Factors Affecting Profits of Broiler Industry in Jordan: A Quantitative Approach

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Abstract: The main objective of this study was to look at the profitability of broiler sector in Jordan. The study has been conducted to investigate the main factors affects profits of broiler producers in the country. A profit function regression model was used as a decision support tool in commercial broiler production. The model was utilized to demonstrate the effect of several investigated factors affecting the industry. The effect of sale price of broiler, price of purchased chick, price of feed, cost of labor, cost of veterinary service and medicine, costs of building and machinery depreciation and maintenance, cost of heating and lighting, mortality rate and feed conversion rate on the profit of the broiler producer were investigated. These variables were resembled by symbols X_1-X_9 diirly. The results of the study shown that each of these factors is with a specific effect on producers' profit. The results shown that a rise in the sale price of broiler meat (JD kg^{-1}), Live Weight (LW) which is resembled X_1 by 1 JD will increase in the profit kg^{-1} LW by nearly 0.80 JD. In the other hand, the rises in X_2, X_3, X_5, X_6, X_7, X_8 and X_9 will lead to a drop in the profit kg^{-1} LW by 0.54, 1.1, 1.4, 1.3, 1.1, 0.245, 1.4 and 0.4 JD, respectively. The model estimates were quite compatible with field observations. In field observations, the most important factors affecting profit in this study were the price of feed and the Feed Conversion Rate pra. The correlation matrix of the variables in the regression model shows stronger negative relation between the dependent variable (profit) and these two factors compared to the other variables. The correlation coefficients were 0.301 and 0.357 for price of feed and FCR, respectively.

Key words: Broiler industry, profitability, profit function, producers, regression, Jordan

INTRODUCTION

In Jordan, broiler production is one of the most important agricultural enterprises among livestock sector. Broiler industry has become a rapidly developing enterprise among the other sectors of poultry production. Poultry meat provide protein in terms of quality and quantity that narrow down the animal protein supply gap in minimum possible time as compared to other sources of animal protein. During the last two decades the number of poultry birds for meat (broilers) increased significantly in Jordan. There were nearly 2297 working broiler farms in the country.

For many animal production farmers the revenue from broiler production considered to be the main source of income. High cost feeds, diseases, delayed payments by commission agents, high transport costs, lack of knowledge on actual marketing condition and inefficient marketing system are the most dominant problems facing broiler production in Jordan. The effects of these problems reflected badly on the profitability of this sector. Price fluctuations lead to uncertainties in securing favorable price for broiler producers in the whole country. Modern broiler enterprises are characterized by mass production with a high turnover of capital but low profit

margin per bird (Cengiz and Ceveger, 2003). This situation characterizes broiler industry in Jordan. In Jordan, farmers are producing broilers without foreseeing the supply and demand situation in the market. Prices are low where the supply is high and vice versa. Such a situation creates uncertainty in the market and as a result, the farmers are unable to plan their business. Control of production costs, availability of the necessary production related and reliable information and risk assessment are the most important issues related to successful broiler industry (Van Arendonk, 1991). For decision makers, managers and producers, these factors are very important in terms of profitability (Heady et al., 1961). The cost of distribution of broiler products is a very important factor to be investigated. The cost of distribution of broiler products from producer to the consumer is very high, mainly due to high share of middlemen involved at various stages.

The extraction of abnormal profit by intermediaries reduces the profit of broiler farmers and discourages them to expand the production unit. The profit share of middlemen also needs to be reduced in order to lower prices at the retail level (Parkhurst, 1967). It is necessary to enable the producers to sell their production at reasonable price and consumers to buy their needs at minimum cost (Maqbool et al., 2005a). It was estimated

that the profit as a percentage of sale price and purchase price was 6.75 and 7.29%, respectively. The share of intermediaries (commission agents+retailers) was about 75% (Qazi, 1989). Other researchers Chohan (1992) and Maqbool *et al.* (2005b) shown higher producer's share than that of intermediaries. These results suggested that marketing margins of commission agents and retailers were higher than producers indicating that commission agent's profit was highest compared to producers and retailers. Commission agents were exploiting producers because producers had cash constraints and had no direct relation with retailers to sell off their output. The margin of the producers is influenced by shifts in retail demand, farm supply and marketing input prices. Time lags in supply and demand, market power, risk, technical change, quality and spatial considerations are another important factors (Wohlgenant, 2001). Chohan (1992) studied the marketing of poultry in district Jhang in Pakistan (A country with similar broiler production conditions to Jordan). He found that broiler producers got considerably less price than that of market price. This is true for broiler producers in Jordan.

Utilization of econometric models: Econometric models have been utilized as decision support tools and tools for progressive planning of the enterprises in livestock sector. Researchers have made several analysis with econometric models and techniques in the Tijani *et al.* (2006) and Yusuf and Malomo (2007) have established profit function models and determined the marginal impact factor of the independent variable. Profit function has been utilized as a selection criterion in dairy cattle breeding (Dartt *et al.*, 1999) and in broiler production systems (Dekkers *et al.*, 1995). Heady *et al.* (1961) have used quadratic and Cobb-Douglas type production model to determine marginal effects of the corn and soybean on body weight gain in broilers. Sakarya (1990) has investigated productivity analysis and determined return of scale in broiler production after estimating Cobb-Douglas type production function. Cevger (2003) found no effect of fattening period, capacity usage, number of animals and other current expense items on profit via constructed profit function regression model in lambs.

