangladesh.

Livestock has been an important component of the mixed farming system practiced in the country for centuries. The contribution of livestock sector to GDP is 2.9 percent and its growth rate is 5.5 percent (Banglapedia, 2015). Dairy and dairy farming is an integral farming system in Bangladesh. In terms of nutrients and protein production for human consumption from a given quantity of resources, it is an efficient and intensive system. A noticeable development has also taken place in breed improvement. Crossbreeding of local cows with Shahiwal, Friesian, Jersey etc. is found as higher yielder in terms of milk and meat.

In this study, economic profitability of milk production of local breed and cross breed milking cows has been compared and the resource use efficiency of the relevant factors determined. Dairying is gradually becoming

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important as a business, side by side agriculture in Bangladesh. Although the importance of dairy cow can hardly be over emphasized, studies on the economics of dairy cow (local breed and cross breed) raising are limited (Jabbar and Raha, 1984; Rahman and Rahman, 1991; Halim, 1992; Islam, 1992; Ashrafuzzaman, 1993; Alam *et al.*, 1995; Paul, 1995; Hassan, 1995; Rahman, 1996; Jabbar *et al.*, 1997; Talukder and Tajuddin, 2000; Akhter, 2000; Goni *et al.*, 2001; Sarker, 2003; Rabbani *et al.*, 2004) in Bangladesh. Therefore, the present study attempts to look into the economics of dairy enterprises in some selected areas of Sirajganj district. Keeping this in mind, the present study was undertaken which is expected to be helpful to the individual farmer since it analyses the relative profitability of different types of dairy cows. The findings of the study are expected to be helpful to individual farmers by providing valuable insight into the problems of dairy cow owners and, therefore, the policy makers may also be benefited. The study will also generate valuable information to the researchers as well as extension workers which can help to form effective national planning for the development of this vital sub-sector.

The findings of this study are expected to be helpful to the individual farmers, policy makers, researchers and extension workers since it analyses the relative profitability of different dairy cows.

Materials and Methods

The present study was conducted in five villages at Tarash upazila of Sirajganj district namely Tarash, Choubari, Kusumbi, Kohit and Khutigasha. The main reasons in selecting the study areas were availability of local and cross breed milk cows. The area was well communicated and better co-operation was found for the collection of reliable data. The survey method was followed for collecting primary data. The study areas were selected purposively. For sampling, 60 sample farmers were selected randomly, based on the availability of which 30 were local breed raisers and 30 were cross breed raisers. Data were collected by the researcher himself in the month of December 2011. Then the data were arranged in tabular form to unveil the interrelationship among factors. Finally, a functional analysis was accomplished to estimate the productivity and efficiency of input factors used in the milk production process.

To explore the effects of variable inputs, both linear and Cobb-Douglas production function models were estimated initially. Cobb-Douglas production function analysis was done taking 60 dairy farms.

The function was specified as: $Y_i = aX_{1i}^{\ b1} X_{2i}^{\ b2} X_{3i}^{\ b3} X_{4i}^{\ b4} X_{5i}^{\ b5} X_{6i}^{\ b6} e^u_i$

The function was linearised by transforming it into the following double log or log linear form:

 $\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + U_1$

Where,

Y = Value of the average milk yield per cow per day (Taka); $X_1 = Value of paddy straw used per cow per day (Taka);$ $X_2 = Value of green grass used per cow per day (Taka);$ $X_3 = Value of bran used per cow per day (Taka);$ $X_4 = Value of labour used per cow per day (Taka);$ $X_5 = Value of veterinary cost used per cow per day (Taka);$ $X_6 = Value of capital cost per cow per day (Taka);$ In = Natural logarithm; a = Intercept/constant; $b_i = Production coefficients; and$ U = Error term

Here, intercept is a fixed component and U is a random effect component, the random effect which is assumed to follow a normal distribution with mean zero and variance σ^2 .

