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Effects of layer farming on socio-economic condition of farmers at Sakhipur Upazila of Tangail district in Bangladesh

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ABSTRACT

A study was conducted to analyze layer farming at Sakhipur Upazila of Tangail district in Bangladesh from an economic viewpoint. Thirty layer farms were categorized as small, medium and large sizes based on the number of birds like 500-1000, 1001-2000 and >2000 birds, respectively. Primary data were collected through the direct interview method from the layer farm owners and interviewed with a pre-tested structured questionnaire to obtain information focusing on the study's objectives. A Cobb-Douglas production function model was also used to determine the effects of essential variables on a layer farm's returns for further analysis. Results revealed that 53.33% of farmers were engaged with layer farming as their primary occupation. The annual income of farm families increases 8.37% due to layer farming, which was higher than the income before conducting layer farm. However, total expenditures of raising layer per farm per year were predicted to be BDT 1718276, 1852038, 1861323, and 1809749, respectively for small, medium, large and all farms. Variable costs accounted for 91.77, 92.66, 93.84, and 92.82% of total costs for small, medium, large and all farms, respectively. The total feed costs per year per 1000 birds represent 82.89, 78.63, 79.43 and 80.28% of the total costs of the small, medium, large and all farms, respectively. The average gross return per year per thousand birds was BDT 1837134, 2021400, 2242656, and 2033730 for small, medium, large, and all farms, respectively. Again, the net return per year per thousand birds for small, medium, large, and all farms was BDT 118858, 187193, 371333, and 223981, respectively. It was also found that the benefit-cost ratio of studied layer farms was varied from 1.06 to 1.20. It was observed that 80% of farmers' socio-economic condition was improved due to layer farming.

INTRODUCTION

The poultry industry has successfully grown to become the country's leading industry. The sector is also proliferating for the last two decades though it started farming during the mid sixties in this country (Ali and Hossain, 2012). The poultry sub-sector is an essential avenue for promoting agricultural growth and reducing malnutrition in Bangladesh (Da Silva and Rankin, 2014). It is a necessary component of Bangladesh's farming system, providing direct and indirect employment opportunities and support services to approximately 6 million people (Ansarey, 2012). Livestock products account for roughly 44 percent of human daily protein intake. Furthermore, it is crucial in the rural socio-economic system because most households are directly involved in livestock (Hamid et al., 2016).

Small-scale poultry production has emerged as an essential source of income for the rural poor in a large number of developing countries around the world. In recent years, the recognition of small-scale commercial poultry production has helped accelerate poverty reduction in Bangladesh, which has reached new heights.

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Poultry farming was not previously regarded as a significant profession. The villagers have kept the chickens primarily for domestic consumption, with little provision for sale at times. In response to the substantial market opportunity, a commercial poultry sector (broiler and layer) has emerged using intensive production techniques and has grown in popularity since the early 1990s. Local breeds were not commercially reared mainly due to the low productivity and high mortality (Haque et al., 1999). In recent years, the poultry sector in Bangladesh has emerged as the most flourishing and promising commercial sector. The poultry industry has been undergoing a silent revolution over the last decade. It is critical in terms of providing nutritious food and generating income. At present, poultry farming is considered one of the most profitable businesses and has become a significant contributor in the livestock sector but with frequent ups and downs. The poultry industry plays a crucial role in economic growth and simultaneously creates numerous employment opportunities (Sultan et al., 2016).

Layer farming has a great potential for providing additional income to both male and female members of rural and urban families by creating employment opportunities. Since most Bangladesh people, irrespective of caste and religion, prefer chickens and eggs, their demand is high. As a result, the prices of these products are high. In recent years, the high profitability of poultry farming has attracted unemployed educated youth to initiate small-scale commercial poultry farming in both rural and urban areas. Generally, educated youth are devoted to broiler and layer farming, and they choose it as a profession. Again, successful farming systems depend on proper cost-benefit analysis. Most young farmers are getting bankrupt from poultry farming due to a lack of financial statement knowledge. As there are lots of peoples of Sakhipur Upazila of Tangail district are involved in poultry farming, but no other research work came into attention to the authors regarding the layer farming effects on farmers' socio-economic condition at Sakhipur Upazila of Tangail district in Bangladesh. That is why, this study was undertaken and assess the profitability, income generations of rural people of layer farming at Sakhipur Upazila in the Tangail district. This research would give detailed information about layer farmers' socio-economic status and provide valuable information to the researchers interested in conducting similar studies.

