International Journal of Multidisciplinary Informative Research and Review
2020; 1(2): 77-87
Published online October 31, 2020 (https://agribusinessedu.com/ijmirr-journal/)
DOI: 10.5281/zenodo.4309775
ISSN: 2709-6289 (Online)

An Economic Analysis of Cross Breed Milk Producing Farms in Some Selected Areas of Manikgonj District

Mahfuzur Rahman[1*], Farzana Ahmed Mukta[2]

[1] Lecturer, Atish Dipankar University of Science and Technology(ADUST), Dhaka, Bangladesh.
[2] Research Scholar, Dhaka, Bangladesh.

Email address:

* Corresponding author: mahfuzurecon@gmail.com (M. Rahman)
farzanamukta03@gmail.com (F.A. Mukta),

To cite this article:

Mahfuzur Rahman, Farzana Ahmed Mukta. An Economic Analysis of Cross Breed Milk Producing Farms in Some Selected Areas of Manikgonj District. *International Journal of Multidisciplinary Informative Research and Review*. Vol. 1, No. 2, 2020, pp. 77-87.

Abstract: *The present study was undertaken to investigate and the socio-economic characteristics and relative profitability of 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 cross breed cows. On an average, cross breed dairy cow owners possessed 9.26 animals per household respectively. Per day total costs of rearing per cross breed cow was Tk. 238. Feed cost constituted about 46 percent for cross breed cows. Paddy cost occupied the largest share out of total feed cost in cross breed cows. The average milk yield per day per cow was 7.87 litres for cross breed dairy cow while the total return per day per cow was estimated at Tk. 376 and the net returns per day per cow was Tk. 144. The study revealed that green grass, human labor and veterinary cost have significantly positive impact on milk yield for cross 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.*

Keywords: *Milk production, Marketing system, Profitability, Biological system, Dairy.*

1. Introduction

Dairying is a biological system that converts large quantities inedible roughage into milk, the most nutritious food known to man. It is an efficient and intensive system, in terms of nutrient and protein production for human consumption from a given quantity of resources. As human population in relation to fixed land resources increases, pressure increases for utilization of the land more efficiently. Where conditions are suitable, dairying is preferred to beef production since it makes efficient use of feed resources and provides a regular source of income to farmers. It is also more labor intensive and supports substantial employment in production, processing and marketing (Michaell *et al.*, 1991). Because of ago-climatic features of Bangladesh, dairy could be an effective instrument for increasing income and employment in the rural areas.

Milk production in Bangladesh falls far short of requirement and the country has to import a huge quantity of milk by spending large amount of foreign exchange. It is estimated that domestic production of milk accounts for only about 14 percent of nutritional requirement. Milk being an ideal food acts as a substitute of many food items in terms of supply of essential nutrients and vitamins. Thus milk consumption is highly valued from nutritional point of view. But since the country does not produce adequate milk domestically, import of milk becomes imperative.

The government of Bangladesh, over the past years, adopted some policies to encourage dairy rising by private farmers. These policies encouraged farmers to set up commercial dairy farms in the country and quite a large number of farmers were established over the past years. However, the pattern of growth of the farms and the constraints associated with their establishment are not adequately known. It is reported that the rate of growth of establishment of dairy farms has already started declining. Such decline is attributed to high price of cattle feed, inadequate availability of veterinary services and highly unorganized and undeveloped milk marketing system. All these aspects need to be investigated for proper identification of constraints associated with dairy development. Although decision on whether or not Bangladesh will

continue expansion of milk production domestically will depend on a number of factors including self-sufficiency, employment generation and income distribution criteria, economic rationale for domestic milk production will have to be judged by the criteria of the country's comparative advantage in milk production.

The economic profitability analysis will provide important piece of information to the public authority in respect of the true opportunity cost of a Taka spent on dairying vis-à-vis on alternative investment proposition from society's point of view. The study will also generate important set of information which will help researchers in examining comparative cost principle in the case of investment in agricultural and non-agricultural projects.

2. Literature Review

This part of the study reviewed available literature both locally and internationally to find out the research gap and ways to contribute in to the body of knowledge.

Fang and Sugimoto (1994) Studied comparison of cost and technical structure of milk production between Japan and USA. This study compared the cost and input structure of milk production in Japan and the USA and analyzed the production structure, economics of scale and technical change over the period 1997-98 using a Cobb-Douglas production function. The results indicated that the average production cost per 100 kg milk was less in New York than in Japan. The proportion of non fixed capital inputs such as labour and feed were lower in USA than in Japan. The production elasticity of fixed capital was lower in Japan. The marginal productivity was low in Japan than in USA. Scale of economics was higher in Japan than in USA. Technical progress occurred during the period studied in both regions, but the range was higher in USA (New York State).

