Araştırma Makalesi

FACTORS INFLUENCING PROFITABILITY IN DAIRY HERDS: A QUANTITATIVE METHOD APPROACH[*]

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Süt Sığırcılığında Kârlılığı Etkileyen Faktörler: Kantitatif Yöntem Yaklaşımı

Özet: Bu araştırma, süt sığırcılığında kara etkili faktörlerin kantitatif yöntemlerle tespit edilebilmesi amacıyla yapılmıştır. Çalışmanın materyali Afyonkarahisar'da faaliyet gösteren rastgele örnekleme yöntemiyle seçilen 78 süt sığırcılığı işletmesinden elde edilmiştir. Araştırmada sığır başına kar ile karlılığa etkisi olduğu düşünülen değişkenler arasındaki ilişkinin yönünü ve miktarını belirlemek üzere çoklu regresyon modeli kullanılmıştır. Model tahmin sonuçlarına göre, analize dahil edilen tüm bağımsız değişkenlerin sığır başına kar (Y) üzerindeki etkisi önemli (P<0.001; P<0.05) bulunmuştur. Buna göre, yem, işçilik, veteriner-sağlık, diğer ve genel idare, bakım-onarım ve amortisman masraflarında 1 TL'lik artış Y (kar/sığır) üzerinde sırasıyla -0.869; -0.838; -1.090; -2.168 ve -1.163 TL değerinde azalmaya neden olmaktadır. Buna rağmen laktasyon süt veriminin 1 lt daha fazla elde edilmesi ve sütün satış fiyatındaki 1 TL değerindeki artış Y (kar/sığır) üzerinde sırasıyla 0.193 ve 45.815 TL'lik bir artışı sağlamaktadır. Üreticilerin yem ve süt fiyatlarında bir insiyatif kullanamaması işletme karlılığını önemli ölçüde etkilemektedir. Sonuç olarak, kar fonksiyonu regresyon modeli, süt üretiminde de fiyatların ve maliyet unsurlarının değişebileceği durumlarda karar destekleme aracı olarak kullanılabileceğini ortaya koymuştur.

Anahtar Kelimeler: Süt üretimi, regresyon modeli, karar destekleme aracı, kar fonksiyonu

Abstract: This research was carried out to determine the factors affecting profits by quantitative methods in dairy cattle. The material of the study was obtained from 78 dairy enterprises running in Afyonkarahisar by random sampling method. Multiple regression method was used to predict the way and quantity of the relations between the profit per cattle and variables which were thought to have influences on profitability. All the independent variables involved in the model found to have significant effects on profit per cattle (P<0.001; P<0.05) according to the established prediction equation. This result indicated that a one TL increase in feed, labour, veterinarian-health, other and general management, maintenance and amortization expenditures on Y (profit/cattle) cause a decrease of -0.869; -0.838; -1.090; -2.168 and -1.163 TL respectively. However, a one liter additional gain in lactation milk yield and a one TL increase in the selling price of milk results in an increase of 0.193 and 45.815 TL respectively in Y (profit/cattle). The profitability of the enterprise is significantly affected due to the lack of farmers' using an initiative on determining the feed and milk prices. It was concluded that, the function of profit regression model could be used as a decision support tool in case of any change in sale prices and cost-effect factors in milk production.

Key Words: Milk production, regression model, decision support tool, profit function

Introduction

One of the important factors in dairy industry is to control the milk production costs and increase profit margin as high as possible. Therefore milk producers should pay more attention in controlling the factors which influence the profit of the enterprise (**4, 6, 8, 12, 13**).

Econometric models are used as a decision support tool regarding the future plans of the enterprises. The profit function is therefore established and degree of factors affect profitability has been examined. Profit function is generally seemed to be used for the selection purposes in dairy cattle breeding (**1, 3, 5, 16, 20**).

Nevertheless determining optimum usage of the input as well as measuring each of them is possible in milk production. Cobb-Douglas production function is used for this aim and marginal production factors affect profit are calculated (**7, 18, 19**).

In this research we aimed to calculate the effects of some factors on the profit per cattle acquired by the regression model in dairy cattle. By means of this, importance of the quantitative methods as a decision support tool was stated exhibiting the validity of them in dairy industry.