MATERIALS AND METHODS

Study area and duration

The study was conducted at Sakhipur Upazila (occupies 435 km²) of Tangail district, situated 80 km north of the capital city Dhaka. Sakhipur Upazila is located between 24°11´and 24°26´ north latitudes; and between 90°04´ and 90°18´ east longitude (Figure 1). The mean annual rainfall ranges from a minimum 1126 to a maximum of 2748 mm and the mean annual temperature from a minimum of 20.25°C to a maximum of 31.48°C. The relative humidity varies between 69 and 86%, the duration of sunshine ranges average from 5-9 hours and the average maximum wind speed was 87 km/hour (NWRD/CEGIS, 2015). The period of the study was three months.

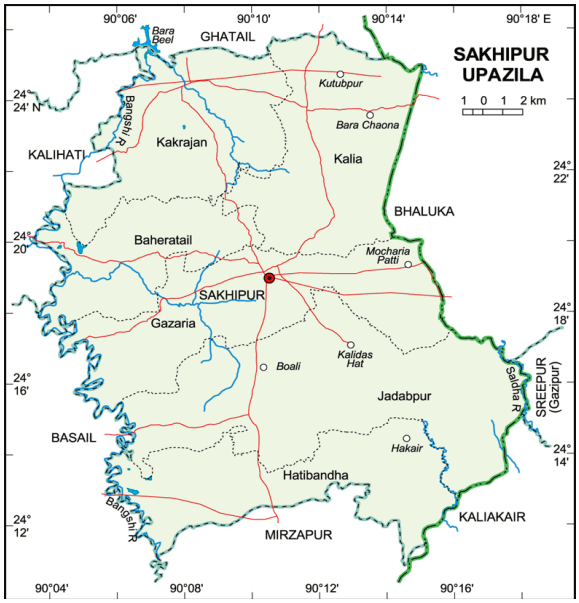

Figure 1: Map showing the study areas

Collection of the data

A random sampling technique was followed in this study. Primary data were collected through direct interview methods from the layer farm owners. The layer farms were categorized as small, medium and large based on the number of birds

like 500-1000, 1001-2000 and above 2000 birds, respectively. The questionnaire was pre-tested in the study area by the researcher. Before the actual interview, the farmers were given short briefings regarding the study's nature and purpose. The questions were asked systematically and explanations were made whenever it was felt necessary. A total of 30 layer farm owners were surveyed, focusing on the objectives of the study. The survey contained both open and closed forms questions. Data were collected in local units with a view to minimization of errors.

Statistical and quantitative analysis

Collected data were organized and analyzed using Microsoft Excel. Descriptive Statistics was performed to show the comparative performance of categorized layer farms. Cobb-Douglas production function model was used to determine the effects of essential variables on a layer farm's returns for further analysis. Production of layer farming was assumed to be influenced by six cost items and other five factors. Thus, 11 variables were ultimately selected to explain the variations in the production of layer farming. The selected Cobb-Douglas production function model in its stochastic form may be expressed as:

$$Y= AX_1^{\beta1} X_2^{\beta2} X_3^{\beta3} X_4^{\beta4} X_5^{\beta5} X_6^{\beta6} X_7^{\beta7} \mu$$

Cobb-Douglas production function can be estimated using OLS (ordinary least square) method, in a log linear form, the estimated equations is,

$$lnY = lnA + \beta_1 1nX_1 + \beta_2 1nX_2 + \beta_3 1nX_3 + \beta_4 1nX_4 + \beta_5 1nX_5 + \beta_6 1nX_6 + \beta_7 1nX_7 + \mu$$

Where, Y= Gross return from layer farm (Tk/year/1000 birds)is the dependent variable. Corresponding explanatory variables are X_1 = cost of day old chick (Tk/year/1000 birds), X_2= cost of feed (Tk/ year/1000 birds), X_3 = cost of human labour (Tk/year 1000 birds), X_4= cost of treatment (Tk/year/1000 birds), X_5 = cost of electricity (Tk/year/1000 birds), X_6= cost of litter (Tk/year/1000 birds) and X_7 = layer farm size (decimal). Again, A = intercept constant, β1 to β7 = coefficients, *ln* = natural logarithm and μ = error term.