Sangu (2005) conducted comparative economics of milk production for buffalo: Desi cow and cross breed cow in village and town conditions. A survey of 120 milk producers (312 milking animal) was carried out in the Meerut district of Uttar Pradesh. The average investment on fixed assets per milking animals in villages and towns were respectively Rs. 5713 and Rs. 5971 for buffaloes, Rs. 5435 and Rs. 5959 for cross breed cows and Rs. 2291 and Rs. 2629 for desi cows. The fixed costs consisted mostly of animal and buildings costs. The total maintenance cost per lactation of buffaloes, cross breed cows and desi cows was Rs.196349, Rs. 7714 and Rs. 4669 respectively in villages and Rs. 7383, Rs. 8842 and Rs. 5075 in towns. Fixed costs for buffaloes, cross breed cows and desi cows contributed to 30, 31 and 25 percent respectively of the total maintenance costs in villages and 34 32 and 26 percent of the total maintenance cost in towns. The major variable costs were concentrate feeds, green and dry fodder. The maintenance cost in villages was significantly lower than that in towns. The production cost per kg milk for buffaloes, cross breed cows and desi cows was Rs. 4.12, Rs. 3.48 and Rs. 3.89, respectively in villages and Rs. 4.48, Rs. 3.88 and Rs. 4.10 respectively in towns. The rate of return per rupee invested over total cost was highest for cross breed cows followed by buffaloes and desi cows. The actual production of milk of cross breed cows was significantly higher than their break-even production levels (2114 vs. 920 kg in villages and 2280 vs. 940 in towns).

Sagar (2001) studied productivity of dairy cows as related to management attributes of milk products. A study was conducted on a total of 245 randomly selected livestock owners from 12 selected villages; 36 were classed as landless, 92 marginal, 63 small and 54 medium to large milk producers. Productivity of dairy cows was measured by the livestock production (milk yield) index on desi and cross breed cows. Some relevant management attributes of milk producers were selected and their relationships with dairy cattle productivity were computed. Correlation coefficients indicated that average income from milk and milk products, total annual income and feeding of the animals were positively and significantly correlated with productivity of dairy cows of all four categories of milk producers.

Kairon, Singh and Singh (2000) conducted resource use efficiency and optimum allocation in milk production of small farms in Northern Haryana. This study was carried out in the operational area of the Ambala Kuru Kshetra Regional Rural Bank, India. Regression analysis results identified concentrate to be the most important input aflcting milk production. The optimization resources of with existing capital indicated that it should be possible to increase milk output by diverting a part of funds from green fodder and human labour to concentrates.

Baruah, Sarker, and Bora (1999) conducted a study of economics of milk production in Assam. During one year period, data was collected from 124 milk producing households in Assam. All households had Jersey cross breed cows. The overall average total fixed investment per milking animal was Rs. 9759 of which 4.7, 2.7 and 92.6 percent were investments in cattle sheds, equipment and the animals respectively. On an average, variable costs made up 87.4% of the total costs, whereas fixed costs made up 12.6 percent of cost. The fixed costs increased as the number of milking animals per household increased. The major component of the fixed costs was interest on fixed capital, whereas the major component of the variable cost was feed cost. The total return per milking animal was higher in households with 4-6 cows than in any other category of households. The cost of milk production (Rs./litre) was 8.47, 8.23, 8.28, 8.38 and 8.08 in households with

<4, 4-6, 7-9, 10-12 and >12 cows, respectively.

Kumar and Balishter (1996) studied economics of cross breed cow and Murrah buffalo - a study in Firozabad district of Uttar Pradesh. Data were analyzed on fixed and variable costs incurred by 33 cross breed cows owned by 25 households and 117 Murrah buffalos owned by 92 households in India. Net income per household averaged Rs. 3760 and. 2912 and the costs of producing a litre of milk Rs. 3.53 and 4.45 for cattle and buffaloes respectively.

