Ann. Bangladesh Agric. (2015) 19 : 11-21 *ISSN 1025-482X*

FINANCIAL ANALYSIS OF DAIRY FARMING IN SELECTED AREAS OF BANGLADESH

M. M. O. Rashid[1], M. Kamruzzman[2] and A. R. Anik[2]

Abstract

The study was undertaken to examine the profitability and resource use efficiency of dairy farming under traditional and commercial management at rural households and farms. For obtaining information from farmers two milk producing districts namely Sirajgonj and Gazipur were selected purposively for this study. Data were collected from dairy farmers using pretested questionnaire during April to July, 2011. Productive performance, cost of farming and returns were collected to determine cost benefit ratios. The sample size were 200 dairy farmers including commercial and traditional farmers. The benefit-cost ratios of traditional and commercial farmers were on an average of 0.865 and 1.34, respectively. Traditional farmers decreased milk production cost by decreasing the use of labor and concentrated feed. Among all the production inputs, labor is the most dominant input for dairy production. The present study revealed that the dairy farming under commercial management was more profitable than traditional farming. Traditional farming was less profitable mainly due to small herd size, low productivity of animal and extra family labor were engaged. The returns to scale and production elasticity revealed that the dairy farmers could not use inputs efficiently. Both traditional and commercial farmers had abundant opportunities to increase output and income by using modern technologies, suitable breed and use of inputs properly.

Introduction

Bangladesh is a densely populated country with an acute shortage of milk. Generally dairy in the country is practiced as a part of crop-livestock farming system with one or two cows. The average milk production in Bangladesh is less due to low productivity of dairy animals, and lack of proper care and management (BER, 2012). Due to this acute shortage in domestic milk production and high income elasticity of demand for milk there is a good potential for growth of dairy sector. Despite the high demand of milk and milk products, the dairy farming is not growing with the pace of requirement of the country. In Bangladesh from 2005/06 to 2011/12 increased 22.80 million to 23.17 million cattle population but milk production decreased from 2.27 million metric tones to 2.12 million metric tones. Although the production of milk was highest in 2008/09 which was 2.66 million metric tones (BER, 2012).

The economy of Bangladesh depends on livestock sector and contributes 2.57 percent to the gross domestic product (at constant prices with 1995-96 as base) in Bangladesh during 2010-11, whereas the contribution was 2.88 percent in 2006-07. Therefore, the

[1.] Associate Professor, Department of Basic Science, Patuakhali Science and Technology University,[2] Professor and Assistant Professor, Department of Agricultural Economics, BSMRAU, Gazipur.

contribution of livestock sector is declining to the GDP of Bangladesh. Although the sharing of livestock in the GDP has declined over the past few years, livestock production becomes very successful in increasing livestock population (BER, 2015).

As a source of supplying animal protein to human diet, milk occupies second position after meat and egg. The per capita availability of milk is 45 ml. against the minimum requirement of 250 ml (DLS, 2006/07). There is a huge gap between requirement and the availability of milk. Small scale dairy production and related backward and forward linkage activities in marketing; input supply, etc. have the potential for significant employment generation and poverty alleviation (Jabbar, 2010). Dairy generates more regular cash income and dairy production, processing and marketing generate more employment per unit value added compared to crops (Asaduzzaman, 2000; Omore et al., 2002).

The present study was scheduled to determine the level of production of dairy cows in some selected rural areas of Bangladesh. The study will also facilitate to formulate appropriate policies for future improvement of milk production system in the rural areas of Bangladesh.

The specific objectives of this study were to investigate profitability, resource use efficiency and provide policy guidelines for increasing the availability of milk in the market.

Materials and Methods

The study utilized the primary data. The necessary primary data were obtained from the sample dairy farmers through personal interview with the help of pre-tested and structured schedules during April to July, 2011. The data collected from the sample farmer respondents included general information about dairy farmers, productive performance of dairy cows, cost of farming and returns from farming. Two milk producing districts were selected purposively namely Sirajgonj and Gazipur having two Upazilas in each district, were selected on the basis of concentration of dairy production. The selected Upazilas were Sreepur and Joydevpur in Gazipur district, Shahajadpur and Ullahpara in Sirajgonj district. Sampling size was determined at 95% confidence level and 10% sampling error. In order to reach the maximum sampling volume p and q ratios were obtained. Sampling formula details are given below (Newbold, 2000) :

$$n = \left(\frac{Z\,\alpha/2}{d}\right)^2 .p.q$$

Where n is the sample size, Z α/2 is the confidence level, d is the sampling error, p is the ratio of farmers conducting production analysis and q is 1- p. One hundred traditional farmers and One hundred commercial farmers were selected following random sampling technique from each of the two districts.

