

Original Research Article**Profitability and Factors Affecting Milk Supply: An Empirical Study on Dairy Farms in Chittagong Districts of Bangladesh****ABSTRACT**

It was an attempt to examine the profitability and factor affecting milk supply of dairy farms in selected areas in Chittagong districts. Primary data were collected from both milk producers and traders during the months of August to September 2015. Simple descriptive method and stepwise multiple regression models were used to analyze the data. The return over investment indicates that dairy farming is profitable business in Chittagong district. Stepwise multiple regression models was specified and estimated to identify the factors affecting of milk supply of dairy farmers. Marketed surplus of milk was found to be an important element in the study of raw milk marketing. Regression analysis revealed that three variables i.e., Number of milking cows, age of household head and experience of dairy farming, as important factors affecting sale volume of milk. The survey result identified that the supply of milk trading was predominantly traditional, fragmented and only one cooling plant which have limited capacity but no other formal agreement either collectors or farmers. As a result most of the surplus milk absorbs by the sweetmeat shops.

Keywords: Profitability, Marketing costs and margin, Milk Supply

1. INTRODUCTION

Dairy farming is an integral farming system in Bangladesh. It is an activity involving investment for milk production and marketing. Dairying plays a vital role in respect of nutrient, generation of income and employment. It is more efficient and intensive system in terms of nutrient and protein production for human consumption from a given quantity of resources than beef or sheep farming. Dairy farming also supports substantial employment in production, processing and marketing [1]. Bangladesh is country of rural based subsistence agriculture. About 47.6% of total labour force is engaged in this sector [2]. Livestock sector contributes 1.78% in GDP out of the 16.33% contribution of the agriculture sector in the economy [3]. The total production of milk in Bangladesh in 2006-07 was 22.8 lac tons

which was increased to 60.90 lac tons in 2013-14 [2]. In this context as dairy farming stands a profitable business everywhere in the world, so dairying in the recent decades has been considered a vital component in the diversification in Bangladesh. Dairying in Bangladesh has been practiced for a long time at a small scale. Some noticeable development has also taken place in breed improvement. In Bangladesh cross breeding of local cows with Australian, Shahiwal, Holstein Friesian, Jercy, etc. are often seen in the rural areas. These cross breed are found as higher in terms of milk and meat. Milk is also considered as an ideal and a completed food for the people of the whole world. There is no more complete food that milk yet known to mankind. Moreover, milk today is a rare commodity even for many children. Both population growth and rising income are contributing to rapid expansion in the demand for milk and its products as it has high income elasticity of demand [4]. As a result of the development of modern civilization and culture, particularly the emergence of high income urban population group has changed the pattern of milk consumption. They prefer packaged milk over ordinary raw milk. With the alarming growth of population, the demand for milk and dairy products rises faster than the demand for crops both in developing and developed countries. Due to fact that production of milk and milk products has also reportedly increased in Bangladesh in the last decade, though it is much more or less than the original demand. There are some milk pocket areas in the country where dairy farming has been traditionally an important and major component as mixed farming system. These areas are particularly located in Pabna, Sirajgonj, Manikganj, Faridpur, Kishoreganj, Rangpur, Tangail districts and now it is extended to Chittagong districts, as one of the dairy producing emerged areas. The numbers of cross breed private dairy farms have been increasing in the study area over the last few years. As it is labour intensive farming and support employment in production, processing and marketing, so, development of dairy enterprise is essential to create the employment opportunity of the people in the country in general and Chittagong region in particular. Development of this sub sector may be considered as an important strategy of poverty alleviation which is an objective of the government of Bangladesh. Several studies conducted by different researchers [5, 6, 7, 8, 9, 10] influenced to analyze the profitability and factors affecting of milk supply on dairy farms in Chittagong district. The present study was undertaken with the specific objectives of examining the profitability of dairy farms, estimating the marketing cost and margin of milk traders and analyzing the factors affecting of milk supply to the market.

2. METHODOLOGY

On the basis of specific objectives of the study and taking into consideration with associated limitations, two Upazilas (Patiya and Banskhal) and Chittagong metropolitan city in Chittagong districts were purposively selected as the study area because of that comparatively higher concentration of high yielding cross breed dairy cow. A sample of 55 milk producers and 35 milk traders were selected by using simple random and convenience sampling technique respectively. Required data were collected through direct personal interview during the month of August to September 2015. The collected raw data was carefully checked to detect errors and omissions and to avoid irrelevant information. In order to achieve the objectives, descriptive statistics and the following analytical techniques were used.

