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A COMPARATIVE ECONOMIC ANALYSIS OF LOCAL BREED AND CROSS BREED MILK COW IN A SELECTED AREA OF BANGLADESH

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ABSTRACT

The present study was undertaken to investigate and compare the socio-economic characteristics and relative profitability of local breed and cross breed dairy cow rearing farmers. The focus of the present study was to quantify the costs and returns and to explore the interrelationship of factors affecting yield, cost and net return for the local and cross breed cows and also compare these with each other. On an average, local and cross breed dairy cow owners possessed 4.93 and 4.76 animals per household respectively. Per day total costs of rearing per local and cross breed cow were Tk.32.85 and Tk.71.23 respectively. Feed cost constituted about 58 percent of total cost for local breed cows while it was 62 percent for cross breed cows. Paddy cost occupied the largest share out of total feed cost in local breed cows. The average milk yield per day per cow was 1.89 litres and 7.68 litres for local breed and cross breed dairy cows respectively while the total return per day per cow was estimated at Tk.58.27 and Tk.224.76 for the same and the net returns per day per cow were Tk.25.42 and Tk.153.53. The study revealed that green grass, concentrate feed, labour cost and capital cost have significantly positive impact on milk yield for cross breed cows but all the inputs other than labour cost and capital cost have positive impact on milk yield for local breed cows. It was further observed that the resources were not efficiently used by both local breed and cross breed farms. It may be concluded that both local and cross breed dairy cow owners had a scope to reallocate their resources. However, it was found from the study that profitability of cross breed cows was higher than that of the local breed cows. The study identified some major problems and constraints as reported by farmers which were: lack of grazing land, lack of veterinary care and services, high price and scarcity of feed and fodder, low price of milk, etc. Finally, policy implications of the study were suggested.

Key words: Profitability, Returns to scale, Resource use efficiency, Net return.

INTRODUCTION

Bangladesh is an agriculture based country. Majority of its population live in the rural areas. Most of the rural farmers are engaged in cow rearing as their integrated farming. Dairy farming also supports substantial employment in production, processing and marketing (Michal 1991). However, dairy cattle in Bangladesh have been used as the dual purpose animal. The primary purpose has been using the cattle for agricultural operation and the secondary purpose has been to get some milk for home consumption and selling for some cash income. Here, milk production is considered as a by-product. But milk is considered as an ideal and a complete food for human health all over the world. The priority of milk in the diet is widely recognized and it has a very high elasticity of demand as compared to other food items (Jabbar and Raha, 1984). Thus for promoting the interest of both products and consumers the need for encouraging milk supplies to fulfill increasing demand is an urgent need for the day. In the public sector there are only a few dairy farms located at Dhaka (Savar), Rajshahi, Sylhet, and Faridpur. Large quantity of the milk is produced by the rural households and majority of them have one or two dairy cows which are used for both milk production and draught purposes. In Bangladesh there are some milk pocket areas where dairy farming has been traditionally an important and major component of mixed farming system. These areas are particularly located in

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Pabna, Sirajgonj, Manikganj, Munsiganj, Faridpur, Madaripur, Kishorganj, Rangpur and Tangail district. (Goni M.D., Miah A.G. etal.)There are some large farmers in this area, who keep dairy cows only for milk production. Total contribution of agriculture sector in GDP at constant price is about 20.60 percent in 2008-09 (Economic Review 2009) of which livestock sub sector contributes 2.73 percent. Jabbar and Green (1983) performed a survey in Mymensingh district and observed that milk production were 1.42 litre per cow not used in ploughing, 1.21 litre per cow used in ploughing. The importance of broad based research work on dairy industry is therefore necessary. In Bangladesh a noticeable development activities have also taken place in breed improvement. Cross-Breeding of local cows with Australian, Shahiwal, Holstein Frieisian, Jersy etc, are often seen in rural areas. These Cross-Breeds give higher yield in terms of milk and meat. Dairying is gradually proving to be a profitable agribusiness. (DLS 2003). Some big commercial capital intensive dairy farms have also come up.

The present study is undertaken which is expected to be helpful to the individual farmers by demonstrating the relative productivity and resource use efficiency of different types of dairy cows. It is expected that this study will provide useful information to the policy makers to formulate appropriate policies in respect of milk production and the improvement of dairy sector. Increased production of milk will serve as saving of foreign exchange on the one hand and contribute to national product and hence increase farmer's income on the other.

Objectives

The specific objectives of this study are given below

- To measure and compare the profitability of milk production of local and cross breed milk cows.
- To determine the efficiency of various inputs used by local and cross breed dairy rearing farms.
- To identify the problems related to rearing of dairy cows and to make policy recommendations for better economic performance.