The total cost per farm per year was classified into variable costs (feed, hired labour, day old chick, vaccine, medicine and electricity) and fixed costs (family labour, housing, tools and equipments, interest on operating capital) determined by applying straight-line depreciation method. The annual depreciation cost was worked out as follows: Depreciation = (original value – salvage value)/an expected life of the asset.

Interest on operating capital was calculated by taking all variable costs incurred for various operations in layer firming. The interest rate was charged at 10% per annum. The following formula was used for calculating interest on operating capital (IOC):

Interest on operating capital= K/2* it
Where, K= Amount of operating capital
i = Interest rate, which was assumed 10%
t= Length of the period of layer production (1 year)

Gross margin and net return were calculated as follows: Gross margin = Gross return – Variable cost (subtracted cost of goods sold from total revenue) and Net return = Gross return – Total cost (variable + fixed cost). In addition, the benefit-cost ratio (BCR) was also calculated by dividing the gross return by the gross cost. It is a relative measure that is to be used to compare the benefit of the per-unit cost of production.

RESULTS AND DISCUSSION

Age distribution of farmers

All the selected layer farmers were categorized into different age groups like below 35 years, 35 to 45 years and above 45 years. Farmer's age distribution is given in Table 1, and it was found that 20% of farmers were below 35 years of age, 53.33% were between 35- 45 years of age and 26.67% were above 45 years of age.

Table 1: Age distribution of the studied farmers

Age group (years)	Small farms		Medium farms		Large farms		Overall farms	
	No. of owners	%	No. of owners	%	No. of owners	%	No. of owners	%
<35 years	2	33.33	1	10.0	3	21.43	6	20.0
35 – 45 years	3	50.0	7	70.0	6	42.86	16	53.33
> 45 years	1	16.67	2	20.0	5	35.71	8	26.67
Total	6	100	10	100	14	100	30	100

Small, medium and large farms having 500-1000, 1001-2000 and above 2000 birds.

Table 2: Educational status of the layer farmers

Level of education	Small farms		Medium farms		Large farms		Overall farms	
	No. of owners	%	No. of owners	%	No. of owners	%	No. of owners	%
Illiterate	-	0	-	0	-	0	-	0
Primary	2	33.33	3	30.0	4	28.57	9	30.0
Secondary	1	16.67	4	40.0	7	50.0	12	40.0
Higher secondary	3	50.0	1	10.0	3	21.43	7	23.33
Graduate	-	-	2	20.0	-	-	2	6.67
Post-graduate	-	-	-	-	-	-	-	-
Total	6	100	10	100	14	100	30	100

Small, medium and large farms having 500-1000, 1001-2000 and above 2000 birds.

Table 3: Occupational status of the farmers

Main occupation	Small farms		Medium farms		Large farms		Overall farms	
	No. of owners	%	No. of owners	%	No. of owners	%	No. of owners	%
Agriculture	1	16.67	-	-	1	7.14	2	6.67
Business	2	33.33	3	30.0	3	21.43	8	26.67
Fishery	-	-	-	-	1	7.14	1	3.33
Layer farming	2	33.33	6	60.0	8	57.15	16	53.33
Service	1	16.67	1	10.0	1	7.14	3	10.0
Total	6	100	10	100	14	100	30	100

Small, medium and large farms having 500-1000, 1001-2000 and above 2000 birds.

Literacy status

Overall literacy status of studied layer farmers is mentioned in Table 2. It was observed that 30% farmers had primary education level, 40% of farmers had secondary education level, 23.33% percent had higher secondary and 6.67% farmers had a graduate level of education. Again, it was found that 33.33 and 28.57%of small and large category farm owners had primary level education, 16.66, 40 and 50 percent of small, medium and large owners had secondary level of education and 50 10 and 21.43% owners had higher secondary education. It was also showed that 20% of owners of the medium farm had a graduate degree.

Occupational status of layer farm owners

The occupational status of farm owners is mentioned in Table 3. Overall, it was found that 53.33% of farmers were engaged with layer farming as a significant occupation. About 26.67% were involved in business, 6.67% were involved in agriculture and 3.33% were involved in fish farming as their primary occupation. However, layer farming occupation in study areas were

33.33, 60.0 and 57.15% small, medium and large scale farmers, respectively.