Net Return of Milk Producer: To analyze the costs and returns of the milk producers or dairy farms by tabular analysis following profit equation was used.

$$\pi = P_m \times Q_m + V_{bp} - \sum P_{xi} \times X_i - TFC$$

Where,

Π = Profit of milk producer per year per farm

P_m = per unit price of milk (Tk./litre)

Q_m = quantity of milk (Litre/year)

V_{bp} = Value of by product (Tk. /year)

TFC = total fixed cost of milk producer per year per farm

P_{xi} = per unit price of i-th inputs (Tk.)

X_i = quantity of the i-th inputs per year per farm (kg)

$i = 1, 2, 3, \dots, n$ (number of input)

The BCR (undiscounted measure) was calculated by using the following formula:

$$\text{Benefit cost ratio (BCR)} = \frac{\text{Gross return}}{\text{Total cost}}$$

The marketing margin and net margins of milk traders were estimated by using following formula:

i) Gross marketing margin (Tk./litre) = Sale price (Tk. /litre) – purchase price (Tk. /litre).

ii) Net margin (Tk. /litre) = Gross marketing margin (Tk. /litre) - marketing cost (Tk. /litre)

Market Supply Model: Following multiple regression models was used to analyze the factors affecting farm level milk supply [11].

$$Y = X'\beta + U$$

Where,

Y = quantity of milk supplied/marketed volume to market

X' = a vector of explanatory variables (Number of milking cows, age of household head, gender of household head, education of household head, family size, experience, distance to market, market information, price of milk, veterinary training and off farm income.)

β = a vector of parameters to be estimated, U = disturbance term.

Table 1: Description of the dependent and independent variable

Variables	Types	Values
Total milk marketed /sales volume(TMMV)	Continuous	litres
Age of house hold head(AHH)	Continuous	Number of years
Sex/Gender of household Head(SHH)	Dummy	Male=1, Female=0
Education of Household Head(EHH)	Dummy	Literate=1, illiterate=0
Total Milk Production(TMP)	Continuous	litres
Family Size(FS)	Continuous	Number of Family Member
Experience(EXP)	Continuous	Number of years
Number of Milking Cows(NMC)	Continuous	Number of Cows
Veterinary Training(VT)	Dummy	Yes=1, No= 0
Price of Milk(PM)	Continuous	Taka per litre
Distance to Market(DMT)	Continuous	Kilometer
Market information(MIF)	Dummy	Yes=1, No=0
Off farm income(OFFI)	Continuous	Taka

3. RESULT AND DISCUSSION

3. 1 Cost and Return of Rearing Cross-breed Dairy Farm

The total annual costs and return per farm of rearing cross-breed milching cows are presented in Table 2. The total cost per year per farm was estimated at Tk.145448.77. Feed was one of the major cost items (60.18 percent) of rearing cross-breed milching cows. Cost of feed included expenses on

paddy straw, green grass, rice bran, salt, vitamin, maize bran, pulse bran, molasses, oil cake, and wheat bran and others. The total feed cost per year per farm was estimated at Tk. 87529.12. The return of dairy farm consisted return from milk production, cow dung and calf. The total gross return was Tk. 198542.73 and the net return per farm per year was Tk. 53093.96. The BCR (undiscounted) is a relative measure is used to compare benefits per unit of cost. Table shows that benefit cost ratio of dairy farm was 1.37, which indicating that investment in dairy farming was profitable for individual producers point of view (Table 2).

Table 2: Total annual cost and return of raising Cross-breed dairy farm

Items	Tk./year
Variable Costs:	87529.12(60.18)
Feed cost	
Labour cost	
Electricity charge	
Veterinary cost	
Miscellaneous cost	
Fixed Costs:	10305.26(7.09)
Housing cost	
Costs of capital	
Interest on operating capital	
Total cost	145448.77(100)
Return:	179400
Milk	
Cow dung	
Calf	16381.82
Total Return	198542.73
Net return	53093.96
BCR	1.37

Number of milching cows per farm	1.96
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Source: Field survey (2015)

Note: Figures within parenthesis indicate percentage of total costs

3.2 Milk Marketing Channels

In the study areas a number of marketing channels were observed. A sketch of overall milk marketing channels for the study area is shown in following figure;