MATERIALS AND METHODS

Five villages namely Kalihati Sadar, Nischintopur, Hamidpur, Khilda and Munshi para of Kalihati upazila in Tangail district were purposively selected as the study area. The farmers who have at least one milking cow of these villages constituted the population of the study. Total 60 sample farmers were selected randomly of which 30 were local breed owners and the other were cross breed owners. Data were collected by using a pre-tested interview schedule by the researchers during the months of March, 2008 to April, 2008. In this study cost items consist of feed, labour, housing, veterinary, others cost and cost of capital that is interest on value of cows. The total cost per cow per day was calculated for both local breed and cross breed cow in the study areas. Calculation of costs and return of dairy cows by lactation could be a worthwhile proposition. Generally a lactation period prolongs for 10 months for cross-breed cows. The purchased feeds were valued according to the average prices actually paid by the dairy cow owners. Home supplied or own feeds were also charged according to the average prices prevailing in the market. Veterinary cost was calculated by taking into account the actual cost incurred by the farmers. Doctor's fee and medicine were two major components of the total veterinary cost. The cost of housing was calculated by taking into account the depreciation cost, repairing cost and interest on average value of animal shed. Per day per cow housing cost was calculated by dividing total housing cost for a year by 365 and number of cows in a herd. Capital cost was measured in the present study as the interest on the average value of dairy cows. It is assumed that the dairy cow owners had purchased the cow just before calving and sold it after one year. The returns from dairy farm consisted of value of milk sold, values of cowdung, net changes in inventory, return from other purpose uses and return from calf. The returns from milk were calculated on the basis of the average quantities of milk yield per cow and average price received per litre of milk. Returns from cowdung were found out by taking average price at which cowdung was sold in the study areas. The returns from calf were calculated by dividing the value of calf by the age of the calf in number of days during the period of data collection.

Both tabular and statistical techniques were used to find important relationships among the relevant variables. The Cobb-Douglas production function model was used to determine the effects of key

variables. The resources are considered to be efficiently used when the ratio of marginal value product (MVP) to marginal factor cost (MFC) approaches one, or in other word, MVP and MFC for each input are equal. Marginal value product (MVP) is obtained by multiplying the marginal physical product (MPP) by the market price. Marginal factor cost (MFC) is the price of one unit of input. To identify the most important variables in the production process of milk production of dairy farms, the following specification of the model was made:

$Y= aX_{1i}^{b1} X_{2i}^{b2} X_{3i}^{b3} X_{4i}^{b4} X_{5i}^{b5} X_e^{Ui}$

The Cobb-Douglas production function was transformed into following logarithmic form so that it could be estimated by the ordinary least squares (OLS) method:

$$\text{In } Y= \text{In } a + b_1 \text{ In } x_{1i} + b_2 \text{ In } X_{2i} + b_3 \text{ In } X_{3i} + b_4 \text{ In } X_{4i} + b_5 \text{ In } X_{5i} + U_i$$

Where,

Y= Value of average milk yield per cow per day (Taka)

X_1= Cost of paddy straw used per cow per day (Taka)

X_2= Cost of green grass per cow per day (Taka)

X_3= Cost of concentrate used per cow per day (Taka)

X_4= Cost of labour used per cow per day (Taka)

X_5= Capital cost used per cow per day (Taka)

In = Natural logarithm

a = Intercept/ Constant

b_i= Production coefficients; and

U_i = Error term

RESULTS AND DISCUSSION

Profitability of dairy farming:

Cost of Rearing Dairy Cows

Table 1 reveals that total costs per local breed and cross-breed cow per day amounted to Tk.32.85 and Tk.71.23 respectively of which Feed cost shared 57.88 percent of the total cost for local breed and 62.36 percent for cross breed dairy cows.

Table 1 Total Cost and Return of Rearing a Local breed and Cross-breed Dairy Cow per Day

Particulars	Local Breed		Cross Breed	
	Total (Tk)	Percentage of total	Total (Tk)	Percentage of total
Feed Cost	19.01	57.88	44.42	62.36
Paddy Straw	13.96	42.48	18.67	26.22
Green Grass	1.55	4.72	6.18	8.68
Oil Cake	1.35	4.12	10.14	14.23
Bran	1.79	5.44	6.26	8.79
Salt	0.08	0.24	0.22	0.31
Molasses	0.28	0.85	2.93	4.12
Other Feed Cost	0.01	0.02	0.02	0.02
Labour Cost	11.37	34.61	20.17	28.32
Housing Cost	0.29	0.88	0.43	0.60
Veterinary Cost	0.21	0.63	1.28	1.80
Capital Cost	1.74	5.29	4.60	6.46
Miscellaneous Cost	0.24	0.72	0.33	0.46
Total Cost	32.85	100	71.23	100