Estimate of production elasticity

The function coefficient (ε) measures the proportional change in output resulting from a unit proportional change in all inputs, i.e., ε is the percentage of change in output as all inputs are varied in some fixed proportion. It is mathematically defined as:

$\varepsilon = (dy/y)/(dx_n/x_n)$ Where, ε is total elasticity of production

We know the total differentiation of n variable factor model as:

$$dy = f_1\, dx_1 + f_2\, dx_2 + \ldots\ldots + f_n\, dx_n$$

Or, $\varepsilon = E_1 + E_2 + \ldots\ldots + E_n$

Where, $f_i = MPP_1 = d(TPP)/dx_1 = dy/dx_1 = df(x_1, x_2, x_3, \ldots..X_n)/dx_1$

$f_2 = MPP_2 = d(TPP)/dx_2 = dy/dx_2 = df(x_1, x_2, X_3\ldots..X_n)/dx_2$

:

$f_n = MPP_n = d(TPP)/dx_n = dy/dx_n = df(x_1, x_2, \ldots\ldots\ldots X_n)/dx_n$

The marginal physical productivity (MPP) function gives the exact rate of change of total product function for an infinitesimal change in the factors. On the other hand, the function coefficient or total elasticity of production (ε) is also called the returns to scale.

When, ε = 1, ε >1 and ε <1, it will be the case of constant, increasing and diminishing return to scale.

Estimation of marginal value productivity and resource use efficiency

The efficient use of resources in attaining the maximum profit is happened, when the ratio of marginal value product (MVP) to marginal factor cost (MFC) approaches one. Or in other words, MVP and MFC for each input are equal. The marginal value product (MVP) is obtained multiplying product price by the marginal physical product (MPP).

Marginal factor cost (MFC) is the price of one unit of every input. The optimum use of a particular input would be ascertained by the condition of equity of MVP and MFC.

$$\text{ie.,} \quad \frac{MVP_{Xi}}{MFC_{Xi}} = 1$$

$$\text{therefore, } MVP_{(Xi)} = bi \frac{Y\,(GM)}{X\,(GM)}$$

Y= Mean value (GM) of gross return (Tk)

X= Mean value (GM) of ith variable input (Tk)

i = 1, 2, 3-------10 ;

GM = Geometric mean and

bi = slope of production function

Results and Discussion

Cost of milk production: Cost of human labor, green grass, straw, concentrated feed and veterinary services were taken into consideration, while calculating cost of milk production. Beside this, interest on operating capital and value of the cows and depreciation cost on cow–shed were also considered as cost of milk production. The cost of milk production consists of variable cost and fixed cost which were Tk. 22031 and Tk. 41822 for traditional farming, and Tk. 11269 and Tk. 62776 for commercial farming in all study areas. Table 1 shows that on an average total cost of milk production for both traditional and commercial farming were Tk.63853 and Tk. 74045, respectively. Which was highest for traditional farming in Sirajgong was Tk.64623 compared to Gazipur Tk.54532. Again, in the case of commercial farming, total cost were found highest in Gazipur Tk.80607 compared to Sirajgong Tk.67483 mainly due to the highest price of input. Although the dairy farmers of Sirajgong provide higher iputs to their cows compared to Gazipur. The average cost of milk production was found to be the lowest in traditional farming because of the lower input costs. On an average, total cost of milk production per liter in both traditional and commercial farming were Tk.66.13 and Tk.41.86 respectively. Because, in traditional farming yield of milk production is much

Table 1. Annual cost of milk production per dairy cow in study areas.