Materials and Methods

The material of the research was acquired from 78 dairy enterprises running in Afyonkarahisar. A questionnaire has been applied using random sampling method (**10**) in May 2006. The data included the annual production activities of the producers regarding 2005-2006.

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Questions regarding the producers' socio-economical conditions, production techniques, inventory information and income-outgoings of the enterprise were asked in the face to face practiced survey.

Enterprise scale was determined according to the owned livestock number while the profile of the producer was determined according to the education level and age in the examined enterprises.

The profit of the enterprise per cattle was calculated to determine the factors affect the profit using quantitative methods (2). Multiple regression method was used to predict the way and quantity of the correlations between the profit per cattle (Y) and the variables that are thought to affect profit (X$_i$) (10). The established regression equation was:

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

Y   : Profit (Turkish Lira-TL) per cattle,

X$_1$: Cost of feed (TL/per cattle),

X$_2$: Cost of labour (TL/per cattle),

X$_3$: Cost of veterinary service and medicine (TL/per cattle),

X$_4$: Other costs including energy and fuel-oil, transport, interest of credit and miscellaneous (TL/per cattle),

X$_5$: General management, building and equipment amortization, reparation and maintenance costs (TL/per cattle),

X$_6$: Milk selling price (TL/Liter-L),

X$_7$: Lactation milk yield (L/cow/305 days).

R e s u l t s

Multiple regression model was developed and the hypothesis of the model was examined. In this context, the criteria for normality, linearity, residuals, autocorrelations (Durbin-Watson) and multicollinearity (VIF) were determined.

The model results and related statistic tests by regression analyses are given in Table i. The independent variables involved in the model explain the variation of profit gained per cattle with a percentage of 84.9% (R^2 = 0.849 and Adj. R^2 = 0.834).

Table 1: Regression model for profit per cattle (TL) and some factors affecting profit in milk production

Variables	β (X ± Sx)	T	Sig t*	VIF	R^2	Durbin-Watson	F	Sig F**
Constant	-1009.943±547.921	-1.843	0.070		0.849	1.836	56.188	0.000
X$_1$	-0.869±0.119	-7.286	0.000	1.632				
X$_2$	-0.838±0.194	-4.313	0.000	1.839				
X$_3$	-1.090±0.520	-2.095	0.040	1.236				
X$_4$	-2.168±0.714	-3.039	0.003	1.575				
X$_5$	-1.163±0.271	-4.299	0.000	1.330				
X$_6$	45.815±15.379	2.979	0.004	1.204				
X$_7$	0.193±0.023	8.518	0.000	1.229				

Y = Profit (TL/cattle)   P<0.05*   P<0.001** N = 78

β values shown in the table are the prediction coefficients of the equation which shows the change amount (TL) of dependent variable (Y) in return to one unit change in independent variable (X$_i$). In the established model, a high correlation level wasn't seen between the independent variables (X$_i$) according to correlation matrix (Table 2).

Table 2: Correlation matrix of the variables included in the regression model

Variables	Y	X$_1$	X$_2$	X$_3$	X$_4$	X$_5$	X$_6$	X$_7$
Y	1							
X$_1$	-0.565	1						
X$_2$	-0.575	0.375	1					
X$_3$	-0.415	0.321	0.109	1				
X$_4$	-0.404	-0.023	0.536	0.074	1			
X$_5$	-0.497	0.388	0.362	0.067	0.195	1		
X$_6$	0.179	0.128	0.112	-0.150	0.005	0.218	1	
X$_7$	0.434	0.159	0.072	-0.199	-0.089	0.020	0.337	1

As a result of regression analyze, all of the independent variables found to affect Y ($P<0.05$). According to this, a one TL increase in feed (X_1), labour (X_2), veterinarian-health (X_3), other (X_4) and general management, maintenance and amortization expenditures (X_5) cause a decrease of -0.869; -0.838; -1.090; -2.168 and -i.163 TL respectively on Y (profit/cattle). However, a one liter additional gain in lactation milk yield (X_7) and a one TL increase in the milk selling price (X_6) results in an increase of 0.193 and 45.815 TL respectively in Y (profit/cattle). In this connection, the regression equation could be expressed as:

$$Y = -1009.943 - 0.869X_1 - 0.838X_2 - 1.090X_3 - 2.168X_4 - 1.163X_5 + 45.815X_6 + 0.193X_7$$

D i s c u s s i o n a n d C o n c l u s i o n

The decreasing effect of inputs on the profitability per cattle shows the unconsciousness in the source management in the enterprises. For example, insufficient and improper usage of feed make one thought the ineffective usage of labor. However, it was reported that optimum utilization of feed and labor inputs cause 9.8 - 26.3% increase in milk production (**11**).

