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Viability of Medium Scale Layer Farming in Gazipur District of Bangladesh

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ARTICLE INFO	ABSTRACT
	The viability of medium chicken layer farming in the Gazipur district of Bangladesh is measured in this study. A total of 40 medium-scale layer farmers were selected for primary data collection through a face-to-face interview during the period of October to December 2018. Cost analysis revealed that the production of the chicken layer was profitable and the average total costs and average net return for 100 layers per year for medium farms were estimated at Tk.66,913 and Tk. 23,632 respectively. The average benefit-cost ratio was estimated at 1.35. The researchers also investigate that most of the farmers in the study area used almost the same types of antibiotics. Among the farms surveyed, 98% of the farms practiced proper vaccination, and the average antibiotics and vaccine costs for 100 layers in a year for all medium farms was estimated at Tk. 498 and Tk. 2,347 respectively. The estimated multiple linear regression model reveals that the key variables included in the model were individually or jointly responsible for variation in the profitability of chicken layer farming. In linear regression analysis, among the nine explanatory variables, most of the variables had a positive impact on chicken layer farming and the main influencing factor was the feed cost. In the study area, the major problem faced by the medium scale layer farmers were price fluctuation in different markets, lack of adequate storage facilities, inadequate capital, low market price, etc. To control the price fluctuation and ensure fair price to the farm owners, it is necessary to have government intervention in layer marketing.

Introduction

Livestock is one of the crucial sectors in the national economy and it significantly contributes to agriculture and the Gross Domestic Product (GDP) of Bangladesh. The agricultural sector contributes 10.67% of the GDP, whereas the livestock and poultry sub-sector contributes 1.53% (BER, 2018). Furthermore, it is pivotal for the rural economic system as maximum households in Bangladesh are directly or indirectly involved in livestock farming. Among the livestock sub-sector, the poultry industry as a fundamental part of animal production is committed to supplying the nation with a cheap source of good quality nutritious animal protein in terms of meat and eggs (Akter and Uddin, 2009). It also plays a vital role in reducing malnutrition and fostering the nation's agricultural sector (Silva and Rankin, 2014). Specifically, the egg industry is an integral part of agriculture, as it has completed its industrialization, produces high-quality outputs, provides employment opportunities and export facilities (Dogan et al. 2018). The number of poultry farmers on a commercial basis is being increased in Bangladesh, which is regularly expanding (Kamruzzaman et al., 2021). Egg production, fertility, and hatchability are important reproductive traits that determine the success of any poultry industry (Islam et al., 2002). However, the chicken layer is the prospective but moderately developed sector in Bangladesh that produces both egg and meat for human consumption. Developing countries like Bangladesh, where rice and potatoes act as staples can fulfill their protein requirements through the poultry sector which are essential for nutrition and health. Chicken and egg are the cheapest sources of protein among all the other expensive animal sources of protein. The chicken layer business, often known as the egg industry has grown rapidly owing to increase per capita egg consumption. According to the UN, an average human being must