Cost heading	Gazipur		Serajgonj		Average	
	Traditional	Commercial	Traditional	Commercial	Traditional	Commercial
A. Fixed cost	23431	11319	20631	11219	22031 (34.50)	11269 (15.22)
1. Family labor	20870	6958	18434	6176	19652 (30.78)	6567 (8.87)
2. Depreciation on cowshed	715	1081	697	276	706 (1.11)	678 (0.92)
3.Depreciation on cow	1847	2740	1500	4600	1673 (2.62)	3670 (4.96)
4. Depreciation on tools and equipment	-	541	-	167	-	354 (0.48)
B. Variable cost	31101	69288	43992	56264	41822 (65.50)	62776 (84.78)
1. Hired labor	7693	18338	7554	9934	7623 (11.94)	14136 (19.09)
2. Green grass	8802	13421	13031	10194	10916 (17.10)	11808 (15.95)
3. Straw	6804	13963	8261	10590	11808 (18.49)	12276 (16.58)
4. Concentrates	6077	17958	12538	20732	9308 (14.58)	19345 (26.13)
5. Veterinary service	192	1968	480	2180	336 (0.53)	2074 (2.80)
6.A. insemination	114	524	180	117	147 (0.23)	320 (0.43)
7. Interest on operating capital	1336	2978	1892	2419	1614 (2.53)	2698 (3.64)
8. Miscellaneous	83	140	57	98	70 (0.11)	119 (0.16)
9. Total cost (A+B)	54532	80607	64623	67483	63853 (100)	74045 (100)
10. Total cost (Tk/liter)	81	54	51	30	66	42

Note: The figures in the parentheses indicate percentage of total cost.

lower than commercial farming though the total production cost is low.

Return from dairy cow rearing

The average lactation period and milk yield for a native cow was found to be 255.15 days and 3.79 liter/day respectively. The highest lactation period was found in Gazipur (255.7 days). But the highest yield of milk was recorded by the Sirajgonj farmers (4.96 liter/ day) mainly due to the use of higher amount of feed and the quality of dairy breed.

On the other hand, in the case of commercial farming, the average lactation period and milk yield for a cow was found to be 247.63 days and 7.6 liter/day, respectively. The highest lactation period was found in Sirajgonj (252.07 days) and also yield of milk was recorded by the Sirajgonj farmers (9.11 liter/ day) mainly due to the management practices, environment, feed and breed.

The total income from dairy cow rearing consists of the values of milk, dung and appreciation of calves. For traditional management the average annual income per dairy cow was estimated at Tk.47858 and Tk.55404 in Gazipur and Sirajgong, respectively. Again for commercial management the average annual income per dairy cow was estimated at Tk.102841 and Tk.95151 in Gazipur and Sirajgonj, respectively. The dairy farmers in the study areas received the highest income from milk sale (on an average Tk.36214 and 73712 for traditional and commercial farming, respectively) followed by appreciation of

calf and selling of dung. Although the net return from traditional farming was found to be negative, but these were found to be positive when it was practice in commercial management.

The average net return was estimated to be Tk.-6674 and Tk.-9218 annually in Gazipur and Sirajgonj respectively for traditional farming. In case of commercial management, it was Tk. 21324 and Tk. 27668 annually in Gazipur and Siragjong, respectively. The average sales proceeds received from milk sale by commercial farmers were higher compared to the traditional farmers due to higher yield of milk per cow. The undiscounted benefited cost ratios (BCR) were 0.87 and 0.86 for traditional management, and 1.27 and 1.41 for commercial management.

Benefit cost ratio (BCR)

Benefit cost ratio is a relative measure, which is used to compare benefits per unit of cost. It helps to analyze the financial efficiency of the farms. The BCR = 1.34 indicates that, by investing one taka, the return would amount to Tk.1.34. The benefit cost ratios of commercial dairy farming were more than 1 indicates the existence of potential for dairy activity. Among the dairy farmers, the highest BCR was observed in Sirajgonj for commercial farming.

Break-even analysis of dairy farming

Under traditional management, on an average herd size of 1.75 and 3.87 in Gazipur and Sirajgonj, respectively incurred loss (Table 3). A herd size of at least 2.45 and 6.99 dairy cows in Gazipur and Sirajgonj was required to cover the cost of production. In all the areas, the break even size is estimated to be 4.72 numbers of dairy cows. This implies that a smallholder traditional diary farm must have a number of dairy cows that is higher than the break-even size to earn profit.

Table 2. Annual profitability of dairy cow rearing in the study areas.