The resources are considered to be efficiently used to result in attaining the maximum profit when the ratio of marginal value product (MVP) to marginal factor cost (MFC) approaches one. When the marginal physical product (MPP) is multiplied by the product price, it is called marginal value product (MVP). Marginal factor cost is the price

of one unit of input. The optimum use of a particular input would be ascertained by the equation of equality of MVP and MFC,

i.e., $MVP_{xi}/MFC_{xi} = 1$

Results and Discussion

Profitability of dairy cow rearing: There are some necessary inputs such as paddy straw, green grass, oil cake, bran, labour, etc. which is very important for dairy cow. The total feed costs per day per local breed cow and cross breed cow were Tk 22.65 and 64.4, respectively and all of these cost constituted 56.90 and 67.64 percent of the total cost (Table 1).

Particulars	Local	Breed Cow	Cross	Breed Cow
	Total (Tk)	Percentage	Total (Tk)	Percentage
Feed Cost	22.65	56.90	64.4	67.64
Paddy Straw	13.50	33.9	19.67	20.66
Green Grass	2.90	7.28	15.91	16.71
Oil Cake	1.11	2.79	10.14	10.65
Bran	3.75	9.42	12.25	12.87
Salt	0.54	1.36	1.50	1.58
Molasses	0.35	0.88	2.93	3.08
Other Feed Cost	0.50	1.26	2.00	2.10
Labour Cost	12.32	30.9	20.17	21.01
Housing Cost	0.63	1.58	1.43	1.53
Veterinary Cost	0.25	0.63	1.28	1.34
Capital Cost	2.60	6.53	7.60	7.99
Miscellaneous Cost	1.40	3.51	0.33	0.35
Total Cost	39.83	100.00	95.21	100.00
Average No of Animal		3.50		4.20
Returns				
Milk	51.45	89.40	221.65	93.58
Cowdung	2.80	4.86	2.89	1.69
Other purposes use	0.50	0.87	0.10	0.91
Calf	3.21	5.58	4.12	3.82
Total Return	57.56	100.00	229.76	100.00
Net Returns		18.13	1	34.55
BCR (Undiscounted)		1.45		1.71

Table [*]	1. '	Total	cost	and	return	of	raising	я	local	breed	and	crossbreed	dairv	COW	ner da	v.
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The analysis of costs and returns revealed that the dairy cow owners had to incur higher cost (Tk 145761.92) in rearing cross breed cows than that of local breed cows (Tk 50859.130).

The costs of paddy straw, green grass, oil cake, bran, salt and molasses were Tk 13.50, 2.90, 1.11, 3.75, 0.54 and 0.35 for per local breed cow per day which were 33.9, 7.28, 2.79, 9.42, 1.36 and 0.88 percent of total cost, respectively. The corresponding figures for cross breed per cow per day were Tk 19.67, 15.91, 10.14, 12.25, 1.50 and 2.93 which covered 20.66, 16.71, 1065, 12.87, 1.58 and 3.08 percent of total cost, respectively (Table 1). It appeared from Table 1 that on an average total labor cost were estimated at Tk 12.30 and 20.17 per cow per day for local breed and cross breed cows, respectively which were 30.9 and 21.1 percent of the total cost. On an average the veterinary cost was Tk 0.25 per day per cow for local breed farms, but this cost was Tk 1.28 per day per cow for cross breed farms (Table 1).

The housing cost per farm per year was Tk 800.98, Tk 2211.18 for local breed and cross breed raising farm, respectively (Table 2). The average capital cost of per local breed dairy cow per was day Tk 2.60 while it was Tk 7.60 for a cross breed dairy cow (Table 1) and their respective shares of total costs were 6.53 percent and 7.99

percent. The interest on capital for local breed and cross breed farms were Tk 3310.40 and 11685.58, respectively (Table 2).

Miscellaneous cost included cost of some minor items like feeding troughs, ropes, milking equipments, mosquito net/coil, electricity charges, water charges, chain etc. Miscellaneous cost per cow per day was Tk 1.40 and Tk 0.33 for local breed and cross breed animals, respectively (Table 1). Miscellaneous cost per year per farm was Tk 1779.40 and Tk 512.53 for local breed and cross breed rearing farms, respectively (Table 2).