Akteruzzaman and Doi (1997) studied returns of labour and income generation in cross breed dairy farming in rural Bangladesh: a Case Study of Bangladesh Rural Advancement Committee Cattle Distribution Programme. In an attempt to examine the employment opportunities in Bangladesh through the livestock sector, the study conducted a survey of 4l households in three thanans (Bera, Debidwar and Trishal) who were participating in the Bangladesh Rural Advancement Committee (BRAC) cattle distribution programme. The households were surveyed during 1992. Information was collected on two aspects: Socioeconomic aspects and family income before and after the project, and information on milk production, and costs and returns relating to dairy rearing. Improvements were seen in both socioeconomic aspects and family income, and in increasing employment opportunities.

3. Objectives

The specific objectives of the study are as follows:

(i) To estimate the costs of cross breeds dairy cows.

(ii) To estimate returns and profitability of cross breed dairy cow rearing.

(iii) To identify effects of different factors on cross breed dairy cow rearing.

4. Statement of the Problem

Dhaka, the most densely populated megacity of the world, is home to 8.5 million people (World Population Review, 2016). Of them, a large number engage themselves in informal income generating activities like street vending. According to the Labor Force Survey 2002-03 of Bangladesh (BBS, 2004:138) 1.41 percent of all the working people (older than 15 years) in Bangladesh's cities are street vendors by major occupation. Haque *et al.* (2010) noted that a census in 2003 in Dhaka City Corporation areas found that there were 90,000 street vendors in the city. But the data from the Labor Force Survey suggests that at least 110 thousand hawkers roam the streets of the wider megacity Dhaka as an informal trade in the main urban transaction points. Most of the street vendors are rural-urban migrant due to lack of work facilities and public services in rural area. Although the city authorities of Dhaka city see that, the street vendors a Problem for their urban areas as they constraint the regular movement of the city dwellers in the footpath and so on. Without street vending in the urban areas a large number of urban dwellers fall into a critical situation in their lives. Not only the low-income group but also the middle-income group of urban dweller depends on vegetable street vendor for daily kitchen shopping in their life. In addition, poor urban dwellers cannot fulfill their basic need without those informal activities in urban areas. According to Dhaka City Corporation records, around 60 percent of the city dwellers lead an impoverished live who mostly depend on street vending for their living.

Street vending is an essential factor for a large number of urban dwellers to maintain their livelihood. For most street vendors, trading from pavements is full of uncertainties. Large number people are entering in Dhaka city from the rural area and most of those rural migrants engage themselves in street vending. These people have no place to go but to the cities, hoping to improve their lots. With low skills and in most cases, no education, no ability to find better paid and secured employment in the formal sector, they have to work in this informal sector. They are constantly facing many problems by city authorities (such as conduct eviction to clear the footpaths, confiscation of merchandise etc.) that make their livelihood at stake.

In most cities street vending is regarded as an illegal activity. City authorities impose restrictions on the use of urban space for vegetable street vending. Informal sectors are unregistered and government pays little attention to this sector. But they are not socially and economically mainstreamed. Hence there is a need to study the nature of the livelihood and different employment risks associated with vegetable street vending.

5. Methodology of the Study

The study was conducted to identify the major dairy farmer categories with respect to production of milk in a selected area of Bangladesh and to determine their relative impact on resource use and productivity of farmers producing milk. Necessary data were collected from the operating farmers of the selected area and analyzed in terms of the objectives set for the study.

This study was based on field level data. There are several methods of collecting this basic information. The; data for this study were collected by the survey method.

Selection of the study area: For selection of the study area, the researcher visited village namely thanapara under Singair Upazila of Manikganj District. The village from which owner dairy farmers were selected possesses similar Socio-economic attributes and homogeneous physiographic conditions.

Sampling technique: Random sampling is used for this study.

Sample Size: The sample size should be as small as to allow for adequate degrees of freedom in the statistical analysis. In other words, administration of field research, processing and analyzing of data should be manageable within the limits imposed by physical, human and financial resources. It was found that 30 farms in this selected study area had production of milk.

Sources of Data: The study is involved in collection of data both from the primary and secondary sources. Different types of data and their sources are discussed under the following heads:

Primary Data: Primary data from respondents were collected through face to face contact. During data collection the objectives of the study were clearly explained to the respondents.

Secondary Data: For the research purpose secondary data would also be collected from different sources like books, journals, newspaper, and document of BBS.

Study Period: Data would be collected by survey method with the help of pre-designed and pretested interview schedule during March 2019.

Processing and analysis of data: Data collected were classified,, tabulated and analyzed in terms of the objectives set for the study. Both tabular and statistical techniques were used to find important relationships among the relevant variables.