Particulars	Gazipur		Serajgonj		Average	
	Traditional	Commercial	Traditional	Commercial	Traditional	Commercial
Lactation period (Day)	256	243	255	252.07	255	248
Milk yield (Liter/day)	2.63	6.1	4.96	9.11	3.79	7.6
Price of milk (Tk/liter)	50	50	30.8	31.9	40.4	40.95
A. Income from milk (Tk/ cow/year)	33533	74170	38895	73253.8	36214	73712
Cow dung quantity (Kg/cow)	2538	2268	2086	1288	2312	1778
B. Income from dung (Tk/cow/year)	6116	5601	4172	1931	5144	3766
C. Return from gunny bag (Tk/year)	398	908	1040	1418	719	1164
D. Appreciation of calf (Tk/ cow/year)	8210	22160	11297.72	18547	9754	20354
E. Total returns (Tk/cow/ year)	47858	102841	55404.4	95151	51631	98996
G. Net returns (Tk/cow/year)	-6674.08	21324	-9218.48	27668	-7946	24496
H. Benefit cost ratio (BCR)	0.87	1.27	0.86	1.41	0.865	1.34

Table 3. Break-even analysis of dairy cow rearing in the study areas under traditional management.

Cost and return (Tk/ farm)	Gazipur		Serajgonj		Average	
	Average herd size	Break-even size	Average herd size	Break-even size	Average herd size	Break-even size
No. of cow	1.75	2.45	3.87	6.99	2.81	4.72
Fixed cost	41005	41005	79843	79843	60424	60424
Variable cost	54427	76198	170248	307502	112337	191850
Total cost	95432	117202	250090	387845	172761	252273
Gross return	83752	117253	214415	387277	149084	252282
Net return	-11680	50.35	-35676	-67.76	-23678	-8.71

A commercial diary farm in Gazipur and Sirajgonj would incur loss, when its average herd size was below 1.59 and 4.18 number of cross-breed cows, respectively (Table 4). A herd size of at least 1.59 and 4.18 number of cross-breed cows in Gazipur and Siragjong was required to cover the cost of production. In all area break-even size was estimated to be 2.88 number of cross-breed diary cows. A commercial diary farm must have a number of dairy cows that is higher than the break-even size to earn profit.

Inputs affecting milk production under traditional management

It was observed that a number of variables included in the multiple linear regression models had their influences on milk yield at different levels of significance (Table 5). In all the areas, the co-efficients of green grass, straw and wheat bran are positively significant at 1 percent level, indicating that one taka increase in these inputs, keeping other factors constant, would result in an increase of gross returns by Tk.0.96, Tk. 1.07 and Tk. 1.45, respectively. The co-effficients of both family and hired labor and pulse bran was negative, implying that one taka increase in family and hired and pulse bran, keeping other factor constant, would result in a decrease of gross returns by Tk.0.138, Tk. 0.015 and Tk. 0.108, respectively. The influence of green grass and straw on milk yield was found positively significant in Sirajgonj and Gazipur but veterinary care was not positively significant in Gazipur. Besides the influences of hired labor and wheat bran was found positively significant in Sirajgonj and rice bran, salt was

Table 4. Break-even analysis of dairy cow rearing in the study areas under commercial farming.

Cost and return (Tk/farm)	Gazipur		Serajgonj		Average	
	Average herd size	Break-even size	Average herd size	Break-even size	Average herd size	Break-even size
No. of cow	4.7	1.59	14.5	4.18	9.6	2.88
Fixed cost	53198	53198	162672	162672	107935	107935
Variable cost	325654	109822	815831	235184	570742	172503
Total cost	378852	163002	978503	397856	678677	280438
Gross return	483351	163019	1379685	397730	931518	280374
Net return	104500	16.75	401182	-127	252841	-63

Table 5. Regression coefficient of milk production under traditional management.

Explanatory variable		Regression coefficient		
		Gazipur	Sirajgonj	Average
N		48	48	96
Intercept term	β_o	-9.373 (12.666)	13.820 (38.284)	10.629 (16.383)
Family labor	X_1	-0.113 (0.060)	-0.064 (0.061)	-0 .138 (.088)
Hired labor	X_2	- 0.092 (0.072)	0.012* (0.033)	- 0.015* (0.101)
Green grass	X_3	1.101*** (0.136)	3.872*** (0.516)	0.963*** (0.219)
Straw	X_4	0.819** (0.771)	2.809*** (0.253)	1.068*** (0.211)
Rice bran	X_5	3.312* (1.249)	-2.071 (1.718)	1.831 (1.019)
Wheat bran	X_6	0.077 (0.87)	1.803** (1.072)	1.446*** (0.421)
Pulse bran	X_7	-0.031 (0.025)	-1.036 (0.117)	-0.108 (0.022)
Oilcake	X_8	0.454 (0.311)	-0.014 (0.920)	0.411* (0.022)
Salt	X_9	0.231*** (0.236)	-2.482 (0.536)	0.181 (0.328)
Veterinary care	X_{10}	-0.618 (0.115)	5.006*** (1.152)	1.019** (0.840)
R^2		0.78	0.67	0.73
F		5.32***	6.77***	8.86***