Particulars	Local Breed		Cross Breed		
	Total (Tk)	Percentage	Total (Tk)	Percentage	
Feed Cost	28935.38	56.90	98725.2	67.64	
Labour Cost	15713.59	30.90	30665.53	21.01	
Housing Cost	800.98	1.58	2211.18	1.51	
Veterinary Cost	319.38	0.63	1962.24	1.34	
Capital Cost	3310.40	6.53	11685.58	7.98	
Miscellaneous Cost	1779.40	3.51	512.53	0.35	
Total Cost	50859.13	100.00	145761.92	100.00	
Cost animal ⁻¹ year ⁻¹	14531.18	-	34705.22	-	
Cost animal ⁻¹ day ⁻¹	39.83	-	95.21	-	

Table 2. Annual Cost of Raising Dairy Animals by Different Farm Categories.

Results represented in Table 1 shows that the average milk productions per day per cow were 1.25 litre and 5.60 litre amounted Tk 51.45 and Tk 221.65 for local breed and cross breed dairy cows which were 89.40 percent and 93.58 percent of total return, respectively (Table 1). The estimated gross return per cow per day stood at Tk. 57.56 for local breed cows while it amounted to Tk. 229.76 for cross breed cows in the area under study (Table 1). Further net returns per dairy cow per day were Tk. 18.13 and Tk. 134.55 for local breed and cross breed dairy cows, respectively (Table 1). Table 1 shows that the investment in the selected dairy farming gave return of Tk 1.45 and Tk 1.71 for local breed and cross breed dairy farms, respectively. It is also found that BCR of cross breed dairy farm is greater than local breed dairy farm which indicates that cross breed dairy cow rearing is more profitable than local breed dairy cow rearing.

Functional analysis for measurement of productivity and efficiency of resource use in milk production:

Paddy Straw (X_1): The regression coefficient of the paddy straw for local breed dairy cows was positive and insignificant. The regression coefficient of the paddy straw for cross breed dairy cows was positive and significant at 5 percent level of significance. It indicates that 1 percent increases of this input keeping other factors constant, would result in increase of milk yield by 0.124 percent.

Green grass (X_2): The value of regression coefficient of the paddy green grass for local breed dairy cows was positive and significant at 1 percent level. It reveals that 1 percent increases of this input keeping other factors constant, would result in increase of milk yield by 0.233 percent. The regression coefficient of the green grass for cross breed dairy cows was positive and significant at 5 percent level indicating that 1 percent increases of this input keeping other factors constant, would result in increase of milk yield by 0.241 percent.

Concentrate (X_3) : In the case of concentrate feed the regression coefficient of paddy for local breed dairy cows was positive and significant at 5 percent level of significant. It reveals that 1 percent increases of this input keeping other factors constant, would result in increase of milk yield by 0.186 percent. The regression coefficient of the concentrate for cross breed dairy cows was positive and significant at 1 percent level of significance indicating that 1 percent increases of this input keeping other factors constant, would result in increase of milk yield by 0.475 percent.

Labour (X_4) : The regression co-efficient for the labour input was significant at 1 percent level for cross breed dairy cows but for local breed dairy cows, it was negative and insignificant They indicate that one percent increase in labour, keeping other factors constant would significantly increase the milk yield by 0.180 percent for cross breed

dairy cows, but the milk yield would decrease by 0.159 percent for local breed dairy cows. The negative coefficient implies the excessive use of labour.

Veterinary cost (X_5) : The regression coefficient of the veterinary input for both local breed and cross breed dairy cows was insignificant but positive.

Capital (X_6): The regression coefficient of the capital for both local breed and cross breed dairy cows was positive but insignificant.