Annual income of layer farmers

The average annual income of farm families before conducting the poultry farm and after conducting the poultry farm are presented in Tables 4 and 5. Income from agricultural sources is greater than non-agricultural sources. Before conducting poultry farm income from agriculture was found 51.75%, but after conducting poultry farm it was 60.12% which was 8.37% higher than the previous conducting poultry farm. However, it is clear from this study that after conducting poultry farm income level and livelihood status of the farmers increased. In another study, Shammugam and Kumar (1995) analyzed the supply response of egg and poultry meat in the Salem district of India and reported that layer farm was a more profitable farm.

Table 4: Average annual income (BDT) of layer farmers before conducting poultry farm

Items	Small farms		Medium farms		Large farms		Overall farms	
	Tk	%	Tk	%	Tk	%	Tk	%
Income from agriculture sources								
Crop	93333.33	21.41	123333.33	21.8	99750	16.65	105472.2	18.15
Fishery	65000	14.91	107500	19.0	50714.29	8.47	74404.76	12.80
Poultry farm	-	0	-	0	-	0	-	0
Others (Dairy, orchard)	57500	13.20	55000	9.72	107500	17.94	120833	20.80
Sub-total	215833.33	49.52	285833.33	50.52	257964.29	43.07	300709.9	51.75
Income from non-agriculture sources								
Business	100000	22.95	100000	17.67	245000	40.90	148333.3	25.53
Service	120000	27.53	180000	31.8	96000	16.03	132000	22.72
Sub-total	220000	50.48	280000	49.48	341000	56.93	280333.3	48.25
Total (A + B)	435833.33	100	565833	100	598964.4	100	581043.2	100

Small, medium and large farms having 500-1000, 1001-2000 and above 2000 birds.

Table 5: Average annual income (BDT) of layer farmers after conducting poultry farm

Items	Small farms		Medium farms		Large farms		Overall farms	
	Tk	%	Tk	%	Tk.	%	Tk.	%
Income from agriculture sources								
Crop	118000	17.45	101666.7	12.58	99545.45	11.02	319212.2	13.37
Fishery	73333.33	10.84	112500	13.92	69000	7.64	254833.3	10.67
Poultry farm	160000	23.66	162727.2	20.13	213827.7	23.67	536555	22.47
Others (Dairy, orchard)	85000	12.57	40000	4.95	200000	22.14	325000	13.61
Sub-total	436333.33	64.52	416893.6	51.58	582373.1	64.47	1435600.5	60.12
Income from non-agriculture sources								
Business	120000	17.74	211333.3	26.15	225000	24.90	556333.3	23.30
Service	120000	17.74	180000	22.27	96000	10.63	396000.0	16.58
Sub-total	240000	35.48	391333.3	48.42	321000	35.53	952333.3	39.88
Total (A + B)	676333.33	100	808227.2	100	903373.3	100	2387933.8	100

Small, medium and large farms having 500-1000, 1001-2000 and above 2000 birds.

Overall cost of layer production

Cost and return of layer production per year per 1000 birds under small, medium, large scale and overall farms are given in Table 6, 7, 8 and 9, respectively. In this study, the total costs of layer production per year per 1000 birds were estimated based on the variable and fixed costs for different sizes and all farms. Total costs of raising 1000 layers per farm per year were estimated at Tk 1718276 for small farms, Tk 1852038 for medium farms, Tk 1861323 for large farms and Tk 1809749 for all farms. A similar type of finding was reported by Islam (1995) who found that total costs per poultry bird per year were Tk 406.17, 373.86 and Tk 347.54 for small, medium and large poultry farms of which the variable expenses shared 84.97, 88.76 and 92.32%, respectively. It was clear that the variable cost accounted for the major part of the total variable costs per thousand birds per year for small, medium, large and overall farms were Tk 1576946, Tk 1716112, Tk 1746621 and Tk 1679895, respectively, which accounted for Tk 91.77, 92.66, 93.84 and 92.82% respectively of their total cost. In this study, total fixed costs per thousand birds per year amounted to Tk 141330 for small farms, Tk 135926 for medium farms, Tk 114702 for large farms, and Tk 129854 for all farms (Tables 6-9).

Feed cost in layer farms

The study reveals that, total feed costs per year per 1000 birds for the layer farms were estimated at Tk 1424362, 1456322, 1478409 and 1453034, respectively for small, medium, large and overall farms. Feed cost is the major cost for the rearing of live birds and it representing 82.89, 78.63, 79.43 and 80.28% of the total costs for small, medium, large size and overall farms, respectively (Tables 6-9).