***, ** and * denote 1%, 5% and 10% level of significance. Figures in the parentheses indicate standard errors. The coefficients are unstandardized.

positively significant in Gazipur. It was also revealed that who provided straw along with green grass received higher yield. The co-efficient of multiple determinations (R^2) for all areas were quite high for each area and pointed out that 73 percent of variations in milk yield was due to the explanatory variables included in the model.

Resource use efficiency

Table 6 shows that the ratios of MVP and MFC for green grass (X_3) straw (X_4) and veterinary care (X_{10}) were greater than one and positive indicating inefficient use of these inputs. Therefore, the dairy farmers in the study areas have potentially ample opportunities to increase milk yield by using more of these inputs.

On the other hand, the ratio was less than one and negative or positive for family (X_1) and hired labor (X_2), rice bran (X_5), wheat bran (X_6), pulse bran (X_7). oilcake ($X_{8)}$ and salt (X_9) implying an inefficient use of these inputs. In this case dairy farmers can easily decrease milk production cost, keeping milk yield constant, by decreasing the use of family and hired labor, rice bran, wheat bran, pulse bran, oilcake and salt.

Based on the above discussion, the dairy farmers of Gazipur should use larger amount

Table 6. Elasticity of different inputs in milk production under traditional management.

Particulars	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	Returns to scale
Gazipur											
APP	11.480	32.880	0.558	0.950	4.240	14.61	16.44	29.22	43.83	3.045	
MPP	-0.415	-0.019	0.194	0.172	-0.628	-0.418	0.127	0.358	-0.241	0.351	
MVP	-20.75	-0.950	9.700	8.600	-31.40	-20.90	6.35	17.90	-12.05	17.55	
MFC	250.00	250.00	5.120	6.730	8.000	21.59	20.62	21.03	10.00	10.00	
MVP/MFC	-0.083	-0.004	1.890	1.280	-3.925	-0.968	0.308	0.851	-1.205	1.755	
E_p	-0.036	-0.001	0.348	0.181	-0.148	-0.028	0.008	0.012	-.005	0.115	0.446
Serajgonj											
APP	19.84	48.16	0.729	1.35	3.73	10.55	27.56	21.56	62.00	3.255	
MPP	-0.304	0.011	0.501	0.267	0.268	-0.115	0.380	0.118	-0.108	0.355	
MVP	-9.363	0.338	15.43	8.224	8.254	-3.542	11.704	3.634	-3.326	10.934	
MFC	200.00	200.00	5.25	6.15	7.12	20.13	19.09	21.77	10.00	10.00	
MVP/MFC	-0.047	0.002	2.939	1.337	1.159	-0.176	0.613	0.167	-0.333	1.093	
E_p	-0.015	0.001	0.687	0.198	0.072	-0.011	0.014	0.005	-0.002	0.109	1.058
All areas											
APP	15.660	40.520	0.644	1.15	3.985	12.58	22.00	25.39	52.915	3.150	
MPP	-0.359	-0.004	0.348	0.219	-0.36	-0.267	0.254	0.238	-0.179	0.353	
MVP	-15.056	-0.306	12.565	8.412	-11.573	-12.221	9.026	10.766	-7.688	14.242	
MFC	225.00	225.00	5.185	6.440	7.56	20.86	19.86	21.40	10.00	10.00	
MVP/MFC	-0.065	-0.001	2.415	1.309	-1.303	-0.572	0.461	0.509	-0.769	1.424	
E_p	-0.025	-0.0001	0.518	0.189	-0.038	-0.019	0.011	0.009	-0.004	0.112	0.753

of green grass, straw and need to spend more money on veterinary care in order to increase milk yield. Nevertheless, the use of family and hired labor, rice bran, wheat bran, pulse bran, oilcake and salt need to be reduced for lowering production cost. In Sirajgonj, the use of most of the feed items accept green grass, straw, rice bran and veterinary care to be decreased to minimize the production cost. Gazipur farmers also should rear high yielding cows to make dairy rearing profitable. The elasticity of production of the resources during milk production in traditional farms were found to be 0.753 for all areas, indicating that it will be the case of decreasing return to scale.