Tubular Technique: Tabular technique of analysis is generally used to find out percentage share in difference input. In this study tabular technique was used to illustrate the whole picture of analysis. The advantages of tabular analysis are:
i) . Computation of data involves less work; and
ii) It illustrates the whole picture of analysis as well as the results of analysis

Production function: Production function is a mathematical relationship between output and a set of inputs. For getting special advantages production function namely Cobb- Douglas was used in this study. To determine the contribution of the most important variables in the production process, the following specification of the model was made:

$$Y = a\, X_{1i}^{b1}\, X_{2i}^{b2}\, X_{3i}^{b3}\, X_{4i}^{b4}\, X_{5i}^{b5}\, X_{6i}^{b6}\, X_{e}^{ui}$$

$$\text{Or, } \ln Y = \ln a + b_1 \ln X_{1i} + b_2 \ln X_{2i} + b_3 \ln X_{3i} + b_4 \ln X_{4i} + b_5 \ln X_{5i} + b_6 \ln X_{6i} + U_i \text{ Where,}$$

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 labor used per cow per day (Taka)
X_5=Cost of veterinary charges used per cow per day(Taka)
X_6 =Cost of housing used per cow per day (Taka)
a = Intercept
b_1, b_2, b_3 …… b_6= Production Coefficients
U_i = Error term
In = Natural logarithm

Cobb-Douglas form of production function has the following advantages.
i) dy/dxj =bj/xj y[ify=f(xj)]
ii) Elasticity of Y upon xj can be easily read out from bj.
iii) In Cobb-Douglas production function, returns to scale can be easily calculated by simply summing up the elasticity's of Y with respect to Xj.

iv) This form of production function explains that milk production operates under either constant increasing or decreasing returns to scale.

6. Results and Discussion

Socioeconomic Characteristics of the Sample Farmers

Age Distribution of the sample dairy farmers

In the present study the sample dairy farmer's age has been classified into four age groups such as less than 30 years, 30-40 years, 41-50 years and 51 years and above.

Table 1: Age Distribution of the sample dairy farmers

Categories according to age	Number	Percent
less than 30 years	07	23%
30-40 years	15	50%
41-50 years	06	20%
51 years and above	02	07%
Total	30	100%

Source: Field survey 2019

In the study, the sample dairy farmer's age has been defined as total number of persons. Table 1: reveals that about 23 percent of the dairy farmers fell into the less than 30 years of age group. About 50 percent were between 30-40 years of age group, 20 percent were between 41-50 years age group and 07 percent dairy farmers belonged to above 51 years of age group.

Occupational status of the sample dairy farmers

There were number of poor farmers in the study area. Agriculture was the main occupation of the selected heads of household in the study area. Besides agriculture, some farmers were engaged in others occupation like Business, Service, Self-Employed and others.

Table 2: Occupational status of the sample dairy farmers

Occupation	Main		Subsidiary	
	Number	Percent	Number	Percent
Agriculture	14	47%	10	33%
Business	09	30%	06	20%
Service	04	13%	03	10%
Self-Employed	03	10%	03	10%
Others	-	-	08	27%
Total	30	100%	30	100%

Source: Field survey 2019

In the study, the sample dairy farmer's occupation has been defined as total number of persons. Table 2: reveals that about 47 percent of the dairy farmers were engaged in agriculture. About 30 percent in business, 13 percent were in service and 10 percent dairy farmer's belonged to self-employed as their main occupation. On the other hand 33 percent of the dairy farmers were engaged in agriculture as their subsidiary occupation. About 27 percent in others, 20 percent were in business, 10 percent in service and 10 percent dairy farmer's belonged to self-employed as their subsidiary occupation.

Educational status of the sample dairy farmers

Education was defined as the ability of an individual aged above 6 years to read and write or formal education received up to certain standard. The government and various organizations placed greater emphasis and extend special facilities (like free education, stipend etc.) for increasing the literacy rate. Education helps a person to have day to day information about the modern techniques, production costs and also production in this field.

To examine the educational status of the sample dairy farmer's were divided into five categories. These were i) Illiterate, ii) Ability to sign, iii) Primary Level (I to v) iv) Secondary Level (vi to x) v) Above Secondary Level. Those who can't put signature, read and write were considered as Illiterate. Table 3: displays the educational levels of the sample dairy farmer's.

