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ECONOMICS OF BEEF CATTLE PRODUCTION IN SELECTED AREAS OF BANGLADESH

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Almost all beef cattle in the study area were produced by small-holder farmers. The beef cattle were raised in an extensive way for use of some draught power and wealth accumulation purposes. Inputs availability is a major challenge for farmers associated with their poor resource utilizing capacity which limit beef cattle productivity. This study reports a survey which was conducted to describe the beef cattle production elasticity and resource use efficiency of small-scale farmers in Bangladesh. Eighty farmers raising beef cattle in Sirajgong and Gazipur districts were randomly selected for an interview in 2011. On an average the interviewed farmers raised 9 beef cattle per household. A herd size of at least 5.66 and 20.4 number of beef cattle head in Gazipur and Sirajgonj was required to cover the cost of production at the prevailing prices. Among sample farmers, Gazipur farmers gave higher amount of feed to their beef cattle, compared to farmers of Sirajgonj. The production costs per beef cattle head were the highest in Gazipur mainly due to higher input use and lower number of beef cattle. The annual net return per beef cattle head was estimated at Tk.-576.14 and Tk.-2919.27 in Gazipur and Sirajgonj respectively. The undiscounted benefit cost ratios (BCR) were 0.98 and 0.91 in Gazipur and Sirajgonj over total cost respectively. Therefore, the beef cattle farmers had ample opportunities to increase output by using more of those inputs. A positive relationship between farm size and amount of feed use was found in the study areas.

Key word: Beef cattle, Production Inputs and Returns

Livestock production is considered to be an important pathway out of poverty for the rural poor in developing countries (Kristjanson *et al*. 2010) and worldwide 1 billion poor people depend on livestock for their livelihoods (McDermott *et al*. 2010). Livestock are living assets contributing to nutrition, food security and building wealth. The increasing consumption of meat in some developing countries, related to rising household income and rapid urbanization, has been well documented (Delgado, 2003). In Bangladesh, the livestock sector plays an important role in economy and agricultural development. Livestock being one of the four components of agriculture (such as crops, livestock, forest and fisheries) plays a vital role in national economy, contributing about 1.84% of Gross Domestic Product (GDP) (Bangladesh Economic Review, 2015). Livestock plays an indispensable role in the traditional agriculture as well as largely in the subsistence economy of Bangladesh (Haq, 1992). The landless and marginal farmers largely depended on livestock for their survival (Ahmed, 1992). The total livestock population in Bangladesh is estimated at 23.341, 1.45, 25.276, 3.143, 249.0 and 47.253 million cattle, buffalos, goat, sheep, chicken and duck respectively (BER, 2015).

The sound growth of beef cattle industry will ensure the significant impact of ruminant sub-sector on the livestock sector as a whole. The local beef cattle industry is slow in its development as compared to the non-ruminant industry such as poultry. The beef and other ruminant enterprises are unable to compete for the available resources and funds. The slow production of beef has resulted in dependency on the

importation of beef from other countries to meet the local demand. According to the report of the DLS (2006-2007) average per capita availability of meat is 21 gm per day whereas per capita requirement of meat is 120 gm per day. Caloric consumption from animal food per capita availability is 120 kcal per day and requirement is 237 kcal per day which is much lower in Bangladesh than that of in the developed countries of the world. The total meat production increases from 10.4 lac tons to 30.21 lac tons in 2006-2007 to 2013-2014 (BER, 2015). In view of the above scenario in Bangladesh, it can be easily understood that livestock farming might play a crucial role.

MATERIALS AND METHODS

The study utilized the primary data. The necessary primary data were obtained from the sample beef cattle 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 beef cattle farmers, cost, returns and management practices of farming. Two districts were selected purposively namely Sirajgonj and Gazipur and two Upazilas from each district were selected on the basis of concentration of beef cattle production. Eighty farmers raising beef cattle (40 from each district) were randomly selected for the interview. All data from the survey were stored in Windows Excel and analyzed using SPSS package.

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 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:

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

Or,

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

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 resources are considered to be efficiency used to result in attaining the maximum profit 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. When the marginal physical product (MPP) is multiplied by the product price, the marginal value product (MVP) is obtained.