Factors affecting milk production under commercial management

It revealed that the level of milk yield as well as gross income largely depended on feed and other variables. The co-efficients of straw, oilcake and veterinary care were positive and significant at 1 percent level and the co-efficient of hired labor, green grass and wheat bran were positive and significant at 5 percent level, indicating that one taka increase in these inputs, keeping other factor constant, would result in an increase of gross returns by Tk.1.725, Tk. 0.391, Tk. 2.511, Tk. 0.987, Tk. 1.762 and Tk. 0.219, respectively. But the co-efficient of family labor and salt were negative, implying that one taka increase for family labor and salt, keeping other factor constant, would result in a decrease of gross returns by Tk. 0.012 and Tk.0.023, respectively. The value of R^2 for all areas pointed out that 78 percent of variations of milk yield was explained by the variables included in the model. In case of Sirajgonj the influence of hired labor, green grass, straw and oilcake on milk yield were found positively significant at 1 percent level, besides the influence of hired labor, green grass, straw and wheat bran were found positively significant in Gazipur.

The overall performance of regression model for commercial dairy firms is good fit as indicated by the estimated R^2 and F- values. The linear production model with coefficient values fitted for commercial dairy farms is given in Table 7.

Resource use efficiency

Table 8 shows that the ratios of MVP and MFC for green grass (X_3), straw (X_4), rice bran (X_5) and veterinary service (X_{10}) were greater than one and positive indicating inefficient use of these inputs. Therefore, the commercial dairy farmers in the study areas were found to have ample opportunities to increase milk yield by using more of these inputs.

Again, the ratio of MVP and MFC for family (X_1) and hired labor (X_2), wheat bran (X_6), pulse bran (X_7), Oilcake (X_8) and salt (X_9) were less than one and positive/negative, also implying the inefficient use of these inputs. In this case commercial dairy farmers need to decrease milk production cost, keeping milk yield constant, by decreasing the cost of family and hired labor, wheat bran, pulse bran, oilcake and salt.

The ratios of MVP and MFC for green grass, straw and rice bran were greater than one and positive/negatives for labor, wheat bran, pulse bran, oilcake, veterinary care and salt in Gazipur. On the other hand, ratio for green

Table 7. Regression coefficient of milk production under commercial farming.

Explanatory variable		Regression coefficient		
		Gazipur	Serajgonj	All
N		60	60	120
Constant term	β_o	12.894 (38.269)	22.653 (19.779)	19.974 (17.569)
Family labor	X_1	-0.117 (0.651)	0.019 (0.082)	-.012 (0.133)
Hired labor	X_2	0.067** (0.048)	1.236*** (.890)	0.987** (.269)
Green grass	X_3	2.182*** (0.512)	2.918*** (0.992)	1.762** (0.716)
Straw	X_4	.288** (0.114)	1.273*** (0.315)	1.725*** (0.449)
Rice bran	X_5	0.014 (0.011)	0.093 (0.163)	0.067 (0.157)
Wheat bran	X_6	0.169* (0.261)	0.087** (0.032)	0.219** (0.226)
Pulse bran	X_7	0.024 (0.081)	0.013 (0.019)	0.028 (0.091)
Oilcake	X_8	0.451 (0.511)	0.296*** (0.322)	0.391*** (0.225)
Salt	X_9	0.016 (0.031)	0.091 (0.022)	-0.023 (0.024)
Veterinary care	X_{10}	1.923 (0.221)	3.629*** (1.526)	2.511*** (0.829)
R^2		0.82	0.74	0.78
F		24.57***	22.86***	30.61***

***, ** and * denote 1%, 5% and 10% level of significance. Figures in the parentheses indicate standard errors. The coefficients are unstandardized.

Table 8. Elasticity of different inputs in milk production under commercial farming.