Table 3: Educational status of the sample dairy farmers

Level of Education	Number	Percent
Illiterate	01	3%
Ability to sign	03	10%
Primary Level	08	27%
Secondary Level	12	40%
Above Secondary Level	06	20%
Total	30	100%

Source: Field survey 2019

In the study, the sample dairy farmer's Level of Education has been defined as total number of persons. Table 3: reveals that about 03 percent of the dairy farmers respectively were illiterate having no formal or informal education. About 10 percent were able to sign respectively, 27 percent the sample dairy farmers were completing primary school (class-i to v)

constituted 40 percent respectively had level of education ranged from class vi to x. and 20 percent dairy farmers respectively had level of education ranged above secondary level.

Average annual income

The annual incomes of the sample dairy farmers are given bellow table. The activities were Crop, Dairy, Poultry, Livestock and livestock product, Fish culture, Vegetables and fruits, Services, Business and Miscellaneous. It is evident from table 4: that the average annual incomes of the sample dairy farmers were Tk. 72350.

Table 4: Average annual income of sample dairy farmers from various sources

Source	Amount Tk /Year	Percent
Crop	15250	21%
Dairy	13600	19%
Poultry	17200	24%
Livestock and livestock product	2450	03%
Fish culture	2200	03%
Vegetables and fruits	1300	02%
Services	10050	14%
Business	8050	11%
Miscellaneous	2250	03%
Total	72350	100%

Source: Field survey 2019

In the study, the sample dairy farmer's average annual income has been defined as table 5.5. The dairy farmers respectively the income obtained from 21 percent of Crop, 19 percent of Dairy, 24 percent of Poultry, 03 percent of Livestock and livestock product, 03 percent of Fish culture, 02 percent of Vegetables and fruits, 14 percent of Services, 11 percent of Business and 03 percent of Miscellaneous.

Average number of cow of sample dairy farmer's

In the present study the sample dairy farmer's Average number of cow has been classified into four types of cow groups such as less than 06, 06-09, 10-12 and 13 and above.

Table 5: Average number of cow of sample dairy farmer's

Categories according to cow	Number	Percent
less than 06	03	10%
06-09	13	43%
10-12	09	30%
13 and above	05	17%
Total	30	100%

Source: Field survey 2019

In the study, the sample dairy farmer's total number of cow has been defined as total number of persons. Table 5 reveals that about 10 percent of the dairy farmers fell into the less than 06 number of cow group. About 43 percent were between 06-09 number of cow group, 30 percent were between 10-12 number of cow group and 17 percent dairy farmers belonged to above 13 number of cow group.

Costs and Returns

In the milk production process, the sample dairy farmer's used two categories of inputs, namely, variable and fixed inputs. Variable inputs were either purchased or home supplied. Expenses on purchased inputs were measured by the amount of the payment made for the purpose, while opportunity cost principle was used for estimating the value of home supplied variable and fixed inputs.

Cost of Feed for milk production

Feed cost was one of the major cost items of maintain dairy animals. Cost of feed included Paddy Straw, Green Grass, Bran, Oil Cake, Salt, Molasses, Vitamin and Others. In this study, the purchased feed was valued according to the average prices actually paid by the dairy farmers. Home supplied feed was also charged at the average prices of the items.

Table 6: Cost of Feed of Rearing a Cross-Breed Dairy Cow per Day

Particulars	Home Supplied		Purchased		Total Cost (Tk)	Percent of Total cost
	Quantity	Cost (Tk)	Quantity	Cost (Tk)		
Paddy Straw	2kg	13	3kg	20	33	31%
Green Grass	5kg	10	1.5kg	03	13	12%
Bran	2.5kg	05	5kg	10	15	14%
Oil Cake	-	-	200gm	08	08	07%
Salt	-	-	100gm	02	02	02%
Molasses	-	-	200gm	06	06	06%
Vitamin	-	-	20ml	18	18	17%
Others	500gm	06	600gm	06	12	11%

Source: Field survey 2019

It is evident from the table 6 that a cross-breed dairy cow per day cost of paddy straw was Tk. 33 where home supplied was Tk. 13 and purchased was Tk. 20, green grass was Tk. 13 where home supplied was Tk. 10 and purchased was Tk. 03, bran was Tk. 15 where home supplied was Tk. 05 and purchased was Tk. 10, oil cake, salt, molasses, vitamin were no home supplied cost but there purchased cost were Tk. 08, Tk. 02, Tk. 06, Tk. 18, and Others was Tk. 12 where home supplied was Tk. 06 and purchased was Tk. 06. It also show that purchased of paddy straw was Tk. 20 which was higher than other feed cost. Home supplied of green grass was Tk. 10 which was higher than other feed cost.

