

Effects of Some Technical and Socio-Economic Factors on Milk Production Costs in Dairy Enterprises in Western Turkey

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Abstract: This research was conducted to determine the technical and socio-economic factors that may affect the cost in dairy enterprises. In this context, the annual production records (2005-2006) of 77 dairy enterprises running in Western Turkey were examined. Data were analyzed by using multiple regression model. Results showed that the parameters such as education of the producer, scale of the enterprise, feed consumption, feed procuring and litter size had significant effects ($P < 0.05$) on the average milk costs. On the other hand, marketing, main occupation and age of the producer were found to be statistically insignificant ($P > 0.05$). In conclusion, controlling the technical and socio-economic factors was found to have important effects on decreasing the cost of the production as well as increasing the profitability of the enterprise.

Key words: Dairy cattle • cost • regression model • socio-economic factor

INTRODUCTION

The term “cost” has some bases in animal production as in the other production areas. The prepared cost accounts contribute to determine the unit costs, control the activities of the enterprise for the next term, make the enterprise planning and take the decisions of management. Therefore reaching the desired goals is associated with controlling the costs seriously [1].

Optimum utilization of the sources and controlling the costs are the indicators of success or failure in dairy cattle production where profitability and productivity are considered primarily. Thus, to determine the factors that affect the costs in milk production and taking precautions, directly influence the performance of the enterprise [2].

In some studies, the effects of several technical [3-6], economical [6, 7] and socio-demographic factors [8-12] on milk production is reported. However, it would be beneficial to indicate that the influence of the

mentioned factors could change according to the region and country.

In this study, some technical and socio-economical factors effective on production costs provided per cattle were examined in dairy cattle enterprises running in Western Turkey.

MATERIALS AND METHODS

The data used in the study was acquired from the dairy cattle enterprises running in Western Turkey by surveys. The data comprise the production records of 77 enterprises which were selected by random selection method [13] regarding 2005-2006 years.

Initially, the constituent factors of cost have been determined and cost per cattle (Turkish Lira-TL/head) was calculated using the annual production records. Multiple regression model was used to determine the way of the correlations between cost per cattle and some factors that are thought to affect cost [13]. The established model is as shown below:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8)$$

In the model;

- Y: Average production cost (Turkish Lira-TL / cattle),
 X₁: Main occupation; does the producer do full time farming? (1 = yes, 2 = no),
 X₂: Education level of the producers (1 = primary school, 2 = higher than primary school),
 X₃: Age; age of the producers,
 X₄: Marketing; the ways of marketing of milk (1 = own, 2 = cooperative),
 X₅: Feed procuring (1 = own production, 2 = purchased),
 X₆: Herd size; number of cattle in the farms (head / herd),
 X₇: Litter size: average number of calves born from each cow (head / cow / year),
 X₈: Feed consumption; consumption of feed (kg / cattle).

Cost (Y) is considered as the dependent variable while the others (X_i) are considered as the independent variables in the established model. The marginal differences in the independent variables explain the variation on the dependent variable.

RESULTS

Multiple regression model has been established and the hypotheses of the model have been examined. In this connection, the criteria for normality, linearity, residuals, autocorrelations (Durbin-Watson) and multicollinearity (VIF) were determined to be appropriate for the model. On the other hand, no significant correlation was seen between the independents variables (Table 1).

The established model was found reliable ($P < 0.001$) and all of the independent variables determined to explain the variation on the average cost with a percentage of 64.9% (R^2 : 0.649 and Adj. R^2 : 0.608). As a result of the

regression analyses, the factors such as education level of the producers, scale of the enterprise, feed consumption, feed procuring and litter size were found to affect the average milk cost ($P < 0.05$) while the main occupation of the producer, marketing and age of the producer were found to have no significant effect ($P > 0.05$) (Table 2).

The β coefficients indicated the amount of decrease or increase (TL) in terms of one unit increase in the independent variable on the average cost (Y). With reference to this, an increase in the education level of the producers (X₂) and the increase in the number of the producers who only deal with dairy cattle breeding (X₁), decreases the cost per cattle as 254.3 and 4.8 TL, respectively. In addition, the increase in the age of the producers (X₃) cause a 3.5 TL decrease in the cost per cattle. It has also found that one unit increase in the litter size per cow (X₇) and the number of cattle (X₆) at the enterprise cause a decrease in cost per cattle as 324.6 and 16.4 TL, respectively. On the other hand, purchasing the feed consumed at the enterprise (X₅) from outside and marketing the milk by the facilities of the producer (X₄), increase the cost per cattle as 223.3 and 37.06 TL, respectively. Moreover, one unit increase in feed

Table 1: Correlation matrix of the variables entered in the regression model

Variables	Y	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈
Cost	1								
X ₁	-0.022	1							
X ₂	-0.208	0.317	1						
X ₃	-0.087	-0.041	-0.350	1					
X ₄	0.034	0.301	0.278	-0.067	1				
X ₅	-0.274	0.011	0.132	-0.093	-0.128	1			
X ₆	-0.573	-0.090	0.014	0.101	-0.181	0.249	1		
X ₇	-0.252	0.169	0.124	-0.082	0.118	0.144	0.062	1	
X ₈	0.464	0.008	-0.055	-0.052	-0.019	-0.481	0.042	-0.100	1