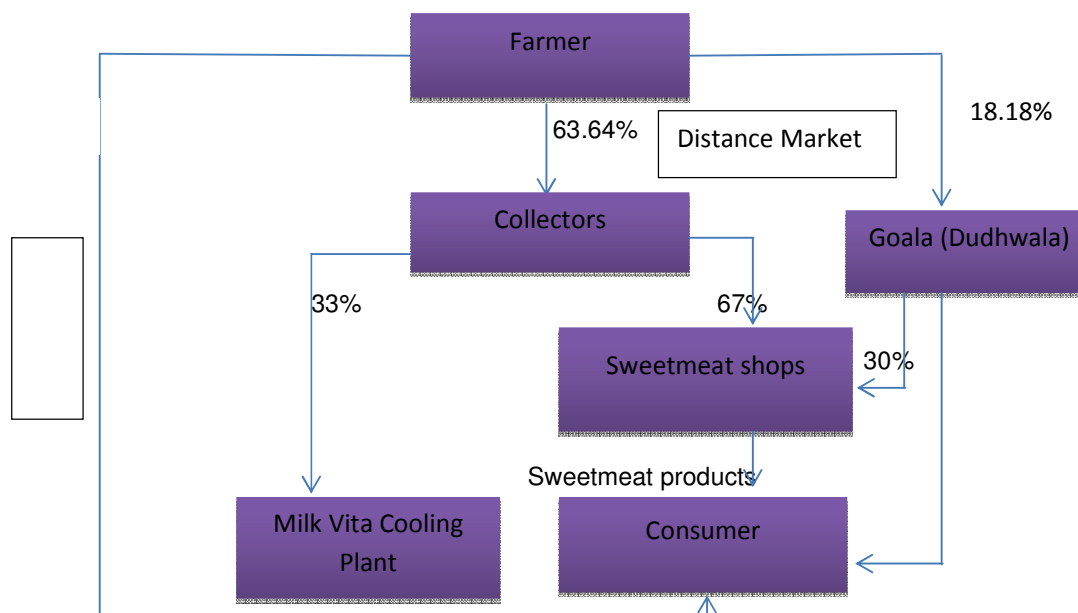


Figure 1: Marketing channels of raw milk in the study area

Marketing channels of raw milk in the study area moves from the producer to the ultimate consumer through direct and indirect marketing channel. The main and most important two marketing channel, which accounts for 63.64% of total milk marketed. This was the case reason this two channel can absorb a large amount of surplus milk in the region while the local demand for milk is much less than supply in the study area. The percentage of total supplied milk to the sweetmeat shops was varies during the month of May to august because of summer or fruits season. So, the main and most important two marketing channel are shown in below;

Farmer —> Collector —> Sweetmeat shops —> Consumer
 Farmer —> Collector —> Milk Vita cooling plant

3.3 Marketing Cost and Margin of Milk traders (Collectors)

Marketing cost of milk collector includes labour, transportation, milk container, spoilage, rent, electricity and personal expenses etc. The average estimated marketing cost per litre of milk incurred

by the milk collector was 3.39. The gross margin was Tk. 6. So the net margin by milk collector was Tk. 2.61 per litre (Table 3). The total marketing costs of milk collectors was low because of that, per day raw milk transaction of collectors was 1371.4 litres (on average) and market concentration ratio of milk collector was highest in sampled area.

Table 3: Marketing costs and margin of milk traders (collectors)

Particulars	Tk./litre
Labour	2.28
Transportation	0.56
Milk container	0.02
Spoilage	0.01
Rent	0.12
Electricity	0.17
Mobile costs	0.09
Personal Expenses	0.14
Total Marketing Cost	3.39
Average purchase price	45
Average sales price	51
Gross margin	6
Net margin	2.61
Volume of milk trading per day (liters on an average)	1371.4

Source: Field survey (2015)

3.4 Marketing Cost and Margin of Goala (Dudhwala)

Marketing cost of Goala (farmer called dudhwala) includes labour, transportation, milk container and personal expenses etc. the average estimated marketing cost per litre of milk incurred by the milk traders was 12.39. The gross margin was Tk. 18. So the net margin by milk traders was Tk. 5.61 per litre (Table 4).

Table 4: Marketing costs and margin of milk traders (Goala)

Particulars	Tk./litre
Labour	6.52
Transportation	3.64
Milk container	0.13
Spoilage	0.59
Personal expenses	1.51
Total marketing cost	12.39
Average purchase price	46
Average sales price	64
Gross margin	18
Net margin	5.61

Source: Field survey (2015)

3.5. Econometric Analysis

Before run the regression of the study, correlation was tried to find out the relationship between total production of milk and number of milking cows for best fitted model. Correlation coefficient shows that, this two variable are strongly positively correlated with statistically significant ($r = 0.94$, $P=0.00$) and reject the null hypothesis. According to the result and review the several studies [12, 13, 14, 15] the study used the number of milking cows for avoiding the multicollinearity problem and autocorrelation.