Table 6: Cost and return of layer production per year per 1000 birds under small farms

Particulars	Quantity	Unit price (Tk)	Cost/Value (Tk)	% of total cost/ gross return
A. Variable cost				
Feed cost	41893 kg	34.0	1424362	82.89
Day old chick cost	1000 Birds	42.18	42180	2.45
Hired labour cost (daily + permanent)	-		-	-
Treatment cost	-	-	80364	4.68
Electricity cost	-	-	18255	1.06
Litter cost	-	-	8875	0.52
Repairing cost (House + tolls and equipment)	-	-	2910	0.17
Sub-total			1576946	91.77
B. Fixed cost				
Family labour	205 Man-day	250.0	51250	2.98
Depreciation cost	-	-	11233	0.65
Interest on operating capital	-	-	78847	4.59
Sub-total	-	-	141330	8.23
Total cost (A+B)	-	-	1718276	100.0
Returns				
Eggs	306189 No.			
Sold	305227 No.	6	1831362	99.69
Gift	232 No.	6	1392	0.07
Consumed	730 No.	6	4380	0.24
Gross return	-	-	1837134	100.0
Gross margin	-	-	260188	-
Net return	-	-	118858	-

Depreciation cost in studied layer farms

It was estimated that the average depreciation cost of layer production per year for 1000 birds at small, medium, large, and all farms were Tk 11233, 23870, 9871 and 14991, respectively. It was found that depreciation cost covers 0.65, 1.29, 0.53 and 0.83% of the total cost of the small, medium, large and all farms, respectively (Tables 6-9).

Interest on operating capital

Interests in operating capital cost per thousand birds per year were Tk 78847, 85806, 87831 and 84161 for small, medium, large, and overall farms, respectively. This cost is accounted for 4.59, 4.63, 4.72 and 4.65% of the total cost for the small, medium, large and all farms, respectively (Tables 6-9).

Table 7: Cost and return of layer production per year per 1000 birds under medium farms

Particulars	Quantity	Unit Price (Tk)	Cost/Value (Tk)	% of total cost/ gross return
A. Variable cost				
Feed cost	42833 kg	34.0	1456322	78.63
Day old chick cost	1000 Birds	44.08	44048	2.38
Hired labour cost (permanent)	385 Man-day	250	96250	5.20
Treatment cost	-	-	91747	4.95
Electricity cost	-	-	18400	1.00
Litter cost	-	-	6145	0.33
Repairing cost (House + tolls and equipment)	-	-	3200	0.17
Sub-total	-	-	1716112	92.66
B. Fixed cost				
Family labour	105 Man-day	250.0	26250	1.42
Depreciation cost	-	-	23870	1.29
Interest on operating capital	-	-	85806	4.63
Sub-total	-	-	135926	7.34
Total cost (A+B)	-	-	1852038	100.00
Returns				
Eggs	336900 No.	-	-	-
Sold	327840 No.	6	1967040	97.31
Gift	5760 No.	6	34560	1.71
Consumed	3300 No.	6	19800	0.98
Gross return	-	-	2021400	100.00
Gross margin	-	-	305288	-
Net return	-	-	187193	-

Gross return

The study showed that gross return per year for per thousand birds were Tk 1837134, 2021400, 2242656 and 2033730 for the small, medium, large and overall farms, respectively. The average prices of egg per piece were Tk 6 for all farms.

Net return

Net return above total cost was determined by deducting all cost from all return and it represented for all sizes farms in Tables 6-9. Tables showed that the net return above total cost per thousand birds per year was Tk 118856, 187193, 371333 and 225794 for small, medium, large, and overall farms, respectively. Miah (1990) conducted a study on small-scale poultry farms in the Savar area and reported that small-scale commercial poultry farming profitability was positively correlated with the sizes of individual farms.