Marginal factor cost (MFC) is the price of one unit of 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

Input use pattern

The beef cattle farmers in the study areas were found to provide small amount of feed to their beef cattle because they generally give less priority to beef cattle, compared to dairy cows. They mostly operate for outside grazing in feeding beef cattle. Table 1 shows that the average amounts of green grass,

Table1.Quantity of inputs used per beef cattle per day and prices

Input	Gazipur	Sirajgonj	All areas
Green grass (kg)	3.58	3.41	3.49
Price (Tk/kg)	5.12	5.18	5.15
Straw (kg)	3.19	2.99	3.09
Price (Tk/kg)	6.73	6.44	6.59
Rice bran (kg)	0.38	0.68	0.53
Price (Tk/kg)	8.0	7.15	7.58
Wheat bran (kg)	0.11	0.18	0.15
Price (Tk/kg)	21.50	20.08	20.79
Oilcake (kg)	0.13	0.134	0.132
Price (Tk/kg)	21.12	19.61	20.32
Salt (kg)	58.55	61.11	59.83
Price (Tk/kg)	10	10	10
Outside grazing Hour/day	4.88	3.22	4.05
Veterinary cost Tk/year	283.96	749.6	516.78

Table 2. Pattern of labor use per beef cattle per year

Type of activity	Gazipur	Sirajgonj	All areas
Taking animal in and out	16.17	35.17	25.67
Family labor (Hour)	8.19	19.04	13.62
Hired labor (Hour)	7.98	16.13	12.06
Cow-shed cleaning	81.92	63.32	72.62
Family labor (Hour)	47.19	27.67	41.93
Hired labor (Hour)	34.73	35.65	30.69
Cow bathing	47.22	28.39	37.81
Family labor (Hour)	29.88	18.73	24.31
Hired labor (Hour)	17.34	9.66	13.5
Stall feeding	79.63	53.2	66.42
Family labor (Hour)	48.27	39.11	43.79
Hired labor (Hour)	31.37	13.89	22.63
Outside grazing	63.8	85.98	74.89
Family labor (Hour)	38.67	68.23	53.45
Hired labor (Hour)	25.13	17.75	21.44
Veterinary care	93.22	89.94	91.59
Family labor (Hour)	79.63	62.77	71.2
Hired labor (Hour)	13.6	27.17	20.39
Total labor Hour/beef cattle/year	381.97	356.05	366.99
Family labor	251.83	235.55	241.67
Hired labor	130.14	120.5	125.32
Total labor Man-day/beef cattle/year	47.75	44.51	45.87
Family labor	31.48	29.44	30.46
Hired labor	16.27	15.06	15.67

*1 man-day = 8 hours (for male) = 12 hours (for female) = 16 hours (for children)

straw and concentrated feed (rice bran, wheat bran, oilcake and salt) provided to each beef cattle head per day were estimated to be 3.49, 3.09 and 0.824 kg, respectively. Besides, they grazed their beef cattle more than 4 hours per day in the outside field or roadside. The average cost incurred for veterinary services was estimated to be

Tk.516.78 per year. Among sample farmers, Gazipur farmers gave higher amount of feed to their beef cattle, compared to farmers of Sirajgonj. A positive relationship between farm size and amount of feed use was found in the study areas.

Pattern of labor use and employment

In rearing beef cattle, human labor was found to be used in various activities like taking in and out of beef cattle sheds, cow-shed cleaning, bathing, and stall feeding, outside grazing and veterinary care. The highest number of human labor was employed in veterinary care (91.59 hour/year) which was then followed by labor use for outside grazing (74.89 hour), cow-shed cleaning (72.62 hour), stall feeding (66.42 hour) and cow bathing (37.81 hour) (Table 2). A good number of female and child labor was found to be utilized in rearing beef cattle in the study areas. They were mainly involved in stall feeding and outside grazing of beef cattle.

Rearing of beef cattle is a good source of employment especially for family members n the study areas. Table 2 shows that a beef cattle head generated on an average 45.87 man-days of employment per annum, which constituted 30.26 man-days of family labor and 15.67 man-days of hired labor. The highest employment per beef cattle head was found in Gazipur mainly due to extra family labor was engaged for beef cattle rearing.

