



Financial profitability analysis of dairy milk production in some selected areas of Bangladesh

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ABSTRACT

The study analyzed profitability and productivity of dairy milk production from a survey of 70 respondents (farmers and market actors) in Dhaka region. Responsible factors that affect dairy milk production were identified using the Cobb-Douglas production function. The findings unveil that significant coefficients of variables exhibit positive impact on the dairy milk production. It is possible for dairy farmers to enjoy sufficient profits from milk production since earned gross return and net return were Tk. 1099 and Tk. 594, respectively against the total cost of production Tk. 487.83 per cow per day. Average production of milk per cow was 12.5 liters. The estimated Benefit Cost Ratio (BCR) was 2.17 that is dairy farmers earned Tk. 2.17 investing one taka in dairy farming.

Keywords: Dairy farming, Milk production, Profitability, Cobb-Douglas production function, Benefit Cost Ratio (BCR)

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Introduction

The economy of Bangladesh is mainly based on agriculture, which is a predominant sector with about 60 percent of arable land (BBS, 2017a). It plays central role in accelerating the economic growth and development (Alam *et al.*, 2009). A productive, safe and environment friendly agricultural system is a prerequisite for ensuring long-term period food security for citizens.

Agriculture has been given the highest priority to ensure food security in Bangladesh (Bhuiyan and Karim, 1999). The Seventh Five Year Plan-2015 and National Agriculture Policy-2018 have been taken by the government for the overall development of agriculture sector (MoA, 2018; PC, 2015). Over the last few years, food production is on an increase (Mohajan, 2018). Food grains production stood at around 388.14 lakh metric tons (MT) (BBS, 2017a). The agricultural sector (crops, animal farming, forests and fishing) contributes 14.74 percent to the country's GDP, provides employment to about 41 percent of the labour force, according to Quarterly Labour Force Survey 2015-16 (BBS, 2017b). GDP from Agriculture in Bangladesh increased to 10117.30 BDT Million in 2017 from 9922.80 BDT Million in 2016 (BBS, 2017a). Dairy is the most important livestock sub-sector in Bangladesh's economy since it provides both nutrition and income for farm families as well as

rural and urban non-farm jobs (Uddin *et al.*, 2011). Unfortunately, about half of the country's population remains beneath the accepted poverty threshold. Consequently, they are deprived of the basic calorie intake, 2122 kcal per day per person (MoF, 2018). Dairy sector can appear as a promising horizon in this aspect. The contribution of the animal-farming sub-sector to GDP was 1.60 percent in 2017 (BBS, 2017a). Though the share of this sub-sector in GDP is not sizeable to date, it makes remarkable contribution towards meeting the requirements of daily essential animal protein for human consumption, reduction of poverty, cultivation of land, as well as production and export of leather and leather goods. A number of initiatives have been taken for sector-wise development of livestock (Uddin *et al.*, 2011). Since dairying is a profitable enterprise (Hafeez and Rahman, 2014), it directly enhanced the household income providing high value outputs from low value inputs besides acting as wealth for future investment (Siddiky, 2017). According to the estimate of the (DoF, 2017), the population of livestock rose to 647.45 lakh in 2017 while GDP growth rate of livestock was 3.32% with a volume Tk. 35567 crores in GDP at current price. Additionally, the share of livestock in agricultural GDP was 14.31% along with the contribution to direct and partial employment 20% and 50%



respectively (DLS, 2017). Around 50% of arable land was occupied for livestock rearing. The contribution (25%) of livestock and poultry in fuel supply is not negligible at all (DoF, 2017). Fourteen structured industries have been operating dairy businesses in Bangladesh, including Milk vita, BRAC, and PRAN, which hold most of the market shares (Haque, 2009). The production of animal protein like milk, meat (beef, mutton, chicken) has been increasing over the past several years (BBS, 2017a). As a result, per capita availability of animal protein is on a rise (Huque and Sarker, 2014).

Finding from previous studies revealed the profitability of dairy cattle rearing for independent and contract farm (Begum *et al.*, 2017). Although production of dairy milk in the country has been accelerating, the rate of increase is not sufficient to meet the striking demand (Shamsuddoha and Edwards, 2000). The production of milk per crossbreed cow was higher than that of local breeds (Alam *et al.*, 1995). In supply chain of wholesale milk markets, the gains of sweet meat shops were comparatively higher than the other market actors (Mandal *et al.*, 2008). There is a direct link between increasing income and reducing poverty since the increase in household income is a result of dairy support services implementation to a level above the poverty line (1.9 US\$/day equivalent to 147.96 BDT) (Uddin *et al.*, 2017). Very poor knowledge of farmers' in cattle reproductive management was not unprecedented (Islam *et al.*, 2016). Economic opportunities for planning interventions greatly increase farmers' compliance with an extension programmed (Shamsuddin *et al.*, 2006). According to Das *et al.* (2016), farmers' unfamiliarity and scarcity of knowledge made them reluctant to adopt advanced machineries whereas modernization through partial mechanization can have a conspicuous contribution in dairy milk production in Bangladesh. Imperfect milk market was responsible for the construction of inefficient tax and tariff policies, which is good enough to halt the spontaneous growth of dairy sector (Jabbar, 2010). To proclaim dairy farming as an attractive and profitable enterprise, rigorous research is necessary where extension services can have mentionable impacts (Shamsuddoha and Edwards, 2000).