consume 104 eggs annually to remain healthy. Bangladesh got closest to achieve this target in 2018, with a per capita annual consumption of 103 eggs (DLS, 2018). On this note, layer chicken farming has its importance which is mainly used for egg purposes also generates cash income through the sale of live birds, eggs, by-products, and wastes. Layer poultry farming means raising egg-laying poultry birds for commercial egg production which need to be raised from day one of their life. They start laying eggs commercially from 18-19 weeks of age. They can produce about one kg of eggs by consuming about 2.2 kg of food during their egg-laying period (BLRI, 2016). However, layer chicken farming plays an important role in the national economy by creating employment and also by generating income in Bangladesh. The importance of the layer as a source of income for the landless and marginal farmers, particularly women, has become increasingly recognized (Ogunlade and Adebayo, 2009). For these reasons, the development of this layer of farming may be considered as an important strategy for poverty reduction which is one of the pivotal objectives of the government of Bangladesh. This study especially focuses on the medium farmer as the majority of the medium farms are less profitable than large farms but there are many reasons behind this. There are many problems and constraints are associated with the medium farm. The majority of the medium farmers do not have available lands because of a lack of capital and sometimes they are not getting proper training services and also cannot handle the cost of the vaccine because its price is very high. Several research studies covering socioeconomic profiles, profitability, and adoption have been conducted on poultry farming in Bangladesh and other parts of the world. Such as, Hamid et al. (2016) reviewed the scenario of the poultry industry and the role of the private sector for its development in Bangladesh. Islam et al. (2014) discussed that the poultry industry is one of the most promising sectors for Bangladesh. Raha (2014) and Rahman et al. (2015) examined the present situation, future challenges, and potential of the poultry industry in Bangladesh. Billah et al. (2013) explained that family poultry production accounts for most of the poultry production system in Bangladesh, but progress is not satisfactory. Anang et al. *(2013)* conducted a study to compare the profitability of broiler and layer production. Nmadu et al. (2014) find that the profitability, break-even point, elasticity of production, and resource use efficiency of poultry egg production. Altahat et al. (2012) noticed that layer hen enterprises suffer from low profitability or losses in many developing countries all over the world. However, among the above studies very few were conducted on layer farming, and to the best of the researcher's knowledge, there is a dearth of this type of study to reflect the real situations of the medium-scale layer farm in developing countries like Bangladesh. So, it is expected that the findings of this study will contribute to the layer farmers, policymakers, extension workers, and researchers with a view to taking further plans for layer development as well as for carrying out further research. The major focus of this study is the viability of medium-scale layer farming with the specific objectives: to estimate costs, return, and profitability of the layer growers in the study area and to identify the factors affecting the return of layer chicken farms.

Materials and Methods

Sampling technique and data collection

Considering the objectives of the study, data were collected from the medium farmers of Sreepur Upazila of Gazipur district in Bangladesh. A total of 40 farmers were selected from villages namely Barmi, Mawona, Bartopamor, and Telihati of Sreepur Upazila by using the random sampling technique of 10 from each village. The researcher collected necessary primary data of layer farmers through questionnaire interviews with a structured questionnaire during the period of October to December 2018.

Analytical method

The collected data were analyzed on the basis of the objectives of the study by using descriptive statistics and regression analysis. Descriptive statistics were used to represent the socioeconomic characteristics of the respondents.

Mathematical analysis

The mathematical analysis includes the profitability of different layer farms, which was calculated in terms of gross return, gross margin, the net return, and benefit-cost ratio (BCR). For this reason, all costs and returns were measured in 12 months (a year) per 100 chicken layers.

Gross return

Gross return (GR) was calculated by multiplying the total volume of output of an enterprise by the average price in the harvesting period (Dillon and Hardaker, 1993).

Gross return, GR = Σ QP ... (1)
Where GR= Gross return from the product (Tk./layers); Q= Quantity of the product; P= Average price of the product (Tk./100 layers).

Gross margin

The gross margin (GM) of a farming enterprise is its output less the variable costs attributed to it (Barnard and Nix, 1999).
GM = GR-TVC ... (2)

Where, GM = Gross margin (Tk./100 layers); GR = Gross return (Tk./100 layers); and TVC = Total variable cost (Tk./100 layers).

Net return

Net return was calculated by deducting total costs from gross return as shown in equation 3. Net Return, NR= $\Sigma(GR-TC)$ ... (3)

Where GR= Gross return from the product (Tk./100 layers); TC= Total cost (Tk./100 layers).

Total cost is the summation of the variable and fixed cost incurred for the farm where variable cost includes feed cost, human labor cost, price of day-old chick, electricity, medicine cost, lime cost, water supply cost, transportation cost and fixed cost includes housing cost, equipment cost, land use cost.

Benefit-cost ratio (BCR)

The BCR is a relative measure, which is used to compare benefits per unit of cost. The BCR of different chicken layer farms was estimated as a ratio of gross returns and gross costs.

Benefit cost ratio, (BCR) = Gross return/ Total cost ... (4)

Regression analysis

Factors affecting the gross return of medium-scale layer farming were determined by using the following multiple linear regression model.