Explanatory variables	Local breed cow		Cross breed cow		
	Value of coefficient (SE) t-value		Value of coefficient (SE)	t-value	
Intercept	6.09		6.656		
Paddy straw (X_1)	0.164 (0.129)	1.27	0.124 (0.057) **	2.175	
Green grass (X_2)	0.233(0.086)***	2.71	0.241(0.105)**	2.29	
Concentrate (X_3)	0.186(0.068)**	2.74	0.475(0.187)***	2.54	
Labour (X_4)	-0.159 (0.145)	-1.096	0.180(0.047)***	3.83	
Veterinary cost (X_5)	0.025 (0.017)	1.47	0.025(0.015)	1.67	
Capital cost (X_6)	0.421 (0.335)	1.26	0.152(0.150)	1.01	
\mathbb{R}^2	0.852		0.871		
R^2 (adjusted)	0.825		0.846		
F- value	35.925***		28.982***		
Returns to scale	0.748		1.645		

SE = standard error; *** = 1% level of significance; ** = 5% level of significance

The co-efficient of multiple determinations, R^2 (adjusted) were 0.825 and 0.846 for local and cross breed dairy cows, respectively. R^2 of 0.825 for local breed implies that about 83 percent of the variations in milk yields of local breed can be explained by the explanatory variables included in the model. On the other hand, R^2 of 0.846 for local breed implies that about 85 percent of the variations in milk yields of cross breed cows can be explained by the explanatory variables included in the model.

The F-value of the equation was highly significant at 1 percent level implying that the equations were well-fitted for explaining the variations in the milk yield for local and cross breed dairy cows.

Variables	Geometric Mean (Antilog)	Coefficient	MVPs
	Local Breed Co	WS	
Value of milk yield (Y)	51.46		
Cost of paddy straw (X_1)	13.16	0.164(0.129)	0.64
Cost of green grass (X ₂)	2.65	0.233 (0.086)	4.52
Cost of concentrate (X_3)	4.36	0.186 (0.068)	2.2
Cost of labour (X_4)	12.13	-0.159 (0.145)	-0.67
Veterinary cost (X_5)	0.21	0.025 (0.045)	6.13
Capital cost (X_6)	2.31	0.421 (0.335)	9.38
	Cross Breed Co	ws	
Value of milk yield (Y)	221.12		
Cost of paddy straw (X_1)	19.14	0.124 (0.0570)	1.43
Cost of green grass (X ₂)	15.36	0.241 (0.105)	3.47
Cost of concentrate (X_3)	27.86	0.475 (0.187)	3.77
Cost of labour (X_4)	19.85	0.180 (0.047)	2.01
Veterinary cost (X_5)	1.25	0.025 (0.017)	4.42
Capital cost (X_6)	7.12	0.152 (0.072)	4.72

Table 4. Marginal Value Products	s (MVPs) of Different Resources.
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The total of all the production coefficients (production elasticity) of the equations for local breed and cross breed dairy cows were 0.748 and 1.645. This indicated that the production function exhibited increasing returns to scale for cross breed dairy cows. That means there is scope for further improvement in resource allocation particularly for cross breed dairy cow owners.

Resource use efficiency: In order to capture the status of resource use efficiency it was considered that a ratio equal to unity implies the optimum use of that factor, a ratio more than unity indicates that the returns could be increased by using more of that resource and a value of unity less than implies the unprofitable level of resource use which should be decreased to minimize the losses (Table 4).

Particulars	Cost of Paddy	Cost of green	Cost of	Cost of	Veterinary	Capital cost
	straw (X ₁)	grass (X ₂)	concentrate (X ₃)	labour (X ₄)	$\cos (X_5)$	(X_6)
	Local Breed Cows					
MVP	0.64	4.52	2.20	-0.67	6.13	9.38
MFC	1.00	1.00	1.00	1.00	1.00	1.00
MVP/MFC	0.64	4.52	2.20	-0.67	6.13	9.38
Cross Breed Cows						
MVP	1.43	3.47	3.77	2.01	4.42	4.72
MFC	1.00	1.00	1.00	1.00	1.00	1.00
MVP/MFC	1.43	3.47	3.77	2.01	4.42	4.72

Table 5. Marginal Productivit	and Resource	Use Efficiency.
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MVP= Marginal Value Product MFC= Marginal Factor Cost

The ratios of MVP and MFC of green grass (X_2) , cost of concentrate (X_3) , veterinary cost (X_5) and cost of capital were greater than unity for local breed cows indicating that more return may be obtained by increasing the use of these resources. The ratio of MVP and MFC of paddy straw (X_1) was positive but less than unity which implies that resources were used at more than optimum level and hence a downward adjustment was needed to bring the ratios closer to unity. But the ratio of cost of labour (X_4) was negative and less than unity which indicates that the excessive use of this input perhaps due to easy availability of home supplied labour. In the case of cross breed dairy cows, use of paddy straw, green grass, concentrate feed, labour cost, veterinary cost and capital cost would lead to increase value of milk yield (Table 5).