Scale up of the number of dairy farms, over the years in the capital city of Bangladesh is conspicuous. The focus of those farm owners is to grab the prospective milk market and fulfill the ever-increasing demand of milk to city dwellers. Additionally, research on responsible factors that affect the productivity of dairy milk is not adequate in this particular area. Considering the above situation, present study was commenced to identify factors that affect the productivity and to assess the financial profitability of dairy milk production in few selected areas of Dhaka region.

Methodology

Study area

This study was conducted in Dhaka district of Bangladesh since almost all of the farmers in this area operate their farms commercially. To initiate, a list of dairy milk producers was collected, from where another list was created through the random selection of 50 producers. Since they sell fresh milk not only to neighbors but also to sweet shops, wholesalers, retailers, *goalas* (milkmen) direct consumers and relevant data from 20 market actors were assembled. Data were collected through face-to-face interviews of milk producers and market actors from January 2018 to March in 2018.

Analytical technique

With the support of the Cobb-Douglas production feature methodology, the input-output relationship in dairy farming was analyzed. The function was successfully utilized in previous studies (Datta *et al.*, 2019). The following model specification was used to assess the contribution of the most important variables to the dairy farming process:

$$Y = aX_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} e^{u_i}$$

The output function of Cobb-Douglas has been converted into a dual logarithmic form so that it can be solved by the system of ordinary least squares (OLS).

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

Where, Y = amount of milk production (liter/day), X_1 = utilities (number), X_2 = number of human labour (man-days/month), X_3 = amount of green grass and straw (kg/day), X_4 = amount of rice dust and wheat husk (kg/day), X_5 = amount of *khasari* (grass pea) husk and pulse husk (kg/day), \ln = natural logarithm, a = intercept, b_i = production coefficients and U_i = error term. The aim of the research and previous literature, Datta *et al.* (2019) and Sajjad and Khan (2010), helped to determine the explanatory variables to be included.

Profitability analysis

Determination and comparison of profitability among dairy farm families can be possible with cost and return analysis. Multiplying the aggregate quantity of commodity and by-product with their respective prices, the gross return per cow per day was determined. Therefore,

$$GR = \sum Q_m P_m + \sum Q_b P_b$$

Where, GR = gross return, Q_m = amount of the milk produced (liter), P_m = per unit price of dairy milk (Tk. /liter), Q_b = amount of by-product, P_b = per unit price of by-product.

Generally, farmers wanted to maximize return over variable cost of dairy milk production, which justified the gross margin analysis. In order to unveil gross margin, total variable cost was subtracted from gross return. Net return or profit was calculated by deducting the total cost of production from the aggregate return or gross return for per cow per day. Average return to each taka spent on dairy milk production is a main criterion for profitability estimation. Considering this, BCR on total cost was calculated which is the ratio of total return to total cost.

Results and Discussion

The cost of production is considered as a crucial factor for any type of farming decision. The total cost per day per cow was estimated at Tk. 487.83 where lion's share (about 90 %) of total cost was from variable items. Hence, variable and fixed items were calculated separately. Average variable cost was found to be Tk. 438.98 and the fixed was Tk. 48.85, which was only one-tenth of total cost (Table 1). The average marketing cost was Tk. 17.16 per day per cow, which was the accumulation of the cost of labour, electricity, card for branding, polythene, transportation, and container used in dairy milk production (Table 2).

Table 1. Cost of rearing dairy cows per cow per day.

Cost Items	Average Tk./day/cow	Percentage of Total
Variable cost		
A. Cow feed cost	300.29	61.56
Straw	40.14	8.23
Green grass	60.45	12.39
Rice dust	35.61	7.29
Oil cake	20.54	4.21
Wheat husk	49.64	10.18
Khasari husk	40.61	8.33
Pulse husk	22.83	4.68
Broken rice	19.77	4.05
Mineral mix	4.50	0.92
Molasses	6.20	1.27
B. Labour Cost	98.96	20.28
C. Doctor cost +Medicine	29.19	5.99
D. Electricity Cost	8.53	1.75
E. Miscellaneous cost	2.01	0.41
Total Variable Cost(TVC)	438.98	89.98
Water pump	0.47	0.10
Housing cost	1.77	0.37
House rent	22.30	4.57
Cost of capital	24.31	4.98
Total Fixed cost (TFC)	48.85	10.02
Total Production cost	487.83	100
Production cost Tk./Liter	48.78	

Source: Field Survey, 2018

Table 2. Marketing costs per cow per day.