Table 8: Cost and return of layer production per year per 1000 birds under large farms

Particulars	Avg. quantity per year per thousand birds	Unit price (Tk)	Cost/Value (Tk)	% of total cost/ gross return
A. Variable cost				
Feed cost	43483 kg	34.0	1478409	79.43
Day old chick cost	1000 Birds	45.5	45500	2.44
Hired labour cost (permanent)	360 Man-day	200	72000	3.87
Treatment cost	-	-	95600	5.14
Electricity cost	-	-	50000	2.69
Litter cost	-	-	4072	0.22
Repairing cost (House + tolls and equipment)	-	-	1040	0.06
Sub-total			*1746621*	*93.84*
B. Fixed cost				
Family labour	85 Man-day	200.0	17000	0.91
Depreciation cost	-	-	9871	0.53
Interest on operating capital	-	-	87831	4.72
Sub-total	-	-	*114702*	*6.16*
Total cost (A+B)	-	-	*1861323*	*100*
Returns				
Eggs	373776 No.			
sold	336732 No.	6	2020392	90.09
Gift	32444 No.	6	194664	8.68
Consumed	4600 No.	6	27600	1.23
Gross return	-	-	*2242656*	*100*
Gross margin	-	-	486035	-
Net return	-	-	371333	-

Table 9: Cost and return of layer production per year per 1000 birds under all farms

Particulars	Quantity	Unit Price (Tk/unit)	Cost/Value (Tk)	% of total cost/gross return
A. Variable cost				
Feed cost	42736.3 kg	34	1453034	80.28
Day-old chick cost	1000 Birds	43.92	43920	2.43
Hired labour cost (permanent)	248.33 Man-day	225.8	56072	3.10
Treatment cost	-	-	89237	4.93
Electricity cost	-	-	28885	1.60
Litter cost	-	-	6364	0.35
Repairing cost (House + tolls and equipment)	-	-	2383	0.13
Sub-total	-	-	1679895	92.82
B. Fixed cost				
Family labour	131.6 Man-day	233.3	30702	1.70
Depreciation cost	-	-	14991	0.83
Interest on operating capital	-	-	84161	4.65
Sub-total			129854	7.18
Total cost (A+B)	-	-	1809749	100.0
Returns				
Eggs	338955 No.	-	-	-
Sold	323266.3 No.	6	1939598	95.37

Gift	12812 No.	6	76872	3.78
Consumed	2876.7 No.	6	17260	0.85
Gross return	-	-	2033730	100.0
Gross margin	-	-	353895	-
Net return	-	-	223981	-

Benefit-cost ratio of the layer farms

The benefit-cost ratio (BCR) indicates the farms' financial efficiency and BCR of various categories studied layer farms are given in Table 10. It was found that the BCR of the three types of layer farms was varied from 1.06-1.20. The BCR was found highest (1.20) for large farms and was significantly higher than that of the medium (1.09) and small farms (1.06), which indicated that layer farming was profitable in large sizes farms than that of the small sizes farms. In another study, Rahaman (2012) found BCR 1.13 for household poultry farms.

Table 10: Benefit-cost ratio of different categories of layer farms

Particulars	Small farms (Tk)	Medium farms (Tk)	Large farms (Tk)	All farms (Tk)
Gross return	1837134	2021400	2242656	2033730
Variable cost	1576946	1716112	1746621	1679895
Total cost	1718276	1852038	1861323	1809749
Net return	118858	187193	371333	223981
Benefit-cost ratio (BCR)	1.06	1.09	1.20	1.12

Small, medium and large farms having 500-1000, 1001-2000 and above 2000 birds.

Table 11: Production function estimation results for the layer farms

Explanatory variables	Estimated values of coefficient for all farms		
	Standardized Coefficients	Standard error	t-value
Intercept	12.74	1.303	9.781
Day-old chick (x_1)	-0.081	.037	-0.744
Feed (x_2)	0.225**	0.064	2.236
Human labour (x_3)	-0.300***	0.022	-02.902
Treatment (x_4)	0.193*	0.019	1.193
Electricity (x_5)	0.128	0.017	1.188
Litter (x_6)	-0.022	0.010	-0.218
Layer farm size (x_7)	0.354***	0.008	3.253
R^2	0.885		
Adjusted R^2	0.848		
F-value	24.078***		
Return to scale	0.497		

***Significant at 1% level; **significant at 5% level; *significant at 10% level of probability.

Estimation of farm profitability

The estimation results of the production function are presented in Table 11. All explanatory variables are log-transformed in line with the model and total variation of output was measured by multiple coefficients of determination (R^2) shown in Table 11.

Feed cost (x_2): The regression coefficient of feed was positive and statistically significant at a 5 percent probability level. It implies that a one percent increase in feed cost keeping other factors constant, would increase the gross return by 0.225 percent.

Human labour cost (x_3): The regression coefficient of labour was negative and statistically significant at 1 percent level of probability. It implies that a one percent increase in labor cost keeping other factors constant, would decrease the gross return by 0.300 percent.