Returns				
Milk	51.24	87.94	210.00	93.43
Cowdung	2.22	3.81	2.89	1.29
Other purposes use	0.40	0.69	0.10	0.04
Calf	4.41	7.57	11.77	5.24
Total Return	58.27	100.00	224.76	100.00
Net Return	25.42		153.53	

Source: Field Survey, 2008

Paddy straw cost occupies about 73.39 percent and 43.16 percent of total feed costs for local breed and cross-breed dairy cows respectively. The cross-breed cow owners gave more concentrate feed to their cows than the local breed cow owners, which affects positively in milk production. It appeared from table 1 that on an average total labour cost was estimated at Tk.11.37 and Tk.20.17 per cow per day for local breed and cross breed cows respectively. Average family labour covers large portion of total labour used in dairy rearing. Veterinary cost per day per cow for local breed farms constituted a negligible amount which was Tk.0.21 per day per cow, but this cost was Tk.1.28 for cross breed farms. The reason was that cross breed cows were more sensitive to different disease than local breed cows. The housing cost comprised of Tk.0.29 and Tk.0.43 per day per local breed and cross-breed dairy cow respectively. Most of the local breed raising farmers used locally traditional breeding system to inseminate their cows by local bull at free cost or sometime paid lowest cost. The respective shares of average capital cost of the total costs were 5.29 percent and 6.46 percent. Miscellaneous cost included cost of some minor items like feeding troughs, ropes, milking equipment, mosquito net/coil, electricity charges, water charges, chain etc, which comprised of Tk.0.24 and Tk.0.33 per day per local breed and cross breed cows respectively.

Return from Dairy Farming

Table 1 also revels that the estimated gross return per cow per day stood at Tk.58.27 for local breed cows while it amounted to Tk.224.76 for cross breed cows where the shares of milk were 87.94 percent and 93.43 percent of total return respectively. The average milk production per local breed cow was about 2 litres per day and it was 7.5 litres per cross breed cow per day. Daily returns from cowdung were Tk. 2.22 and Tk.2.89 respectively. Return from other uses included gains from ploughing, threshing, draughts power shared 0.69 percent and 0.04 percent of their respective total return and daily return per calf was Tk.4.41 and Tk.11.77 for local breed and cross breed cows respectively. Net returns per local breed cow per day was Tk.25.42 where it wasTk.153.53 for a cross breed dairy cow per day.

Table 2 Relation of Concentrated Feed Cost to Milk Yield and Return

Concentrate feed cost/day/cow	No of farmers	% of total	Milk yield (litres)	Return from milk (Tk)	Gross return (Tk)	Gross cost (Tk)	Net return(Tk)
Local Breed cow							
Up to 10	9	30	1.75	49	56.21	36.89	19.32
10.01-15.00	17	56.66	1.82	50.96	57.56	32.7	24.86
15.01-20.00	3	10	1.87	52.36	58.03	30.25	27.78
Above 20.00	1	3.33	2	56	62.11	31.45	30.66
All average	30	100	1.86	52.08	58.47	32.82	25.65
			Cross breed cow				
Up to 10	1	3.33	7.21	201.88	204.58	66.34	138.24
10.01-15.00	6	20	7.53	210.84	209.54	71.85	137.69
15.01-20.00	18	60	8.26	231.28	235.47	73.25	162.22
Above 20.00	5	16.66	8.36	234.08	248.45	75.28	173.17
All average	30	100	7.84	219.52	224.51	71.68	152.83

Source: Field Survey, 2008

Relation of Concentrated Feed Cost to Milk Yield and Return

Table 2 shows that yield increased with the increase of concentrate feed cost for both type of dairy cows. Milk yields per local breed dairy cow per day were 1.75, 1.82, 1.87 and 2 litres for concentrate feed costs up to Tk.10 , Tk.10.01-15.00, Tk.15.01-20 and above Tk20 respectively while milk yield per cross breed cow per day were 7.21, 7.53, 8.26 and 8.36 litres for the same concentrate feed costs respectively. Thus it is clear that, the concentrate feed had positive effects on net returns.

PRODUCTIVITY AND RESOURCE USE EFFICIENCY IN MILK PRODUCTION

The estimated coefficients and related statistics of Cobb-Douglas production function of local and cross breed dairy cows are shown in table 3. The regression coefficient of green grass cost, concentrate feed cost, labour cost and capital cost have significantly positive impact on milk yield for cross breed cows but all the inputs other than labour cost and capital cost have positive impact on milk yield for local breed cows.