Background of broiler production in Jordan: Among Arab countries, Jordan considered to be one of the first five leading in broiler industry. Poultry meat production kg per capita. in Jordan is nearly 22. Table 1 shows per capita consumption and imports of broiler meat in Jordan in 2005 and the expectation of them in 2015. In Jordan there were nearly 2690 poultry farms, 85% of were broiler farms. A total number of 80340350

Table 1: Per capita consumption and imports of broiler meat in Jordan

Year	2005	2015
Consumption (kg capita^{-1})	22.11	26.53
Imports (1000 tons)	19.74	29.61

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Table 2: The total number and percentages of poultry farms in Jordan

Category	No. of farms	Total farms (%)
Broiler	2297	85.40
Layer	278	10.40
Parent Stock	114	04.20
Total	2689	100.00

DOS (Jordan, 2008)

Table 3: Categories of broiler farms in Jordan according to capacity

Category	No. of birds	No. of farms	Total farms (%)
First	<5000	390	17
Second	5000-29999	1769	77
Thrid	>30000	138	6
Total		2297	100

DOS (Jordan, 2008)

broiler birds produced in Jordan during the year 2008 in 2297 working broiler farms. Table 2 shows the total number and percentages of poultry farms in the country and Table 3 shows the categories of broiler farms in Jordan according to capacity.

Broiler production value in Jordan in the year 2008 was nearly 267829.9 (Thousand JOD). This value resembles about 31% of the total value of livestock production in the country which was 872047.7 in the same year (Thousand JOD).

Important related issues: The marketing process of broilers is in the hands of few functionaries who force the farmers to sell their product at the maneuvered prices. Farmers can not take the risk of keeping the broilers after the recommended growth period because after that period cost of production increases rapidly than the weight gain of birds. After interviewing different stake holders, it was observed that rapid price fluctuation under weighing and high charges of commission were the major problems of present marketing system. Many farmers claimed that intermediaries did not follow business ethics and tried to fetch maximum profit from business transactions. They used many tactics such as juggling with weighing scales, under counting and under weighing to deceive the farmers. In view of this, the farmers suggested a tripartite market arrangement in the form of farmers, intermediary and the government (Maqbool and Bukhsh, 2007).

Net margins of market intermediaries is another important issue to be discussed. There are different chains through which poultry birds move from producer to consumer. Usually, commission agents purchase birds from producers and then distribute them to retailers. The net distributive margin is the highest for commission agents compared to producers and retailers, indicating

that producers' net margin is the lowest while they are a key players in the business. The net margins are indicators of trends in costs, profits and services provided by farmers and food marketing firms. This is the difference between what the consumer pays for food and what the farmer receives for broiler meat (Kohl and Uhl, 1972). There is a strong cumulative effect on the marketing margin resulting from the increasing number of intermediaries involved in marketing process (Bashir *et al.*, 2001). As mentioned earlier, the cost of distribution of broiler products from producer to the consumer is very high mainly due to high share of middlemen involved at various stages. The extraction of abnormal profit by middlemen reduces the profit of broiler farmers and discourages them to expand the production unit. The profit share of intermediary also needs to be reduced in order to decrease prices at the retail level. The sequence of stages involved in transferring product from the farm to the consumer is generally referred to as marketing channel (Shepherd, 1996).

MATERIALS AND METHODS

Data collection: The data related to profits of broiler producers at different areas of production was collected. A total of 120 broiler farms were randomly selected for the purposes of this study. The reference period for the study was from October 2008 to September 2009 covering a period of complete five production cycles. Production cycle refers to the period from a day old chick to the day when it is marketed for meat purpose. In Jordan, this period is in an average of 40-45 days. The study covered the whole broiler production areas in the country, all the country governorates were represented in the sample, the study area were divided into three major production regions, northern, middle and southern regions of the country. To collect the necessary data a questionnaire was constructed. Total net income for all the broiler producers in the sample was the main item in the questionnaire. The collected data is an average of five production cycles.

Sample size: Sixty six producers were interviewed throughout the country, the sample size was determined according to the following equation:

$$n = [(p \times q \times z^2)/e^2]/[(N \times e^2) + (z^2 \times p \times q)/(N \times e^2)]$$

Where:

n = Sample Size
p = The proportion that the sample will occur
q = The proportion that the sample will not occur
  = (1- p)

z = The standardized score
e = Error term
N = Population

The sample size was determined at a confidence level of 0.90, this level was an appropriated level due to the reason that the population itself was relatively small in size. The term error was 0.10 and the Z value correspondent to this level is 1.65, the proportion that the sample will occur was 0.50 and proportion that the sample will not occur was also 0.50 and the population was 2297. The sample size according to the earlier mentioned equation was 66. For accuracy reasons and for the population to be fully represented in the sample twice this number was considered to be the actual sample which is 134. Table 4 shows the distribution of the study sample in the three production areas of the country. The distribution was according to the relative importance of the area in the number of broiler farms.