$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + U_i$... (5)

Where,

Y = Gross return of layer chicken farming (Tk./ 100 layers), β_0 = constant or intercept term, X_1 = feed cost (Tk./ 100 layers), X_2 = labor cost (Tk./ 100 layers), X_3 = price of day-old chick (Tk./ 100 layers), X_4 = electricity cost (Tk./ 100 layers), X_5 = medicine cost (Tk./ 100 layers), X_6 = lime cost (Tk./ 100 layers), X_7 = water supply cost (Tk./ 100 layers), X_8 = housing cost (Tk./ 100 layers), X_9 = miscellaneous cost (Tk./ 100 layers), U_i = error term, β, β_2, β_3......... β_i= coefficient of the respective independent variables/inputs to be estimated.

Results and Discussion

Socioeconomic characteristics of the sample farmer

Socioeconomic characteristics illustrate the wide range of interrelated social attributes of the farmers, which largely influence their economic activities, living conditions, and decision-making process. Table 1 indicates that the majority of the farmers (47.5%) belong to the 36-40 years age group, which matches the findings of Hassan (2020). In the study area, the education level was highest at a secondary level (55%) and lowest at a higher level (2.5%). Concerning the occupational status, it is found that layer farming was the inherent and single major occupation with 62.5% in the study area. The descriptive analysis reveals that 80% of the respondents received training while the rest did not. It is expected in this study that the profitability of the farmers who received training will be increased than others due to their intensive knowledge on better farming practices learned from the training or extension services. The average family size was found 5.57, which is greater than that of the national average of 4.060 (HIES, 2016). It is estimated that the average farm size of layer farmers was 0.07 hectares, including own land, land rented in, and homestead area and excluding the land rented out. The annual income and income from the layer farming were Tk. 348,185 and Tk. 141,735 respectively in the study area.

Table 1. Socioeconomic characteristics of the sample farmers

Characteristics	Categories	Respondents		
		No.	%	Mean
Age	31-35	4.0	10.0	
	36-40	19.0	47.5	
	41-45	12.0	30.0	
	46-50	5.0	12.5	
Educational level	Primary (1-5)	17.0	42.5	
	Secondary (6-10)	22.0	55.0	
	Higher secondary (12)	1.0	2.5	
Occupation	Layer farming	25.0	62.5	
	Business	9.0	22.5	
	Service	6.0	15.0	
Training	Receive	32	80	
	Did not receive	8	20	
Family size (no.)				5.57
Farm size (ha)				0.07
Annual income (Tk.)				348,185
Income from layer selling (Tk.)				141,735

Source: Author's estimation based on field survey, 2018.

Profitability analysis

When the cost of inputs is deducted from the value of output, then it expresses the profit of that farm. Estimation of the cost was exclusively necessary for enterprise costing and subsequently determining the viability of the enterprise from the viewpoint of producers. The profitability of the layer depends on the cost involved in chicken layer farming. Feed cost, day-old chick cost, cost of hired labor, electricity cost, medicine cost, lime cost, water supply cost, transportation cost, and miscellaneous cost were involved in variable costs and cost of family labor, land use cost, equipment cost, housing cost, were involved in fixed costs. Feed cost was estimated as the major cost in the study area. The average share of the fixed cost of farms was 44% of total costs and the average share of the variable cost of medium farms was 56% of the total costs (Table 2). The study also found that most of the farmers in the study area used almost the same types of antibiotics and vaccines. In the study area, the average cost of antibiotics and vaccines were Tk.498 and Tk.2,347 respectively.

Table 2. Total cost in layer chicken farming for 100 layers in a year

Cost items	Average value Tk.	Percent of total average
Feed cost	21,242	31.74
Purchase day old chick	4,536	6.77
Hired labor cost	1,470	2.19
Electricity cost	4,001	5.97
Medication cost of vaccine	2,347	3.50
Medication cost of antibiotics	498	0.74
Lime cost	37	0.05
Water supply cost	2,288	3.42
Transportation cost	1,060.37	1.58
Miscellaneous cost	16.50	0.02
A) Total variable cost	**37,495.87**	**56.00**
Family labor cost	298.19	0.44
Land use cost	26.33	0.04
Equipment cost	12,296	18.37
Housing cost	16,797	25.10
B) Total fixed cost	**29,417.52**	**44.00**
Total cost (A+B)	66,913.00	100.00

Source: Author's estimation based on field survey, 2018.

Gross cost or total cost is estimated by adding all the costs of variable and fixed inputs. In the study area, the average total cost for all medium farms for 100 layers in a year was recorded Tk. 66,913 (Table 2). In variable cost items, the highest cost was identified in feed cost (Tk.21,242) and the lowest cost in miscellaneous cost (Tk. 17). However, the highest fixed cost was housing cost (Tk.16,797) and the lowest land use cost (Tk.26).

In chicken layer farming yield is considered by the number of eggs, the number of layers sold and the amount of waste material sold. It was found in the study area that the average egg sold for all farms for 100 layers in a year was Tk. 11,375 (Table 3). The estimation reveals that the average gross return of all medium farms for 100 layers was estimated at Tk.90,545. The gross margin of layer farming has been calculated by deducting the total variable cost from the total return which was Tk.53,049 for 100 layers in a year. The net return of layer farming is also calculated to evaluate the profitability of producing layer which is estimated at Tk.23,632 per 100 layers during 2018. The final economic measure is the calculation of BCR (undiscounted) which is generally used to compare benefits per unit of cost. The BCR is generally calculated as the ratio of total returns and total cost which is equal to 1.35 in the study area. It implies that Tk. 1.35 would be earned by investing Tk. 1.00 in layer farming. Thereby, it indicates that layer farming is a profitable business. Chowdhury and Chowdhury (2015) also found almost the same finding.

Table 3. Gross return, gross margin, net return and BCR from layer chicken farming for 100 layers in a year

Items	Value (Tk./100 layer)
Total number of eggs sold	11,375
Price per unit of egg	7.96
A) Gross return	90,545
B) Total cost	66,913
C)Variable cost	37,495.87
D)Gross margin (A-C)	53,049
E) Net return (A-B)	23,632
F) BCR (A/B)	1.35

Source: Author's estimation based on field survey, 2018.

In this study area, the marketing cost of the layer was performed by three intermediaries as aratdar, wholesaler, and retailer. The total marketing cost of intermediaries per hundred-layer average estimated cost was Tk.2,718.49. Table 4 have shown that the average cost of wholesalers (Tk. 1,372.82) was higher than aratdar (Tk.1,239.05) and retailers (Tk.106.32). The highest cost of aratdar was labor changes at 47.78 % and the lowest cost was personal expenses, only at 2%. Likewise, wholesalers were also performed many cost items where the highest cost accounted for labor changes (31.43%), while the lowest cost was incurred for tools and taxes (0.22%). Interestingly, retailers spent almost half of the marketing cost (49.97%) on transportation.

Factors influencing the gross return of layer farm

The regression analysis reveals that out of nine explanatory variables, the cost of feed, labor, and electricity had a significant effect on gross return earned from layer farming. The coefficient signs of all the significant variables are positive, which implies that an additional unit increase in these costs will increase the gross return from layer farming by the coefficient values associated with these variables (Table 5). The best plausible explanation of these results could be that

if the farmers are able to afford these input costs in an efficient manner, they will also be able to generate a larger volume of production. Therefore, the gross return will also be high. The model further reveals that the estimated coefficient of feed cost is significant at 10% level whereas the cost of labor and electricity are significant at 1%. The finding of feed cost is found to be consistent with Hossain et al. (2010). The coefficient of multiple determinations (R^2) for the model of all medium layer chicken farming was 0.809 (Table 5) which implies that 80.9 percent of the total variations in gross return have been explained by the explanatory variables included in this model.

Problems faced by farmers in layer chicken farming

Some problems were found in the study area which was faced by the layer farmers in the study area. The most common problem was price fluctuation in different markets, faced by 60% of layer farmers (Table 6). Anang et al. (2013) also found this problem in the case of both broiler and layer farming. Other important problems are lack of adequate storage facilities, inadequate capital, low market price, and lack of adequate market information which were faced by 55%, 42.5%, 37.5%, and 30% of layer farmers, respectively.

Table 4. Marketing cost of different intermediaries

Cost of items	Intermediaries					
	Aratdar		Wholesaler		Retailer	
	Average cost	(%) of average	Average cost	(%) of average	Average cost	(%) of Average
Labor changes	592.00	47.78	431.50	31.43	32.43	30.50
Tools & taxes	146.75	11.84	3.00	0.22	-	-
Transportation	220.00	17.76	333.48	24.30	53.13	49.97
Storage	45.20	3.65	71.63	5.22	-	-
Cost of contract	42.05	3.40	61.83	4.50	8.67	8.15
Packaging cost	27.45	2.20	47.48	3.46	1.40	1.32
Cost of wastage	141.50	11.42	264.625	19.28	-	-
Dalal(commission)	-	-	9.75	0.71	-	-
Personal expenses	24.10	2.00	42.93	3.13	11.00	10.35
Total	1,239.05	100.00	1,372.82	100.00	106.32	100.00

Source: Author's estimation based on field survey, 2018.

Table 5. Estimated values of coefficient and related statistics of layer chicken farming

Explanatory variables	Coefficient	Standard Error	Beta	t value
Intercept	34087.998	18537.283		1.839
Feed cost	0.565*	0.207	0.274	2.735
Labor cost	3.096***	0.595	0.466	5.206
Day old chick	-2.895	1.774	-0.155	-1.631
Medicine	1.087	4.279	0.020	0.254
Electricity	9.441***	2.476	0.378	3.813
Lime	8.692	15.992	0.042	0.544
Water supply	-2.572	36.141	-0.006	-0.071
Housing cost	-27.234	18.704	-0.105	-1.456
Miscellaneous	51.852	48.035	0.089	1.079
F- value	19.31***			
Adjusted R^2	0.809			

Source: Author's estimation based on field survey, 2018.
Note: *** Significant at 1% level , * Significant at 10% level

Table 6. Problems faced by farmers in layer chicken farming

Problems and constraints	Layer farms, n= 40		Ranking
	Number	(%)	
Price fluctuation in different markets	24.0	60.0	1
Low market price	15.0	37.5	4
Poor communication	4.0	10.0	8
High transport cost	7.0	17.5	6
Inadequate capital	17.0	42.5	3
Lack of adequate storage facilities	22.0	55.0	2
Lack of feed supply	5.0	12.5	7
Lack of adequate market information	12.0	30.0	5
Attack of dog and cat	2.0	5.0	9

Conclusion

The prime concern of the present government is to ensure food and nutritional security and alleviate poverty. The poultry industry has the potential to attain the Sustainable Development Goals (SDGs) by reducing malnutrition and promoting better health for the people of Bangladesh. Layer chicken farming contributes to the national economy by employment creation and also by income generation. The findings of the study reveal that medium-scale layer farming is a profitable business in Bangladesh. The regression analysis reveals that the cost of feed, labor, and electricity had a significant effect on gross return earned from medium-scale layer farms. The major problems faced by the medium scale layer farmers were price fluctuation in the different markets, inadequate capital, low market price, high transportation cost, lack of feed supplies, etc. also hampered the layer chicken farming. The net return of the medium-scale layer farm could be increased by eliminating these problems. To control the price fluctuation and ensure fair price to the farm owners, it is necessary to have government intervention in layer marketing. Moreover, as layer farming is a capital-demanding business, institutional credit facilities should, therefore, be made available for all layer farmers on easy terms and conditions and an adequate amount. Thus, well-planned, and management training in accordance with their problems can lead to them to increase farm production and income from layer farming. If proper remedial measures are taken, layer farming could be a more viable and attractive commercial enterprise in Bangladesh.

Competing interests

The authors have declared that no competing interests exist

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