Cost of human labor

Human labor cost is another important cost item in dairy farming and this has implication for income and employment generation. In order of magnitude labor cost came next to feed cost. In this study, human labor was measured in man-days. One man-day was equivalent to 8 hours work of an adult man. For women and children, man equivalent day was estimated. This was computed by converting all women and children day into man-equivalent day according to the following ratio. 1 man-day = 1.5 woman day =2 child day

Table 7: Per cow cost of human labor per Day

Particulars	Number of Labor day			Wage/labor day (Tk)	Total cost (Tk)
	Home supplied	Hired	Total		
Human Labor	26	67	93	213	19809

Source: Field survey 2019

It is revealed table 7 that Total human labor was 93 persons where home supplied was 26 persons and hired was 67 persons. So say that dairy farmers are more dependent on hired labor than home supplied labor.

Total cost rearing a Cross-Breed Dairy Cow

Table 8 reveals that total costs per cross-breed cow per day amounted to Tk. 232 respectively of which feed cost shared 46 percent of the total cost for cross-breed dairy cow.

Table 8: Total cost rearing a Dairy Cow per Day

Particulars	Total Cost (Tk)	Percentage of total
Feed Cost	107	46%
Paddy Straw	33	14%
Green Grass	13	06%
Bran	15	06%
Oil Cake	08	03%
Salt	02	01%
Molasses	06	03%
Vitamin	18	08%
Other Feed Cost	12	05%
Labor Cost	71	31%
Housing Cost	32	14%
Veterinary Cost	22	09%
Total Cost	232	100%

Source: Field survey 2019

The cross-breed dairy cow owners gave more concentrate feed to their cows and which affects positively in milk production. It appeared from the table 8 that a cross-breed dairy cow per day cost of paddy straw cost occupies about 31 percent, green grass was 12 percent, bran was 14 percent, oil cake, salt, molasses, vitamin, other feed cost were 07, 02, 06, 17, 11 percent of total feed costs for cross-breed dairy cows respectively. The average total labor cost was estimated at Tk. 71 per Cow per Day for cross-breed dairy cows respectively. And average housing cost at Tk. 32 and veterinary cost at Tk. 22 per Day per Cow for cross-breed dairy cows respectively.

Total returns rearing a Cross-Breed Dairy Cow

The returns from dairy farming consisted of value of milk sold, value of cow dung, change in inventory and others.
Estimated total returns table 6.5 reveals that per cross-breed cow per day amounted to Tk. 376.

Table 9: Total returns rearing a Dairy Cow per Day

Particulars	Total Cost (Tk)	Percentage of total
Milk	354	94%
Cow dung	10	03%
Change in Inventory	06	02%
Returns from Others	06	02%
Total Returns	376	100%
Net Returns	144	
Benefit Cost Ratio	1.62	

Source: Field survey 2019

The cross-breed dairy cow owners gave more concentrate feed to their cows and which affects positively in milk production. It appeared from the table 9 that a cross-breed dairy cow per day from milk production amounted to Tk. 354. The average milk production per cross-breed dairy cow about 08 liters per day. Daily returns from Cow dung were Tk. 10. Daily returns from change in inventory Tk. 06 and daily returns from others Tk. 06.

Net returns of milk production

Net return was obtain by total cost was deducted from total return. Table 9 reveals that a cross-breed dairy cow per day from milk production amounted to Tk. 144.

Benefit Cost Ratio (BCR)

The undiscounted benefit cost ratio (BCR) is a relative measure which used to compare benefits per unit of cost. It helps to analyze the financial efficiency of the farms. Table 9 reveals that the BCR was 1.62.

Factors Affecting of Milk Production

For producing milk different kinds of inputs, such as Paddy Straw, Green Grass, Concentrate, human labor, Veterinary Charges, Housing etc. were employed, which were considered as a priori explanatory variables responsible for variation in milk production. Some other factors which also might affect production were management, farm size, food quality, Medicine, Artificial insemination charges etc. The use of these inputs was not made because of data limitation. Accordingly, multiple regression analysis was employed to understand the possible relationships between the production of milk and the inputs used.