Some major problems and constraints were identified in this study as obtained from reports by farmers. The principal problems faced by the dairy cow owners were lack of proper treatment and medicine, scarcity of feed and fodder, lack of grazing land, natural hazards, (rainfall, storm, flood, etc.,) high price of feed and fodder, lack of credit, low price of milk, lack of transportation facilities, etc.

It can be concluded from the study that, though dairying faced some constraints, but it was a profitable enterprise. If proper remedial measures could be taken, dairy farming could be a viable commercial enterprise which in turn could play a vital role to overcome the problems of low income, unemployment, under nutrition and unfavorable balance of payment situation of the country. The studies also revealed that rearing of cross breed cow were more profitable than local breed cows.

The policy maker should, therefore, extend more policy supports, which will encourage expansion of dairying and thereby, will contribute to increase milk production in the area and in the country as a whole.

References

Akhter M. 2000. A study of livestock (dairy) credit programme of two NGOs in Savar upazila of Dhaka district. MS Thesis. Dept. of Agri. Finance. BAU, Mymensingh, Bangladesh.

Alam J. 1995. Economics of mini dairy farms in selected area of Bangladesh. Asian Australian J. Anim. Sec. 80:17-22.

Ashrafuzzaman A K M. 1993. An economic analysis of milk production in some selected areas of Sirajganj district. MS. Thesis. Dept. of Agri. Econ. BAU, Mymensingh, Bangladesh.

Banglapedia. 2015. National encyclopedia of Bangladesh. Available on

en.banglapedia.org/index.php?title=livestock. Last accessed on 10 March, 2015.

- Goni M D, Miah A G, Khan M R S and Islam M N. 2001. The performance of cross breed cows available in milk pocket area of Bangladesh. Indian J. Anim. Sci. 71(12):1166-1168.
- Halim A. 1992. A comparative economic analysis of local and cross breed dairy cows in a selected area of Dhaka district. MS Thesis. Dept. of Agri. Econ. BAU, Mymensingh, Bangladesh.
- Hasan T. 1995. An economic analysis of mini dairy farming in two selected areas of Bangladesh. MS Thesis. Dept. of Agri. Econ. BAU, Mymensingh, Bangladesh.
- Islam M A and Oliuzzaman M. 1992. A study on the existing distribution pattern rearing practice and some economic productive and reproductive dairy characters of indigenous cows in some selected areas of Mymensingh district. Annual report BAURES, 7 (A).
- Jabbar M A and Raha S K. 1984. Consumption pattern of milk and milk products in Bangladesh. Bangladesh J. Agri. Econ. 7 (2): 29-44.
- Jabber M A, Sarker S M M U and Basel M A. 1997. An economic analysis of dairy cow rearing in two villages of Pabna district. Bangladesh J. Anim. Sci. 23 (1&2):125-132.
- Rabbani M S, Alam M M, Ali M Y, Rahman S M R and Saha B K. 2004. Participation of rural people in dairy enterprise in a selected area of Bangladesh. Pakistan J. Nutrit. 3(1):29-34.
- Rahman M M and Rahman M H. 1991. An economic analysis of dairy enterprise in four selected villages of Mymensingh district in Bangladesh. Research report submitted to BSERT. BAU, Mymensingh, Bangladesh.
- Sarker M A S. 2003. A comparative economic analysis of local breed and cross breed dairy cow rearing in some selected areas of Mymensingh district. MS Thesis. Dept. of Agri. Econ. BAU, Mymensingh, Bangladesh.
- Talukder R K and Uddin M T. 2000. Economics of milk production in Bangladesh. A contract research report submitted to Bangladesh Agricultural Research Council. Farmgate, Dhaka-1215.