Cost of beef cattle production

The cost of beef cattle production is estimated by summing up variable and fixed costs and is shown in Table 3 .Variable costs included the costs of hired labor, green grass, straw, and concentrate and veterinary services. On the other hand, fixed costs were the cost of family labor, interest on the value of beef cattle and depreciation of cow-shed. The annual cost of a beef cattle head production was estimated to be on an average Tk.33254.59. The production costs per beef cattle head were the highest in Gazipur mainly due to higher input use and lower number of beef cattle. In percentage term, 22.35 percent of cost was incurred for straw, 20.61 percent for family labor and 17.16 percent for concentrated feed. Positive relationship between farm size and the cost of beef cattle production were found in most the study areas. Percent of variable cost was found highest (76.11 %) in Sirajgonj and fixed cost was found (29.57 %) in Gazipur.

Return from beef cattle rearing

Total return from beef cattle rearing consists of the values of farm inventory change, beef cattle dung and sale of draft power for tillage (Table 4). The annual gross return per beef cattle head was estimated to be Tk.33131.57 and Tk.29882.12 respectively, at Gazipur and Sirajgonj. The beef cattle farmers in all study areas received the highest return from farm inventory change followed by selling of hall and selling of dung. The distribution

Table 3.Annual cost per beef cattle production in different study areas

Cost Items	Gazipur		Sirajgonj		All areas	
	Tk/beef cattle	%	Tk/beef cattle	%	Tk/beef cattle	%
A. Fixed cost	9967	29.57	7837	23.89	8876	26.69
1. Family labor	7870	23.35	5888	17.95	6854	20.61
2. Depreciation on beef cattle shed	826	2.45	577	1.56	701	2.11
3.Depreciation on beef cattle	1271	3.77	1372	4.18	1322	3.97
B. Variable cost	23741	70.43	24965	76.11	24353	73.23
1. Hired labor	4068	12.07	3012	9.18	3540	10.64
2. Green grass	6698	19.87	5299	16.16	5998	18.04
3. Straw	7836	23.25	7028	21.43	7432	22.35
4. Concentrate feed	3712	11.01	7702	23.48	5707	17.16
5. Veterinary service	284	0.84	750	2.28	517	1.55
6. Interest on operating capital	1022	3.033	1075	3.28	1049	3.15
7. Miscellaneous	122	0.36	98.99	0.30	110	0.33
C. Total cost (A+B)	33708	100	32801	100	33255	100

Table 4.Annual return and profitability of beef cattle rearing

Particulars	Gazipur	Sirajgonj	All areas
No. of beef cattle/farm	5.33	12.8	9.07
A. Return from inventory change	161925	340053	250989
Cow dung quantity (Ton/year)	2.65	7.09	4.87
Cow dung price (Tk/ton)	2166	1832	1999
B. Return from dung	5740	12989	9364
Number of Hal (No/year)	22.34	84.14	53.24
Price of Hal (Tk/hal)	400	350	375
C. Return from hal sale	8956	29449	14693
Gross return (Tk/farm/year)	176591	382491	279541
Gross return (Tk/beef cattle/year)	33132	29882	31507
Net return (Tk/beef cattle/year)	-576	-2919	-1748
Benefit cost ratio (BCR)	0.98	0.91	0.95

Table5. Break-even analysis of beef cattle rearing

Cost and return (Tk/farm)	Gazipur		Sirajgonj		All	
	Average farm size	Break-even size	Average farm size	Break-even size	Average farm size	Break-even size
No. of beef cattle	5.33	5.66	12.8	20.4	9.07	13.03
Fixed cost	53124	53124	100312	100312	76718	76718
Variable cost	126539	134373	319546	509277	223042	321825
Total cost	179662	187497	419858	609588	299760	398543
Gross return	176591	187525	382491	609595	279541	398559
Net return	-3071	27.75	-37367	6.88	-20219	17.32

of shares to total return from different sources was found to be more or less similar in all the study areas.

The rearing of beef cattle was found to be a losing concern to the farmers in Gazipur and Sirajgonj when all sorts of production costs were taken into consideration in estimating net returns. The annual net return per beef cattle head was estimated at Tk.-576.14 and Tk.-2919.27 in Gazipur and Sirajgonj respectively. The undiscounted benefit cost ratios (BCR) were 0.98 and 0.91 in Gazipur and Sirajgonj over total cost respectively due to access family labor were engaged in both study areas.