Treatment cost (x_4): The regression coefficient of treatment cost was positive and significant at a 10 percent level of probability. The regression coefficient implies that a one percent increase in treatment cost keeping other factors constant, would increase the gross return by 0.193 percent.

Layer farm size (x_7): The regression coefficient of layer farm size was positive and statistically significant at a 1 percent level of probability. The regression coefficient implies that a one percent increase in layer farm size, keeping other factors constant, would increase the gross return by 0.354 percent.

On the other hand, the regression coefficient of the other variable like day-old-chick cost (-0.081), electricity cost (0.128), and litter cost (-0.022) were not statistically significant. According to Bhuiyan (1999), most of the selected input variables had some significant impacts on the production of the broiler and layer poultry farms.

Goodness of fit (F-values): The F-value 24.078 reveals significant at a 1 percent level of probability, implying a good fit of the equations.

Return to scale: The summation of all the regression coefficients was estimated at 0.497. This implies that the production function exhibits decreasing returns to scale. Therefore, if all the variables specified in the production functions were increased by one percent, gross return on average would increase by 0.497 percent.

Changes in socio-economic condition

Everything that goes towards creating that livelihood can be thought of as a livelihood asset. The livelihood framework identifies these five core assets or capital upon which livelihoods are built (Ellis, 2000). It is just one way of dividing up livelihood assets which are shown in Figure 2.

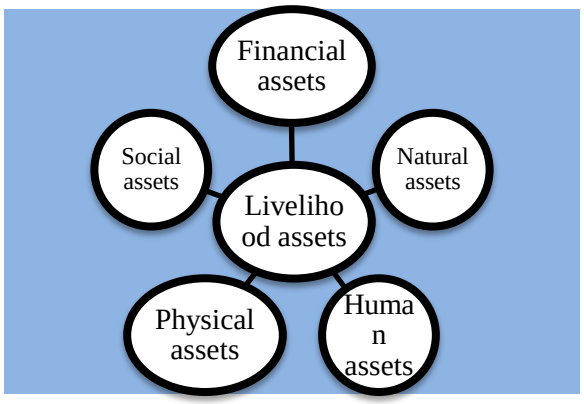

Figure 2: Livelihood assets

To identify the overall socioeconomic improvement of the farmers, they were asked about their financial assets like income and savings, a natural asset like land and pond ownership, physical assets like livestock, housing, jewelry, a human asset like working skill, education of children and use of modern technology. Changes in the overall socio-economic condition of the layer farmers are shown in Table 12. The result reveals that 80 percent of farmers' socio-economic condition got improved after layer farming, while 20 percent responded no change had taken place in their socio-economic condition due to layer farming. Peter (2001) found that about 63 and 83% of total households under BKB and BRDB, respectively, enable overcoming the poverty situation by rearing poultry.

Table 12: Changes in the overall socio-economic condition of the sample layer farmers

Types of change	Degree of change			
	Small farms	Medium farms	Large farms	Overall farms
Improved	2 (33)	10 (100)	12 (86)	24 (80)
Not improved	4 (67)	0 (0)	2 (14)	6 (20)

Small, medium and large farms having 500-1000, 1001-2000 and above 2000 birds.

CONCLUSION

Overall, total costs of raising layer per farm per year were estimated at BDT 1718276, 1852038, 1861323 and 1809749 for small, medium, large

sizes farms and for all farms, respectively. Among the total cost, variable costs were accounted for 91.77, 92.66, 93.84 and 92.82%, respectively per farm per year for small, medium, large and all farms. Feed cost was a significant cost item for layer farms. The current study reveals that total feed costs per year per 1000 birds represent 82.89, 78. 63, 79.43 and 80.28%, respectively of the total costs for small, medium, large and overall farms, respectively. The average gross return per year per thousand birds was BDT 1837134, 2021400, 2242656 and 2033730 for small, medium, large and all farms, respectively. Again, net return per year per thousand birds were BDT 118858, 187193, 371333 and 223981 for small, medium, large and all farms, respectively. The BCR was found highest in large farms than that of a medium and small farms. However, 80% of farmers reported that their socio-economic conditions improved after layer farming while 20% responded that no change had occurred due to layer farming. In terms of profitability, income and employment generation, the production processes of layer farms were significant and profitable in the study area. From this study, it is clear that layer farming brought positive changes economically and socially to the layer farmers of Sakhipur Upazila of Tangail district.

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