Statistical techniques: The aim of this study was to use a profit function model to estimate factors affecting profit kg^{-1} of broiler live-weight and to evaluate whether the established model could be used as a practical decision support tool in the field by the producers. Multiple regression method was used with the aim of estimating the direction and magnitudes of the relation between the profit kg^{-1} live-weight which considered to be the variable (Y) and the variables that are considered to have effect on the profit ($X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9$). The initial regression equation was:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X, X_8, X_9)$$

Where:

Y = Profit (Jordan Dinar or JD) kg^{-1} Live Weight (LW)
X_1 = Sale price of broiler (JD kg^{-1} LW)
X_2 = Price of purchased chick (JD $^{-1}$chick)
X_3 = Price of feed (JD kg^{-1})
X_4 = Cost of labour (JD kg^{-1} LW)
X_5 = Cost of veterinary service and medicine (JD kg^{-1} LW)
X_6 = Costs of building and machinery depreciation maintenance (JD kg^{-1} LW)

Table 4: The distribution of the study sample in broiler production areas

Area of production	Total no. of farms	Country farms (%)	Interviewed producers
North	1286	56	75
Middle	712	31	42
South	297	13	17
Total	2297	100	120

Prepared by the researchers

X_7 = Cost of heating and lighting (JD kg^{-1} LW)
X_8 = Mortality rate (%)
X_9 = Feed conversion rate-FCR (kg feed consumed kg^{-1} LW gain)

The regression equation was estimated by applying a stepwise regression procedure in the SPSS Statistical Package, version 12. In the stepwise procedure, independent variables are included in the equation respectively starting from a variable having the highest correlation with a dependent variable and the ones that are deemed to be statistically insignificant at p<0.05 are automatically dropped from the equation. Thus, the best model explaining the dependent variable can be without a need of trial and error of several models. The relationship between dependent Y and each independent variable X_i in the established model was examined in scatter diagrams and all the independent variables were found to have a linear relationship.

RESULTS AND DISCUSSION

The model results were estimated with stepwise regression method and the relevant statistical tests are shown in Table 5. The R^2 of the model was 91% which means that the independent variables included in the model explains 91% of the variation occurring in the profit kg^{-1} LW. The Beta values (β) in the Table 5 are the estimated coefficient of the equation and they indicate how much JD change shall realize in the dependent variable (JD kg^{-1} LW) against a 1 unit change in each X_i. Y: Profit (Jordan Dinar or JD) kg^{-1} Live Weight (LW) is the independent variable.

The model could be written as follow: Y = 9.95 + 0.844 X_1 - 0.541 X_2 - 1.112 X_3 - 1.401 X_4 - 1.321 X_5 - 1.074 X_6 - 0.027 X_7 - 0.245 X_8 - 0.401 X_8.

As results in Table 5 shows that none of the independent variables entered in the model significant at p<0.05 and so all of them were included in the model. All of the independent variables had a strong statistical association with the dependent variable which is the profit kg^{-1} LW. As R value indicates that 91% of the variation of the profit of farmers due to the effect of the independent variables. The estimated coefficients were depicted by beta (β) values. Each of these coefficients demonstrates the marginal impact of an independent variable in question on the profit kg^{-1} LW. From the model one can predict the type and magnitude of the change in any of the investigated factors on the profit of the broiler producer. It is clear that a rise in the sale price of broiler meat (JD kg^{-1} LW) which is resembled X_1 by 1 JD will result in an increase in the profit kg^{-1} LW by

Table 5: The estimated regression model

Variables	β	t-value	Sig. P	R^2	DW	F	Sig. F
Const.	9.950	52.000	0.00	0.91	2.14	2750.6	0.00
X_1	0.844	154.32	0.00	-	-	-	-
X_2	-0.541	-55.182	0.00	-	-	-	-
X_3	-1.112	-131.05	0.00	-	-	-	-
X_4	-1.401	14.510	0.00	-	-	-	-
X_5	-1.321	-13.004	0.00	-	-	-	-
X_6	-1.074	-26.481	0.00	-	-	-	-
X_7	-0.027	-11.038	0.00	-	-	-	-
X_8	-0.245	-21.210	0.00	-	-	-	-
X_9	-0.401	-48.029	0.00	-	-	-	-

nearly 0.80 JD. In the other hand, the rises in X_2, X_3, X_5, X_6, X_7, X_8 and X_9 will lead to a drop in the profit kg^{-1} LW by 0.54, 1.1, 1.4, 1.3, 1.1, 0.245, 1.4 and 0.4 JD, respectively. As the correlation matrix shows, the model estimates were quite compatible with field observations. In field observations, the most important factors affecting profit in this study were the price of feed and the feed conversion rate. The matrix shows a strong negative relation between the dependent variable (profit) and these two factors.

CONCLUSION

The modeling approach used in this study could be applied by commercial broiler producers and to be used as a decision support tool to evaluate different scenarios of production approach and to evaluate the risk of investment under many unpredictable circumstances in broiler production industry.

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