The importance of feed in production is well known, however the negative effect of feed on profit increases due to the increase in concentrated feed prices versus product prices (**15**). On the other hand, the enterprises where tie stall barn system is used as a production technique could benefit from the pasture on a limited level. It is too hard to find wide and productive pastures. However, it is reported that grazing, leads an increase up to 64% in the income per head in milk production (**14**).

Employing an important part of the labour from the family members, the understanding of traditionalism and mix (vegetable + animal production) production prevent specialization. As a result of this, providing rationality in production and gaining profit per cattle gradually becomes hard. Therefore to reach the desired output in milk production, special attention must be given to the quality and sustainability of the present labour at the enterprises (**17**).

The reduction in profit per cattle caused by the health expenditures give rise to think that vaccinations and medical treatments are made unconsciously. But it is stated that the enterprises where preventive medical profession was active, milk production found to be higher and cause a reduction in the costs of the enterprise (**21**).

In the research, it is seen that energy-fuel oil, transport, credit financial interest and other current expenditures decrease the profit per cattle seriously and affect the financing of the enterprise negatively. The unconscious attitude of the producers like in the expenditures of feed, labor and health costs could be shown as a reason of it.

Nevertheless particularly the credit financial interest is thought to have a contribution in reducing the profit per cattle. The high rates of the interest according to the actual conditions paid for the bank credit of which the enterprise used during the production period term, urges the financing in repayment. However, the necessary financial investment should be provided under suitable circumstances according to day's conditions to sustain the production and enlarge the scale of the enterprise. For this reason, necessary financial source should be obtained at the suitable time with a cheap cost (**19**).

General management, amortization and maintenance cost components decrease profit per cattle. It is possible for the amortization expenditure to reduce the mentioned profitability seriously. Besides building and equipment amortizations in enterprise, live registered (cow and bull) amortization is also counted and occurred values cost a large amount.

Different results were determined in several researches aimed to examine the optimum source usage in dairy. Turkyılmaz (**18**) notified the feed, labour, veterinarian-health, maintenance and marginal efficiency of other outgoings as 1.2, -1.1, -7.5, -3.4 and -1.7 respectively; while Uyanık (**19**), reported the same parameters as 0.5, 0.7, 2.4, -0.5 and 0.8 and Gunlu and Sakarya (**7**), stated as 0.8, 0.9, 1.8, -5.6 and 5.7 TL.

Lactation milk yield having a positive effect in gained profit per cattle is mostly related to breed type, care and feeding conditions. The calculated lactation milk production value in the research could be considered as satisfactory for the conditions of Turkey. In the enterprises where high milk producing Holstein cattle are used, a one "L" increase in lactation yield will surely increase the profit per cattle. Better feeding and maintenance conditions must be provided to increase the effect of lactation on profit per cattle in such enterprises where main income is gained from milk (**7**).

The most meaningful result appeared in the research was the increase in milk selling prices which caused an increase in the profit per cattle on a rather high rate. This fact documents the view of hard conditions where the milk producer makes production. Margin between milk industry and producer prices are quite much in Turkey. Under such a market environment, it is impossible for the milk producer to use price initiative in marketing away from the structure of the organization (**15**).

As a result of this research, the negative consequences of the input expenditures on the profit per unit were determined to be related to failure in taking necessary precautions in milk production. It was obvious that the expected profit per cattle couldn't be realized due to the lack of authorization in controlling the feed and milk prices by the producers in Turkey's conditions. Because of this reason, the factors that affect profit should be controlled more carefully at the enterprise. Moreover, such an

approach has an important role in determining the further strategies of the enterprise. Therefore profit function regression model can easily be used as a "decision support tool" by the producers and advisors.

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