Cost items	Tk/cow/day
1. Labour	2.01
2. Electricity	3.01
3. Card cost(branding)	0.30
4. Polythene cost	3.04
5. Transportation cost	5.02
6. Container cost	3.78
Total marketing cost	17.16

Source: Field Survey, 2018

Returns of dairy farming

The dairy milk farmers were scattered in the study area. They sold raw milk to final consumers, bazar, sweet shop, wholesaler, and neighbors at different prices. Generally, they received Tk. 84, 59, 58 and 65 per liter from consumer, wholesalers, sweet shoppers and nearby markets, respectively. In the study area, average yield of dairy milk per cow per day was 12.5 liters, which was comparatively higher than the findings of [Datta *et al.* \(2019\)](#), and its money value was Tk. 975. The average values of calf and cow dung were Tk. 122 and Tk. 2.29, respectively. Gross return from milk produced per day per cow, calf sold, cow dung sold was 1099 Tk. (Table 3). Net return on per cow per day was measured at Tk. 594, which implies that dairy milk production was a profitable enterprise for the small and medium dairy farmers and the result is

in the line with the findings of [Islam *et al.* \(2018\)](#). The relative profitability of dairy farming can be estimated by gross margin, which takes into account only the variable cost included in the production process. The gross margin of dairy milk production was estimated at Tk. 660 per cow per day (Table 3). Financial efficiency of the dairy milk production was estimated by BCR in this study. The benefit cost ratio of dairy milk production per cow per day was 2.17, which implies that Tk. 2.17 would be earned by investing Tk. 1.00 for dairy milk production per cow per day, which was higher than previous studies ([Islam *et al.*, 2018](#); [Hafeez and Rahman, 2014](#); [Alam *et al.*, 1995](#)). Therefore, the dairy farming was found to be more profitable enterprise for dairy farmers than earlier days.

Table 3. Gross margin and net return from dairy farming.

Particulars	Tk./day/cow
a) Gross return	1099.00
b) Variable production cost	439.00
c) Fixed production cost	48.85
Production cost	487.83
Marketing cost	17.16
d) Total cost (Production + Marketing)	505.00
e) Gross margin(a-b)	660.00
f) Net return(a-d)	594.00
g) Net return (per liter of milk)	59.40
h) Return on cost {(f/d)*100}	117.62
i) BCR (a/d)	2.17

Source: Field Survey, 2018

Table 4. Estimated coefficients and related statistics of cobb-douglas production function.

Items	Coefficient	t- value	P- value
Intercept (a)	1.586***	6.184	0.000
Utilities (X ₁)	0.189**	2.026	0.049
Total labour (X ₂)	0.171*	1.703	0.096
Green grass and straw (X ₃)	0.130**	2.419	0.020
Rice dust and wheat husk(X ₄)	0.291**	2.344	0.024
Khasari and other pulse husk (X ₅)	0.239**	2.226	0.031
R ²	0.877		
Adjusted R ²	0.863		
Returns to Scale	1.020		
F- value	62.978***		

Note: *, **, and *** indicate 10, 5 and 1 percent level of significant respectively.

Source: Field Survey, 2018

Regression model with Cobb-Douglas production function

The regression coefficients of utilities, green grass and straw, rice dust and wheat husk, and *khasari* and other pulse husk estimated through Cobb-Douglas production function were positive and significant at 5% level whereas coefficient of human labour was positive and significant at 10%

level which indicated that if utilities, number of labour, green grass and straw, rice dust and wheat husk, and *khasari* and other pulse husk were increased by one per cent, the production of dairy milk would be increased by 0.189, 0.171, 0.130, 0.291 and 0.239 per cent respectively. Similarly, [Rashid *et al.* \(2015\)](#) represented significant positive impact of green grass, straw, and rice bran on traditional dairy farming in

Gazipur while wheat bran was added in the list instead of rice bran in case of commercial dairy farming in both Gazipur and Serajgonj. The values of the coefficient of multiple determination of dairy milk production was found to be 0.877 which implied that about 87 percent of the total variation in the milk production could be explained by the included explanatory variables in the model (Table 4). The summation of all coefficients related to dairy milk production was equal to 1.02, which means that the production function for dairy milk production expresses increasing returns to scale. If all the variables listed in the model were increased by 1%, gross milk production would also be increased by 1.02% (Table 4).

Conclusion

Dairy farming is considered as one of the important income generating activities to farmers. The study areas exhibited tremendous potentiality for dairy milk production. The result of this study indicated that dairy milk production was highly profitable and it would help to improve the socio-economic condition of dairy farmers in the study areas. Since dairy farming is a capital-intensive enterprise, it is difficult to increase milk production within short period due to scarcity of labour and lack of credit facility in Bangladesh. Farmers were relatively inefficient for being small and marginal. Additionally, lack of adequate space, training, education, political unrest made the problem more severe. Dairy milk production can be a lucrative commercial enterprise through proper monitoring and intervention of Govt., which would play a dynamic role to achieve food and nutritional security along with to alleviate poverty, raise income and stabilize balance of payment situation of this country.

Declaration of conflicting interests

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