Table 3 Results of the Cobb-Douglas Production Function Model

Explanatory Variables	Local breed Cow	Cross-breed Cow
Intercept	6.014	6.740
Paddy straw cost (X_1)	0.124* * (0.057)	0.103 (0.123)
Green grass cost (X_2)	0.241** (0.107)	0.241** (0.105)
Concentrate cost (X_3)	0.195** (0.075)	0.383** (0.147)
Labour cost (X_4)	-0.109 (0.19)	0.16** (0.064)
Capital cost (X_5)	0.295 (0.167)	0.18* (0.047)
R^2 (adjusted)	0.749	0.868
F-Value	11.041*	25.38*
Returns to scale	0.746	1.067

Note: Figures in the parenthesis indicate standard error

*= Significant at 1 percent level

** = Significant at 5 percent level

The coefficient of paddy straw cost for local breed cows indicates that one percent increase in paddy straw cost, keeping other factors constant, would increase value of milk yield by 0.124 percent. Each one percent increase in the green grass cost, keeping other factors constant, would result in an increase value of milk yield by 0.241 percent for both local breed and cross-breed cows. Similarly the value of milk yield of local breed and cross-breed dairy cows increased by 0.20 percent and 0.38 percent respectively for one percent increase in concentrate feed cost. One percent increase in labour cost, remaining other factors constant, would increase the value of milk yield by 0.16 percent for cross breed dairy cows. The regression co-efficient of capital cost for cross breed dairy cows indicate that one percent increase in the capital cost, remaining other factors constant, would result in an increase of value of milk yield by 0.18 percent for cross breed dairy cows.

About 75 percent and 87 percent of the variations in total value of milk yield were explained by the explanatory variables included in the model for local breed and cross breed cows respectively. The F-values of two equations were highly significant at one percent level implying that the equations were well fitted for explaining the variations in milk yield for local and cross breed dairy cows.

Returns to Scale

The sum total of entire production coefficients (production elasticities) of the equations for local breed and cross-breed dairy cows were 0.746 and 1.067 respectively which indicates that the production function exhibits decreasing returns to scale for local breed cows and increasing returns to scale for cross breed dairy cows.

Resource Use Efficiency

Table 4 shows that the ratios of MVP and MFC of green grass cost (X_2), cost of concentrate (X_3) and cost of capital (X_5) 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 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 it closer to unity. But the ratio of cost of labour (X_4) was negative and less than unity which indicates 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 green grass, concentrate feed, capital cost would lead to increase the value of milk yield.

Table 4 Marginal Productivity and Resource Use Efficiency

Particulars	Cost of paddy straw (X_1)	Cost of green grass (X_2)	Cost of concentrate (X_3)	Cost of labour (X_4)	Cost of capital (X_5)
local breed cow					
MVP	0.46	9.20	2.90	-0.49	9.14
MFC	1.00	1.00	1.00	1.00	1.00
MVP/MFC	0.46	9.20	2.90	-0.49	9.14
Cross breed cow					
MVP	1.19	8.26	4.14	1.67	8.87
MFC	1.00	1.00	1.00	1.00	1.00
MVP/MFC	1.19	8.26	4.14	1.67	8.87

Note: MVP= Marginal Value Product

MFC= Marginal Factor Cost
Source: Field Survey 2008

It may be suggested that both local breed and cross breed dairy farms in the study area have scope to attain full efficiency by reallocating the resources.

The principal problems faced by the dairy cow owners in cow rearing and milk marketing were lack of proper treatment and scarcity of feed and fodder, lack of grazing land, natural hazards (Rainfall, Strom, Flood, etc,) high price of feed and fodder, non availability of easy credit facility, lack of transportation facility, unorganized milk market, poor artificial insemination facilities etc,.

CONCLUSION AND RECOMMENDATIONS

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.

Recommendations

a) The following recommendations are made for sound dairy development in the study area:
b) The government should provide necessary assistance for establishment of feed mill in the private sector for making quality quality feed available in the market.

c) The government should make arrangement for leasing khas lands to dairy farmers for fodder production wherever possible.
d) Milk marketing facilities should be improved either by establishing milk processing plant in the area or by making provision for collection of milk through well organized marketing bodies.
e) The Directorate of Livestock Services (DLS) should take steps to issue veterinary card to the registered dairy farmers to ensure timely supply of veterinary services and medicines at reasonable cost.
f) The existing AI services should be extended from the upazila level to the union level and village levels for improving the breed type. Facilities of AI centers and sub-centers should be improved.
g) Mini commercial dairy farms may be encouraged by lowering the rate of interest. For disbursing credit properly and adequately the government may establish "Livestock Bank"
h) The government should emphasize on education and manpower training in dairy activities.

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