Particulars	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	Returns to scale
Gazipur	80.260	30.50	0.846	0.987	3.812	5.809	16.944	32.105	76.25	2.246	
APP	0.129	0.089	0.253	0.642	0.523	0.221	-0.082	0.012	-0.011	0.169	
MPP	6.450	4.450	12.650	32.10	26.150	11.05	-4.10	0.600	-0.550	8.450	
MVP	250.00	250.00	5.100	6.190	8.00	20.01	21.00	20.12	10.00	12.90	
MFC											
MVP/MFC	0.026	0.018	2.480	5.185	3.268	0.552	-0.195	0.029	-0.055	0.655	
E_p	0.002	0.003	0.299	0.651	0.137	0.038	-0.005	0.001	-0.014	0.075	1.187
Serajgonj	108.452	66.985	1.110	1.874	6.073	18.22	22.219	27.606	91.100	3.891	
APP	0.323	0.112	0.418	0.572	0.296	0.189	-0.096	-0.103	0.078	0.493	
MPP	10.303	3.573	13.334	18.246	9.442	1.029	-3.062	-3.285	2.488	15.726	
MVP	200.00	200.00	5.180	5.97	7.710	20.08	18.22	21.620	10.00	12.900	
MFC											
MVP/MFC	0.051	0.017	2.574	3.056	1.225	0.300	-0.168	-0.152	0.249	1.219	
E_p	0.003	0.002	0.376	0.305	0.049	0.011	-0.004	-0.004	0.001	0.127	0.874
All areas	94.356	48.743	0.978	1.431	4.943	12.015	19.582	29.855	83.675	3.069	
APP	0.226	0.101	0.336	0.607	0.409	0.205	-0.089	-0.046	0.034	0.331	
MPP	8.377	4.012	12.992	25.173	17.796	8.539	-3.581	-1.343	0.969	12.088	
MVP	225.00	225.00	5.140	6.08	7.855	20.045	19.610	20.87	10.00	12.900	
MFC											
MVP/ MFC	0.039	0.018	2.527	4.121	2.247	0.426	-0.182	-0.062	0.194	0.937	
E_p	0.0025	0.0025	0.338	0.478	0.093	0.025	0.005	-0.002	-0.007	0.101	1.031

grass, straw, rice bran and veterinary care were greater than one and positive in Sirajgonj. So the dairy farmers should need to decrease the cost of production by reducing these inputs cost to get their profit.

The elasticity of production of the resources during milk production in commercial farms were found to be 1.031 for all areas, indicating that it will be the case of increasing return to scale.

Conclusion

It is observed that the traditional dairy farmers in the rural areas of Bangladesh are the major supplies of milk for the rural and urban consumers. But the demand for milk is partially fulfilled by commercial farm. Although the production of milk under commercial management is considered to be profitable business, the production under traditional system is not very remunerative. This is because traditional farmers keep small number of cows and their productivity is low. The dairy production in rural areas has excellent opportunities to improve family income and employment generation through efficient use of inputs, and use of more productive technologies. The farmers failed to use inputs efficiently in the production of milk. The estimated returns to scale and elasticity of production parameters also reconfirmed that the use of production inputs was at partial optimal level. It is also observed that commercial dairy farmers were more efficient than traditional farmers as they were trained and better knowledge about dairy farming.

For higher production and profitability commercial dairy farming might be

encouraged by government, NGOs and private entrepreneurs by providing improved technologies, credit facilities, subsidy on improved high yielding cows and extension services (emphasis on post-insemination advice*)*.

References

Asaduzzaman M. (2000). Livestock sector, economic development and poverty alleviation in Bangladesh. In: Mandal M.A.S (ed), Changing rural economy in Bangladesh.Bangladesh Economic Association, Dhaka, Bangladesh. pp. 1-20.

Bangladesh Economic Review (2012). Ministry of Finance, Government of the People's Republic of Bangladesh, p.88-89.

DLS (2006-2007). Directorate of Livestock Services, Farmgate, Khamarbari, Dhaka.

Jabbar, M.A. (2010). Policy barriers for dairy value chain develpoment in Bangladesh with a focus on the northwest Region – A study for strengthening the dairy value chain in Bangladesh project of CARE Bangladesh.

Newbold, P. (2000)." Statistics for Business and Economics." Publisher : Prentice Hall; USA

Omore, A. Mulindo, J. C. Islam, SMF, Nurah, G, Khan, M I, Staal, S and Dugdill, B. T. (2002). Employment generation through small scale marketing and processing: