



ECONOMIC ASSESSMENT OF COMMERCIAL TURKEY AND BROILER FARMING IN BANGLADESH: AN APPLICATION OF BINARY PROBIT MODEL

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Article History

Received : 09 January 2022

Revised : 28 January 2022

Accepted : 12 February 2022

Published : 23 June 2022

To cite this article

Marshrat Jahan & M. Kamruzzaman (2022). Economic Assessment of Commercial Turkey and Broiler Farming in Bangladesh: An Application of Binary Probit Model. *Indian Journal of Economics and Financial Issues*, Vol. 3, No. 1, pp. 37-46. <https://DOI: 10.47509/IJEFI.2022.v03i01.03>

Abstract: A comprehensive and comparative study of Broiler and Turkey has been undertaken in Bangladesh focusing the stability issues. The study compared the profits of broiler and newly introduced Turkey breed in Bangladesh. The data used in the study were obtained from a cross-sectional survey of broiler and turkey farmers in the study areas. Purposive and simple random sampling procedures were used to select 180 farmers for the study. The data collected were analyzed using STATA and descriptive statistics. Major findings of this study indicates high gross and net return for Broiler 12.32 lac and 3.98 lac respectively although because of low cost the return over per Taka investment or BCR (undiscounted) was calculated and found high for Turkey 2.227 & of broiler 1.47. The study also revealed that farmer's age, education level had the positive and significant effect and experience, occupation, link with extension services and timely vaccinated had the negative effect for choosing Turkey production (turkey = 1 and broiler = 0). The main impediments to the turkey industry were found lack of proper marketing, veterinary and training facilities turning to a sudden fall in the demand, discouraged farmers to adopt turkey farming. Although both productions were found more or less profitable turkey farmers recorded more profit with less risk and therefore by investing more in turkey could be a strategy to bridging the animal protein supply deficit as a means of increasing farm income.

Keywords: Comparative analysis, Profit, Binary Probit Regression, broiler and turkey production, Problems and Prospects.

INTRODUCTION

The livestock industry has been an integral agricultural subsector of the Bangladeshi economy considering its contribution to the Gross Domestic Product (GDP) and the importance of animal protein in the diet of the people. The significance of animal protein which is a major constituent of balanced diet in the meal of the people cannot be overemphasized. Chicken meat and eggs are, so far, the cheapest source of animal protein in Bangladesh and it is well accepted by all religious, economic, social, and demographic groups (Simon, 2009). Turkey production is an aspect of the poultry industry which although not much popular like broiler in Bangladesh in recent years which is very popular in many parts of the world especially Europe and America where they play an important role in the supply of meat and eggs. This bird was taken in our country as a part of hobby, but within a short time, it got popularity among the countrymen, specially the youths and started turkey bird farming instead of broiler at different parts of the country. Although, turkey production, consumption and trade are much lower than for chicken, they have been affected by many of the same trends that have dominated somewhere the broiler industry (Dale, 2000). Farmers are rearing turkey as an ornamental bird as well as for commercial purpose with a limited extent at a lower cost comparing with broiler farming without having prior experience. But now a day it can be an important source of alternative and cost saving farming against broiler for producer as it can be kept in an open area, not like the poultry farm and on the other hand, turkey disease is very rare whereas broiler industry is threatened to extinct by only a disease named bird flu. There was no concrete data on turkey rearing history in Bangladesh. Farmers are rearing turkey with an inadequate prior experience and it is increasing gradually because of a gamey flavor of meat with lower fat content (Asaduzzaman, 2017). Turkey farming is similar to other poultry birds farming like chickens, ducks, quails, etc. And very enjoyable (Chowdhury *et al.*, 2004). Despite being priced steeply compared to other poultry products, the demand for turkey meat is increasing while first introduced which has prompted various players to set up turkey rearing farms. Turkey production is an important and highly profitable agricultural industry with a rising global demand (Yakubu *et al.*, 2013), and it is adaptable to a wide range of climatic conditions. Ezeano and Ohaemesi, 2018 says profitability ratios showed the Return on Investment (RoI) of 1.53, Net return on Investment (NRoI) of 0.53, and Gross ratio of 0.66 in broiler production as against RoI (1.57), NRoI (0.57) and Gross ratio (0.64) in turkey production. Although both productions were found profitable, turkey farmers recorded more profit. Therefore, farmers and investors should invest more in turkey production as a strategy to bridging the animal protein supply deficit. Besbes (2009) reported that the worldwide poultry sector consists of chickens (63%), ducks (11%), geese (9%), turkeys (5%), pigeons (3%) and guinea fowls (3%). Turkey grows faster like broiler chickens and become suitable for slaughter purpose within a very short time. Turkey farming for meat production is very popular than egg production in Bangladesh (Siddiky, 2017). Turkey is more resistant to disease compared to other poultry species like chicken, duck, and quail. It has also been reported that mortality rate of turkey is very low compared to other poultry bird

(Sampath,2012). The study identifies how commercial turkey farming could be an option to the producer or the trader of poultry over or along with the broiler production and to recognize the hindrances to set up this new business for the survival of the poultry industry. In this regard we set up the following objectives.

- a) To estimate commercial profitability of broiler and turkey farming in Bangladesh
- b) To find out determinants of rearing broiler and turkey and
- c) To identify the constraints in the farming of turkey and broiler.

METHODOLOGY

Selection of the study region is an important phase for the farm management research. “The area in which a farm business survey is to be carried out depends on the particular purpose of the survey and the possible cooperation from the farmers” (Yang, 1965). Based on area and production, the present study was conducted in one of the highest Turkey and broiler growing districts of Bangladesh. Gazipur, Dhaka, Mymensingh and Tangail.

For the present study, the data were collected from primary sources. Primary data were collected from the respondent farmers through personal interview. During interview, proper care and caution was taken by the researcher to maintain accuracy and reliability of data. The research assistant did all possible efforts to maintain a congenial relationship with the respondents so that the respondent farmers feel free to give accurate data to the researcher. Before interviewing, the aim and objectives of the study were explained to each and every respondent farmer.

ANALYTICAL TECHNIQUE

In this study, we aimed to determine socioeconomic and demographic factors affecting the decision of the consumer to produce turkey or broiler. Given the dichotomous nature of the consumer, a qualitative response model is appropriate. Qualitative response models relate the probability of an event to various independent variables. Such models are often useful when assessing producer characteristics that are associated with farming decisions. (Khan, 2002). In order to provide a detailed analysis of the production preferences, either broiler or turkey farming, we applied a discrete choice probit model for binary choice (yes, no) responses to the production preferences question. The probit model is a statistical probability model with two categories in the dependent variable (Liao, 1994). Probit analysis is based on the cumulative normal probability distribution. The binary dependent variable, y , takes on the values of zero and one (Aldrich and Nelson, 1984). The probit analysis provides statistically significant findings of which demographics increase or decrease the probability of consumption.

In the binary probit model, turkey rearing preference is taken as 1, while broiler farming as 0. It is assumed that the i th household obtains maximum utility, it has the preference of

producing turkey rather than broiler. The probability p_i of choosing any alternative over not choosing it can be expressed as in (2), where Φ represents the cumulative distribution of a standard normal random variable (Greene, 2011):

$$P_i = \text{prob} \left[Y_i = \frac{1}{X} \right] = \int_{-\infty}^{x_i\beta} (2\pi)^{-1/2} \exp\left(-\frac{t^2}{2}\right) dt = \Phi(x_i'\beta). \quad (1)$$

The relationship between a specific variable and the outcome of the probability is interpreted by means of the marginal effect, which accounts for the partial change in the probability. The marginal effect associated with continuous explanatory variables X_k on the probability $P(Y_i = 1 | X)$, holding the other variables constant, can be derived as follows [Greene, 2011]:

$$\frac{\partial p_i}{\partial x_{ik}} = \phi(x_i'\beta)\beta_k \quad (2)$$

where ϕ represents the probability density function of a standard normal variable. The marginal effect on dummy variables should be estimated differently from continuous variables. Discrete changes in the predicted probabilities constitute an alternative to the marginal effect when evaluating the influence of a dummy variable. Such an effect can be derived from the following (Greene, 2011):

$$\Delta = \Phi(x\beta, d = 1) - (\bar{y}\beta, d = 0) \quad (3)$$

The marginal effects provide insights into how the explanatory variables shift the probability of frequency of turkey production. Using the econometric software LIMDEP (Greene, 2011) marginal effects were calculated for each variable while holding other variables constant at their sample mean values. Factors influencing farmers attitudes towards produce a product may include product attributes, price as well as producer's social demographic and possible interaction between these factors (Peng, 2006). In this study, we assume that socioeconomic and demographic characteristics of the producer affected the adoption of either turkey or broiler farming. These characteristics are gender, age, education, experience, family size, occupation.

The estimation of the cost items was a tough task as the local units had to convert into standard unit. The cost items were classified into variable costs and fixed costs. The variable costs were calculated based on the prevailing market price multiplied with the regarded quantity for individual farmer and so the fixed cost. Input used in the study area were both purchased and family supplied. Thus, the total production costs consisted of cash and non-cash expenses farmers had to pay cash for the purchased inputs and On the other hand, farmers did not pay for home supplied inputs.

RESULT AND DISCUSSION

The economic analysis of this study was based on one growing year. Different cost items like costs of day-old chicks, feed, veterinary medicine, transport, labor, housing, tools equipment, electricity bill, litter and maintenance cost was taken into consideration. The economic data obtained from the experiment shows how the broiler farm are more cost intensive than turkey. Construction of houses, Tools & equipment's, maintenance and transportation are the costs which were made the turkey production expensive. But compare to broiler in total cost turkey can be a low-cost product. The average day-old chick cost was Tk. 25667 per farm per year and it covers 3.07 percent of the total cost compared to the average poult price per farm per year Tk. 14767 covering 6.11% of total cost.

Human labour is needed for performing different operations like feeding and watering, cleaning of farm, medical care, purchasing inputs and selling birds activities. Labour was measured in terms of man-day that usually consists of 8 hours. Labor wage was reported to vary based on different operation and season. Compare to turkey broiler is more labor-intensive costing Tk. 50013 covers the 5.99 percent of the total. Due to maintain the congenial environment inside the house, the farm owner has to repair the house which includes some cost named as repairing cost. Although turkey can be raised in both free range and intensive system, Turkey consumes generally a bigger space than broiler as a big sized poultry bird. The average per farm per year housing cost was estimated at Tk. 13005 while for turkey the cost is higher to Tk 18062.5.

Table 1: Cost of broiler and turkey production

<i>Particulars</i>	<i>Broiler</i>	<i>% of total</i>	<i>Turkey</i>	<i>% of total</i>
Day old chick price	25667	3.07	14767	6.11
labor	50013	5.99	18400	7.61
Housing	13005	1.55	18062.5	7.47
Tools & equipment	8835	1.05	13787.5	5.70
Electricity bill	46107.4	5.52	12202.86	5.50
Liter	19192.5	2.30	5500	2.27
Transportation cost	2837	0.34	4890	2.02
Feed cost	608795	72.99	132918.4	55.02
Veterinary Expense	57992	6.95	16050	6.64
Maintenance cost	1630	0.19	4996.25	2.06
Interest on operating capital	112707.41	13.51	14680.71	6.07
Total	834073.88	100	241574.55	100

Broiler and turkey farms generally used feeder, drinker, brooder, fan, bulb, khunti, and tube-well etc. The average tools and equipment cost is 5 times more in turkey (5.70%) for per farm per year compare to broiler. Electricity was very essential for poultry farms for maintaining temperature while in the other hand litter cost includes the cost of rice bran,

lime and cement which is an important cost for broiler production. So, conveniently the average electricity and litter cost per farm per year was higher Tk. 46107.4 and Tk. 19192.5 than turkey respectably.

In the study area, farmers transport their purchasing input such as feed, day old chicks and litter by the means of easy bike, rickshaw, van and pulling cart from feed mill to their farm and constituted a very small proportion of the total cost. Feed expenses comprised a major part of the total costs in both. The broiler farm owner uses ready-made feed. The feed cost was calculated by multiplying average quantity of the feed intake by broiler birds to the average per kg price of the feed. In the period of data collection average price of the feed bag containing 50 kg feed was Tk. 2177. In the present study, feed cost was Tk. 608795 which accounted for the 72.99 percent of the total cost. When calculated for turkey which are generally reared by feeding foragers it was just 6th time lower to broiler Tk. 132918.4 accounted for the 52.02 percent of the total.

Farmers in the study area were very careful about the possibility of diseases. So, they use medicine and vaccine to protect their farm from diseases outbreak. In the study area farmer do not pay any fees for veterinarian service because this service was provided by the govt. veterinary doctor. Broiler farmers also purchase additives for the broiler production. Here, additives mean feed supplement for broiler which is mixed in the feed so that the broiler birds can get enough nutrients from regular meals. So, the farmers provide and include vitamins, amino acids, fatty acids, minerals, feed energy, antioxidants, acidifier, antimicrobial and growth promoting factor with the feed. The average Medicare and additives cost per farm per year were Tk. 57992 and that covers total cost by 6.95%. Where turkey need only Tk. 16050 for veterinary service because of the high immunity power. For maintaining purpose broiler farmer spent only 1630 taka while Turkey farmer faced 4996.25 taka of expense.

Interest on operating capital includes variable costs in the broiler and turkey production which was calculated for one year period. Interest rate of 8.5 percent per annum was considered for calculation. It was assumed that if the owner of the broiler farm borrowed money from any financial institution, he would have paid interest at the above-mentioned rate. The interest rate on operating capital was Tk. 112707.41 for per farm per year for broiler and Tk. 14680.71 for turkey respectively.

Gross return is the total revenue earned from the production which includes return from the main product and by-product. Following table shows that Gross-return from broiler is much higher Tk. 1232786.78 than turkey Tk. 550001.875. For net return the picture told the same. But in the case of BCR turkey farm grows profit more than that of broiler.

Table 2: Total return of turkey and broiler

<i>Output</i>	<i>Broiler</i>	<i>Turkey</i>
Gross return	1232786.78	550001.875
Net return	398712.9	308427.325
BCR	1.47	2.277

Benefit Cost Ratio (BCR) considering total cost of production and total return is also presented in Table 3 for both for turkey and broiler. Return over per Taka investment or BCR (undiscounted) was calculated as a ratio of gross return to total cost. The benefit cost ratio of turkey was 2.227 which means that by investing Tk. 1.00, farmers would earn Tk. 2.227 in return. The benefit cost ratio of broiler was 1.47 which means that by investing Tk. 1.00, farmers would earn Tk. 1.47 in return. It was clear that although turkey production did not earned higher gross return and net return than broiler but because of lower cost incurred in turkey, it possesses high return to the last dollar invested. On the basis of above discussions, it could be said that production of turkey was estimated more profitable than that of broiler. Cultivation of turkey other than broiler would help growers to increase their income. We will be increasingly faced with the demand to produce more food for more people with fewer resources and we will need to draw more heavily on high quality meat production to provide meat protein for this growing demand.

Determinants of Turkey and Broiler Production

The production of turkey and broiler was likely to be influenced by different socioeconomic factors. Nine variables such as, farmer's age, gender, farm size, occupation, education level, farming experience, training received, maintenance cost, Link with extension service, Timely vaccinated and Timely sale of output were included in the model. Results shows that farmer's age, gender, education level, farm size, training, maintenance cost & timely sale of output had positive influences and experience, occupation, timely vaccinated and link with extension services had negative influences.

Table 3: Maximum likelihood estimates and marginal effects of variables determining broiler and turkey production among respondent farmer

<i>Explanatory variables</i>	<i>Coefficient</i>	<i>Standard error</i>	<i>z-statistics</i>	<i>Marginal effects</i>
Constant	-2.12	1.50	-1.41	-
Age	0.371	0.198	1.87	0.060**
Gender	0.724	0.880	0.82	0.117
Education	0.375	0.216	1.73	0.060**
Occupation	-0.605	0.244	-0.25	-0.009
Experience	-0.22	0.183	-1.24	-0.037
Farm size	0.175	0.261	0.67	0.028
Training	0.25	0.328	0.77	0.041
Maintenance cost	0.00017	0.00013	1.33	0.000028
Link with extension service	-0.47	0.367	-1.29	-0.077*
Timely vaccinated	-0.097	0.909	-0.11	-0.015*
Timely sale of output	0.379	0.405	0.94	0.061

Note: Number of observation = 180; LR chi-square (9) = 94.09; Log likelihood = -51.91; Pseudo R2 = 0.4754
 *** Significant at the 1 percent level ($p < 0.01$); ** significant at the 5 percent level ($p < 0.05$); * significant at the 10 percent level ($p < 0.10$).

In the probit regression, there is an additional step of computation required to get the marginal effects once one has computed the probit regression fit. Marginal effects of the regressors is, how much the probability of the outcome variable changes when one changes the value of a regressor, holding all other regressors constant at some values. Marginal effects are popular in some disciplines (e.g. Economics) because they often provide a good approximation to the amount of change in Y that will be produced by a 1-unit change in X (Cameron and Trivedi, 2009). Farmer's age and education were positive and significant at 5 percent level. It indicates that 100% increase of age and educational facility increases the probability of turkey production by 6%. It means that, those farmers who are more educated and aged are eager to adopt turkey production more than broiler production. As turkey requires less hard work it is quietly familiar with the older section to have a taste of new variety. Also being newly introduced this turkey requires new innovative ideas to carry out this production operations, so increase in education level is must to adopt turkey.

Experience of farmers negatively affect the adoption strategies of the respondent. The farmers who doing business with broiler for long time are now have a quiet much more knowledge and seizure on the broiler market, capturing turkey market suddenly may incur less profit for them. Experience led to broiler by almost 4%. If the vaccination and extension possibilities increase it will increase the possibility to adopt broiler by 1% and 7% respectively. The broiler industry is often threatened by different diseases which the main hindrance of this business. Farmers in the study area believes if vaccination increases and different extension services available it is highly possible that farmers from different poultry business will switch to broiler. Fast food processed from Broiler are so popular among the young generation as well as the urban people whose daily schedule are very tiring. So to capture the market through broiler is very easy as a producer. In the study it is found that 76.11% respondent wants to switch to broiler and others 23.9% in turkey.

Constraints Faced by the turkey and broiler Farmers

In the beginning of the turkey production, people bought it out of curiosity. Suddenly the demand almost evaporated and the market went down completely. We are also well-known about the fact of broiler instable market. All these problems put the industry in a deadfall. There were many problems in the research area that affected production as well as profitability of broiler and turkey cultivation. Farmers were asked about the important problems they face often during production of broiler and turkey. Those problems were then ranked and arranged in order based on the priority of the problem. The poultry market in Bangladesh also faces a considerable amount of trouble, price of chicken fluctuate frequently and often it reduced drastically which affected the farmers seriously. Following figure represents that, 80 percent of broiler farmer and 75 % turkey farmer reported seriously about this problem. Sometimes the output price decreases drastically as a result farmers cannot cope up with the input cost and faces loss. The turkey farmers specially faced some problems like lack of medical facility, training facility, incubation problem, lack of pure breed for production and finding customer as farmers buy and sell turkey mainly through

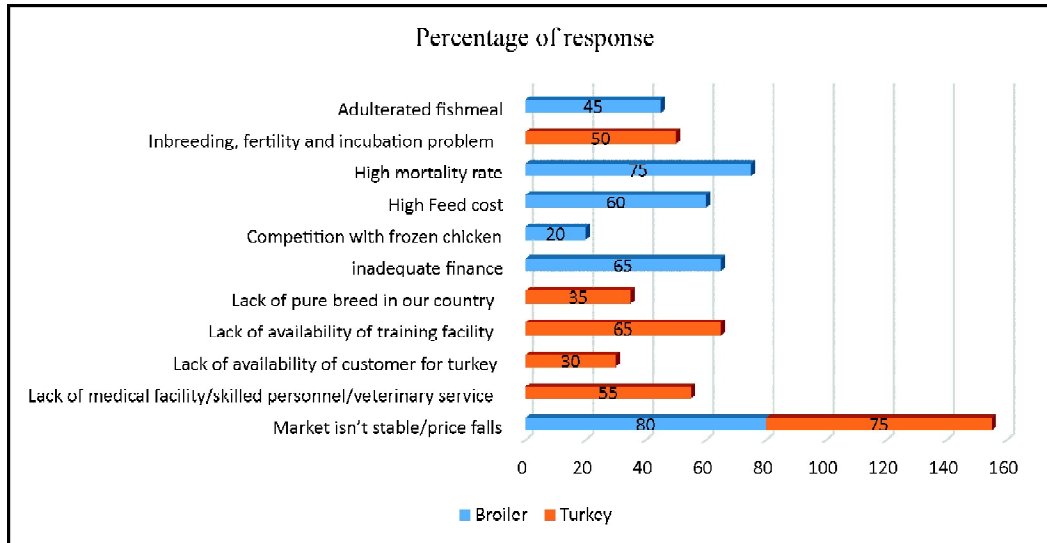


Figure 1: Percentage of the problems faced by the respondents of broiler and turkey

personal communication. The broiler farmer has a fear of mortality rate where turkey has a low diseases criterion. High financial problem 65% with high fees cost were very common for broiler.

CONCLUSION

The profit from turkey enterprise was significantly higher than from broiler enterprise. There is a considerable scope of turkey rearing in Bangladesh, as turkey can be reared in free range farming system. It has a good prospects and new dimension in poultry sector. As a white meat, its quality is superior and it is delicious than any other meat. Suitability of climatic condition, availability of natural feed and manpower can make turkey sector profitable, especially for the poor and marginal farmers. Moreover, broiler meat has a raising demand in market that influencing the producer for making profit from this business. But comparing the whole situation farmers risk free profitability lies on turkey production although broiler has occupied the market with its different phases. Turkey farmers are facing some production and marketing related problems which made the demand for turkey fall suddenly. Taking proper remedial steps specially government intervention, turkey rearing could be a viable commercial enterprise which could play a significant role in poultry sector by supplying nutritious food, generating income, creating employment opportunities and thus improving the living standard of the rural people.

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