3.5.1 Regression Results of factors affecting milk supply

The results of the econometric analysis (stepwise multiple regression models) examine the characteristics of milk producers and its impact on marketed supply of milk to the market. Different variables were expected to influence the volume of marketed surplus of milk like age of household head, sex of household head, education level of household head, family size, experience of dairy farming, Number of milking cows, access to extension training (veterinary training), market information , price of milk , off farm income and distance from the market. Stepwise multiple regression models were employed to analyze the factors that affect the supply of milk. A VIF for continuous variables and contingency coefficient values for discrete variables were computed to check the existence of

multicollinearity problem. The results revealed that no significant problems of multicollinearity and high degree of association among continuous and discrete variables were detected. Durbin Watson (2.17) test used to detect the autocorrelation. The result reveals there is no autocorrelation among the variables. Among the eleven hypothesized factors affecting marketed surplus of milk, three variables (Number of milking cows, Age of household head and experience of dairy farming) were found significant. The coefficient of multiple determinations (R^2) was estimated 0.91 and adjusted R^2 was 0.90. This means that 91% of the variation in the dependent variable is explained by the explanatory variables included in the model. Furthermore the adjusted R^2 of 90% which is significant has further consolidated the goodness of the model, hence, its econometrics significance and reliability (Table 5).

Table 5: Stepwise Regression Results of factors affecting of Marketed Surplus of Milk

Independent variable	Coefficients	t	Sig	VIF
Constant	-6.67	-3.42	0.00	
Number of milking cows	6.24***	15.29	0.00	1.88
Age of house hold head	0.08**	2.34	0.02	1.02
Experience of dairy farming	0.21**	2.14	0.03	1.90
F-statistics	180.33***			
R Square	0.91			
Adjusted R Square	0.90			
Durbin Watson	2.17			

Dependent Variable: Total Volume of milk supplied per day per dairy farms (litres)

*** , *** indicates significant at the level of 5% and 1% respectively.*

As hypothesized number of milking cows (MCO) has positive effect on marketed milk volume and is significant at 1% probability level. The model output predicts that the addition of one dairy milk cow causes the marketable cow milk surplus of the dairy household to rise by 6.24 liters per day per dairy household. This result is plausible and suggests that marketable milk surplus of the household in the study areas are more responsive to number of milk cows. Furthermore, this result illustrates that marketable milk surplus per day increases in responses to the increase in number of milking cow. In addition to that, the age of household head had a positive and significant impact on milk marketed volume of sampled dairy farms. The positive and statistically significant relationship between two variables indicates that older dairy household head could have more milking cows increasing the

possibility of household milk marketed volume. The result also elaborates that when the household age increases by one year, the probability of milk marketable volume increases by 0.08 litres per day per dairy household.

Experience of dairy farming has a positive effect on milk sales volume per household and is statistically significant at 5% probability level. The result suggests that as farmers have high dairy farming experience the amount of milk supplied to the market increased through its effect on milk production. The model also confirms that every one year of experience in dairy production leads to a rise in daily milk sales volume by 0.21 litres per day per dairy household.

4. CONCLUSION

Dairy farming is an economic activity involving investment for milk production and marketing. The study aimed at profitability and factors affecting milk supply of dairy farmers. Result revealed that, the benefit cost ratio (BCR) indicates that dairy farming is profitable business in Chittagong district and econometric results also indicate that number of milking cows, age of household head and experience of dairy farming, significantly associated with marketed supply of milk. Dairy farming is a profitable business although it has been facing problems in relation to the production and supply of milk. Though the study areas only one cooling plant which have limited capacity but have no formal contract with either collectors or dairy farmers. As a result most of the surplus milk absorbs by the sweetmeat shops. If proper remedial measures could be taken and formal institutional arrangements could be established, then milk production and supply could be a viable and more extend in commercial enterprise which in turn would play a vital role to overcome the problems of low income, unemployment, under nutrition and unfavorable balance of payment situation of the country. Therefore, the government should provide necessary assistance for establishment of feed mills in the private sector for making quality feed available. The DLS and NGOs should strengthen their programs to train the dairy farmers on dairy management, animal health care, sanitation, and marketing techniques of milk on priority basis. In order to improve preservation facilities provision should be made for supply of isolated containers to the farm owners at affordable price.

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