Table 4.Annual return and profitability of beef cattle rearing

Break-even analysis for beef cattle farm

The small beef cattle farms under traditional management and with an average herd size of 5.33 and 12.8 number of beef cattle head in Gazipur and Sirajgonj respectively incurred loss, because small farmers use the extra feed for their farm production (Table 5). A herd size of at least 5.66 and 20.4 number of beef cattle head in Gazipur and Sirajgonj was required to cover the cost of production at the prevailing prices. In all areas, the break even size was estimated to be 13.03 number of beef cattle head.

Factors affecting beef cattle production

Linear regression models were fitted to determine the influence of the factors of beef cattle production (Table 6). In all areas, the co-efficient of green grass, straw and rice bran were 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. 37.57, Tk. 14.44 and 9.87 respectively. But the coefficients of human labor and salt were negative and veterinary care was positive and significant at 5 percent level. The value of R^2 in all areas indicated that 73 percent of variations in gross return were explained by the variables included in the model.

Resource use efficiency in beef cattle production

In the models, input-output relationship is expressed in terms of value. Therefore, the coefficients of different inputs represent

Table 6.Regression coefficient of different variables in beef cattle production

Regress or variable		Regression coefficient		
		Gazipur	Sirajgonj	All
N		40	40	80
Constant term	β_o	82.91	47.68	64.93
		(31.22)	(22.11)	(85.34)
Labor	X_1	-0.13	-0.11	-0.16
		(0.18)	(0.10)	(0.09)
Green grass	X_2	17.19**	25.83***	37.57***
		(8.32)	(13.67)	(10.89)
Straw	X_3	29.42***	19.45***	14.44***
		(9.37)	(12.67)	(3.18)
Rice bran	X_4	6.90**	4.10***	9.87***
		(7.43)	(3.55)	(6.71)
Wheat bran	X_5	-3.51	2.43	1.51
		(7.91)	(3.57)	(6.28)
Salt	X_6	-0.33	6.78	-0.93
		(.082)	(11.72)	(7.18)
Veterinary	X_7	11.21**	8.37*	3.93**
care		(8.31)	(0.527)	(1.729)
R^2		0.86	0.81	0.73
F		9.52***	5.24***	16.03***

***, ** and * denote 1%, 5% and 10% level of significance
Figures in the parentheses indicate standard errors

Table 7.Marginal productivity of different inputs in beef cattle production

Particulars	Human labor(X_1)	Green grass ($X_{2)}$	Straw(X_3)	Concentrate feed(X_4)	Veterinary care (X_5)
MVP	-0.36	37.57	14.44	12.31	3.93
MFC	225.00	5.15	6.59	16.25	12.9
MVP/MFC	-0.002	7.29	2.125	0.758	0.305

MVP of one additional taka spent on the input. It can be observed from Table 7 that the ratio of MVP and MFC of green grass (X_2) and straw (X_3) were greater than one and positive, and indicated that the beef cattle farmers in all the study areas failed to show their efficiency in using the resources. Therefore, the beef cattle farmers had ample opportunities to increase output by using more of these inputs. Besides, the ratio was less than one and negative for human labor (X_1) and positive for concentrated feed (x_4) and veterinary care (X_5), implying the inefficient use of these inputs. In this case the beef cattle farmer could easily decrease production cost, keeping gross return constant, by decreasing those inputs.

CONCLUSION

The beef cattle production of small-holder farmers was assessed as low in terms of productivity and inputs. Farmers raised their cattle in the traditional way with low health care intervention. Cattle feeds were mainly based on natural grasses and rice straw. Providing locally available feeds was a major challenge for farmers which required high labor input, especially during the dry and flooding seasons. Lack of feed was a critical factor of farmers to expand cattle numbers. The findings of this study suggest that there exists a possibility of expansion and improvement of the beef cattle farms by adopting the technology of the best practiced farm and through optimal resource allocation. The following recommendations are suggested for the improvement of the beef cattle production in the study area:

Beef price is comparatively cheaper in the local markets, so the farmers are unable to get fair prices of their products; as a result they become discouraged in beef production due to additional unit cost of the beef cattle farming. Government may subsidize the sub sector and take necessary action as well against legal/ illegal import of beef cattle from other countries.

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