Method of Estimation

For determining the effect of variable inputs to the production of milk, Cobb-Douglas production function was chosen on the basis of best fit and significance result on output. Moreover, use of Cobb-Douglas production function enables one to obtain the returns to scale directly. This model is also popular in applied work. The functional form of the multiple regression equation is as follows.

$$Y = a\, X_{1i}^{b1}\, X_{2i}^{b2}\, X_{3i}^{b3}\, X_{4i}^{b4}\, X_{5i}^{b5}\, X_{6i}^{b6}\, X_{e}^{ui}$$

This equation is individually applicable for dairy farmer of milk production because the same set of inputs as indicated in the model was used. This equation may be alternatively expressed as:

$$\text{Or, } \ln Y = \ln a + b_1 \ln X_{1i} + b_2 \ln X_{2i} + b_3 \ln X_{3i} + b_4 \ln X_{4i} + b_5 \ln X_{5i} + b_6 \ln X_{6i} + U_i$$

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 labor used per cow per day (Taka)

X_5=Cost of veterinary charges used per cow per day(Taka)

X_6 =Cost of housing used per cow per day (Taka)

a = Intercept

b_1, b_2, b_3 …… b_6= Production Coefficients

U_i = Error term

In = Natural logarithm

Interpretation of Results

Estimated values of co-efficient and related statistics of Cobb-Douglas production function of the farms which produced milk have been shown in Table 8.1. The following features were noted.

1. Cobb-Douglas production function fitted well for milk producing farms as indicated by F-values and R^2.
2. The value of coefficient of multiple determinations R^2 was 0.6649 for dairy farms, which indicates that 67 percent of the total variation in return was explained by the independent variables included in the model.
3. The F-values was significant implying that all the included explanatory variables are important for explaining the variation of income of farmers in milk production.
4. The result from the summation of all production co-efficient of dairy farmer was 1.2898. This figure implies that production function for dairy farmers displays increasing returns to scale.
5. The relative contribution of individual key variables affecting productivity of dairy farms can be seen from the estimates of regression equation. The results showed that most of the co-efficient had expected sign. However, the explanatory variables like paddy straw (X_1), green grass (X_2), concentrate (X_3), human labor (X_4), veterinary charges (X_5), and housing (X_6) were found to have significant effect on production in the case of dairy farms.

Table 10: Estimated values of co-efficient for the sample dairy farmers and result of the Cobb-Douglas production function model

Explanatory variable	Estimated coefficients
Intercept (a)	9.4522
Paddy straw (X_1)	0.1543 (1.9129)
Green grass (X_2)	0.1760** (2.4131)
Concentrate (X_3)	0.1506 (0.7654)
Human labor (X_4)	0.4367** (2.8815)
Veterinary charges (X_5)	0.3704** (5.3033)
Housing (X_6)	0.0018 (0.0375)
R^2	0.6649
F value	7.6092
Return to scale [$\sum bi$]	1.2898

Source: Field survey 2019

* = Significant at 1 percent level

** = Significant at 5 percent level

Dairy Farmer

Green grass (X_2): The value of the production co-efficient of green grass (X_2) was 0.1760 which was significant at 5 per cent level. This indicates that an increase of 1 per cent in cost of this input keeping other factors constant would result in an increase of gross return by 0.18 percent.

Human labor (X_4): The co-efficient for human labor (X_4) was 0.4367 and was significant at 5 percent level. This indicates that 1 percent increase in human labor cost keeping other factors constant, would increase the gross returns by 0.44 percent.

Veterinary charges (X_5): The value of the production co-efficient of Veterinary charges (X_5) was 0.3704 which was significant at 5 per cent level. This indicates that an increase of 1 per cent in cost of this input keeping other factors constant would result in an increase of gross return by 0.37 percent.

Paddy straw (X_1), Concentrate (X_3), Housing (X_6): The values of the production co-efficient of Paddy straw (X_1), Concentrate (X_3), Housing (X_6) were 0.1543, 0.1506 and 0.0018 which have no significant effect of milk production.

Value of R^2: The co-efficient of multiple determinations, R^2 was 0.6649 for dairy farmers which indicate that about 66 percent of the total variation in return of milk production is explained by the variables included in the model. In other words the excluded variables accounted for 34 percent of the total variation in return of milk production.

F-Value: The F-value of the equation was significant at 5 percent level implying that all the included explanatory variables were important for explaining the variations in milk production.

Returns to scale: The summation of all the production co-efficient indicates returns to scale. For milk production in dairy farms the rumination of the co-efficient was 1.2898 which means that the production function exhibits increasing returns to scale.

7. Conclusion

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.

8. Recommendations

The following recommendations are made for sound dairy development in the study area:

(a) The government should provide necessary assistance for establishment of feed mill in the private sector for making quality feed available in the market.

(b) The government should make arrangement for leasing khas lands to dairy farmers for fodder production wherever possible.

(c) 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.

(d) 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.

(e) 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.

(f) 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”

(g) The government should emphasize on education and manpower training in dairy activities.

(h) Plants of processing Urea Molasses Block (UMB), especially in sugar mill area of the country should be established, proper marketing facilities should be ensured.

(i) In order to improve preservation facilities, provision should be made for supply of insulated containers to the farmers at affordable prices.

(j) The DLS and the non-government organizations should strengthen their programmed to train the dairy farmers on dairy management, animal health care, sanitation and marketing techniques on priority basis.

9. Limitations of the Study

The researcher had to face the following problems in collecting data from the field:

i) Most of the respondents initially did not feel comfortable to answer questions since they thought that the investigator might use the information against their interest. To dispel this confusion a good deal of time was spent to gain their confidence.

ii) The dairy farmers did not keep records of their farming business. Therefore, the author had to depend upon their memory.

iii) Most of the respondents were illiterate which another hindrance to data collection to the researcher was. Sometimes respondents could not answer to questions accurately and to the point.

iv) The dairy farmers usually remain busy with regular work. So, the researcher had to visit some of them even at the field. The researcher sometimes also had to pay more than two visits to meet the fanner in cases they were not found either at houses or in the field nearby at first visit.

v) Most of the dairy farmers do not want to give proper or accurate information about input used in their rented in land.

In spite of all the difficulties, constant persuasion and untiring patience of the researcher made it possible to collect a reasonably accurate set of data from the respondent dairy farmers.

References

[1] Akhtaruzzaman, M. and Doi,T.(1997). "Returns of labour and Income Generation in Cross breed Dairy Farming in Rural Bangladesh, a Case Study of Bangladesh Rural Advancement Committee Cattle Distribution Programme". *Economic Affairs*, Vol, 42 No. 1, PP 38-43.

[2] Baruah, D.K.; A.B.D. arkar and N.N. Bora (1996). "Economics of milk production in Assam". *Indian Journal of Dairy Science*. Vol. 49, No.1, pp 17-23.

[3] Bangladesh Bureau of Statistics (BBS), 2004. Report on Labour Force Survey 2002-2003. Dhaka: Bangladesh Bureau of Statistics.

[4] Feng. J. and Y. Sugimoto (1994). "Comparison of cost and technical structure of milk production between Japan and USA". Technical Bulletin of Faculty of Horticultur. Vol. 48, pp 175-184.

[5] Haque, Q. F. et al. (2010). Institutionalization of Healthy Street Food System In Bangladesh. A Pilot Study With Three Wards Of Dhaka City Corporation As A Model. Report of the Consumers Association of Bangladesh (CAB) within the National Food Policy Capacity Strengthening Programme (NFPCSP). Dhaka.

[6] Michael, J. (1991). "dairy Development in Sub-Saharan Africa; A study of issues and options" World Bank Technical paper Number 135 the World Bank, Washington, D. C, USA cited from Pandit 1993.

[7] Kumar, P. and Balishter (2006). "Economics of cross breed cow and Murrah buffato - a study in Firozabad district of Uttar Pradesh. *Indian Journal of Dairy Science*, Vol. 49, No.6, pp 371-375.

[8] Sagar, R.L; O.N. Kunzru and B. Singh (2005). "Productivity of dairy cows as related to management attributes of milk producers". *Journal of Dairying. Foods and Home Sciences*, Vol. 14, No. 1& 2, pp 47-51.

[9] Sangu, IC.P.S. (2005). "Impact of dairy cooperative societies on production, consumption and marketed surplus of milk". *Indian Dairyman*. Vol. 47, No. 8, pp 43-46.

[10] Singh, H. and R.P. Shiha (2001). " Milch-Critical to Anti-Poverty Rural Development Programme." *Indian Journal of Agricultural Economies*, Vol.. 35, No. 4, pp 160.

[11] Singh, R and Radhey Sham (2000), " The Role of Dairy Enterprise in offering Gainful Employment to Women Workers in Rural Areas of Azamgarh District, East Uttar Pradesh." *Indian Journal of Agricultural Economics,* Vol. 35, Bo. 4, p 169.