Table 2: The coefficient prediction results of the estimated model

Variables	β (X \pm Sx)	T	Sig T*	VIF	R ²	Durbin-Watson	F	Sig F**
Constant	962.775 \pm 420.100	2.292	0.025		0.649	2.070	15.749	0.000
X ₁	-4.846 \pm 128.131	-0.038	0.970	1.214				
X ₂	-254.374 \pm 105.128	-2.420	0.018	1.362				
X ₃	-3.545 \pm 4.634	-0.765	0.447	1.202				
X ₄	37.062 \pm 98.273	0.377	0.707	1.222				
X ₅	223.360 \pm 101.061	2.210	0.030	1.535				
X ₆	-16.464 \pm 2.065	-7.974	0.000	1.173				
X ₇	-324.612 \pm 142.570	-2.277	0.026	1.071				
X ₈	0.220 \pm 0.034	6.534	0.000	1.394				

Y = Cost (TL/cattle) $P < 0.05$ * $P < 0.001$ ** N = 77

consumption (X_8) per cattle results with an increase of 0.22 TL in the average cost. In this connection the regression equation could be expressed as:

$$Y = 962.775 - 4.846X_1 - 254.374X_2 - 3.545X_3 + 37.062X_4 \\ + 223.360X_5 - 16.464X_6 - 324.612X_7 + 0.220X_8$$

DISCUSSION

The result related to the importance of the education level of the producer on the average production cost ($P < 0.05$), confirms the importance of education in assuring consciousness in utilization the sources actively and effectively. While Iype *et al.* [7], reported the educational level of the producers as an unimportant factor in milk production, Dhas *et al.* [3] and Tripath and Kunzru [14] stated the ability of business management with education as an important factor in milk production.

The effect of the age of the producer on the average cost was found insignificant ($P > 0.05$) in the study. However, the age of the producer is a factor that influences the taken decisions and actions at the enterprise, because the thoughts, behaviours and requirements of people are primarily associated with age. Since the producers were generally at the mid-age group (35-50) at the examined enterprises, it could be thought that making and realizing policies for future might be easier in managing the economical sources of these facilities. It was stated that the demographic and socio-economical structures of the producers affect the enterprise performance with a percentage of 14.4% and 34.3% [12].

On the other hand, the age and education level of the producer play a positive role in adoption of the technological innovation in dairy cattle breeding. Then, the new production technique and operating the new equipment influence the profitability and productivity positively [15-18].

One of the important factors of specialization in production and economical development is "the main occupation of the producer". Although this factor was found to have no significant ($P > 0.05$) effect on the average cost, it has an important meaning in rational business administration. In spite of this, it is known that specialization is too low in livestock sector in Turkey and this situation affects the economical development of the enterprises negatively [19].

The parameter of membership of cooperatives hasn't been examined due to the fact that all of the enterprises were the members of the "Cattle Breeders Association".

However, regarding the marketing variable, selling the milk with producer's facilities attracts attention because producers had no support from the association where they were affiliated in marketing their products. Therefore marketing the milk by their facilities causes an increase in production costs. The insufficient service in marketing the products provided to the producers by the cooperatives and failure in supplying cheap input, cause a serious problem in rationalization of production. It is reported that 61-73% of producers in Turkey, don't believe the usefulness of the cooperative organizations [8].

The increase in feed consumption at the enterprises and procuring the feed mostly out of the enterprise result in an increase in the production costs. Particularly the high prices of concentrated feed due to the high prices of raw material influence the consumption in terms of the increase of costs. Thus, procuring roughage inside of the enterprise is an important matter for profitability in livestock enterprises. The producers who supply the most of the required amount of roughage from the field sources they own, have an important advantage in decreasing the production costs comparing the ones who buy from outside [2].

The analyses showed that the increase in calving rate had a dropping effect in costs. In dairy cattle breeding, some income is also acquired from the calf, apart from the produced milk. Particularly male calves are of the desired animal materials in fattening. Therefore increasing the number of calves obtained from each cow is a desired situation. Special attention is being given to the fertility studies at the enterprises to be successful on this subject. It is stated in some studies that procuring the required dairy cattle for the enterprise not only contribute to the control of the costs but also contribute to the increase of profitability [20, 21].

As expected in the study, it was found that increasing the number of cattle at the enterprise has a dropping effect in costs. This fact is an indicator to show the importance of increasing the capacity utilization rates and lowering the unit costs at the enterprises. In a study, it is determined that 56% of one unit increase in milk production is based on the increase of the enterprise scale and 44% of it is based on the increase of the productivity [22].

In a research [2], it was found that the breed of the animal, cooperative membership, litter size, utilization of concentrated feed and milk yield have significant effects ($P < 0.05$) on the average cost while the main

occupation of the producer, education, roughage procuring and herd size have no significant effect ($P>0.05$).

CONCLUSIONS

In conclusion, it is once again determined that the costs are influenced by some technical and socioeconomic factors in milk production and the success in business administration depends on managing the costs. It is important to determine these factors accurately and utilize the sources properly and effectively, because it is not possible for the producer to use an initiative on the outer factors of enterprise (prices of input and product) owing to the structure of oligopsony type market in livestock sector in Turkey.

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