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An Econometric Analysis for Estimation Future of Cattle Farms: A Case Study in Erzurum, Turkey

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Abstract: Farmers usually raise cattle for dairy products and beef production. In recent decade, farmers in Turkey have been raising cattle separately as dairy and beef. Farmers used to produce cattle for both dairy and beef as mixed farms. Since, specialization in dairy and beef farms has been increasing in Turkey, determination of factors affecting the profitability of dairy and beef production and their trends could help cattle producers to decide on specialization. This research was carried out to determine model for the factors affecting profitability of cattle farms for both dairy and beef. The survey has been conducted with 110 cattle farms in three districts (Karayazi, Tekman, Cat) where main income source of farmers are cattle products in Erzurum Province. The factor affecting profitability of cattle farms were estimated for dairy farms and beef farms.

Key words: Cattle farms, econometric modeling, beef, dairy, econometric analysis, Turkey

INTRODUCTION

The profitability of farms are mainly depends on consistency of decisions taken by farmers as manager. However, decisions of farmers are constrains due to their education level in developing countries. The situation is the same for livestock farms being sub-sector of agriculture too.

Agriculture has both economical and natural risks. According to that condition, decisions taken by farmers take consideration against risks that farmers come face to face. In cattle farms, profitability of farms is depends on type of farms such as dairy, beef and mixed. Also, factors affecting profitability are important. Usually, labor, feeds (concentrated and hay), veterinarian expenses and specific costs are main inputs for cattle farms.

The objectives of this study are to determine factors affecting profitability of different type of cattle farms and to estimate farmers' trends for specialization on dairy and beef farms in developing countries.

MATERIALS AND METHODS

For researches, the most accurate data sources are questionnaire applications in Turkey due to the lack of accounting records of farms. The data were collected by application of questionnaires on 110 cattle farms in 3 districts of Erzurum. The districts were selected by taken into consideration; amount of cattle farms and number of cattle. Cat, Karayazi, Tekman were selected as survey area. These districts, also, form of the agro-ecologic Sub-Regions-4 of Erzurum. Erzurum is divided into 4 agro-ecologic sub-regions that show similarity with respect to environmental characteristics of land, potential, soil structure, plant pattern and land appropriateness (Anonymous, 2002). Sub-Region-4 has the highest animal density when animal number and agriculture area were taken into consideration in Sub-regions of Erzurum province. For this reason, Sub-region-4 was selected for present study (Table 1).

The number of farms was determined with simple fortuitous exemplifying technique (Rao, 2000).

$$n = \frac{N \times \sigma^2}{(N-1)D + \sigma^2} = \frac{805 \times 15.53}{804\left[\frac{(11.52 \times 0.05)^2}{1.65^2}\right] + 15.53} = 110$$

In formula,

- n = Sample size
- N = Total population (farms)
- σ^2 = Variation of number of cattle related to farms used to present study
- D = (d2 /z2) value
- d = Error quantity allowed by average exemplifying
- z = Value of Z in table of standard normal dispersion as to error ratio

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Table 1: Animal density of agro-ecologic regions in Erzurum in 2001

Sub-regions	Number of cattle	Number of farm*	Density of livestock (NL/NF)
1	104.408	13283	7.86
2	143.041	17591	8.13
3	169.284	13645	12.41
4	120.380	8923	13.49
Total	537.113	53442	10.05

Anonymous (2002)

Econometric models for factors affecting farms profitability of dairy and beef were estimated as follows;

$$GPVdc = f(TWCdc, VCdc, CFCdc, HCdc)$$
$$GPVbc = f(TWCbc, VCbc, CFCbc, HCbc)$$

Here,

GPVdc = Gross Production Value of dairy cow ($)
TWCdc = Temporary Worker Cost of dairy cattle ($)
VCdc = Veterinarian Cost of dairy cattle ($)
CFCdc = Concentrated Feed Cost of dairy cattle (kg)
HCdc = Hay Cost of dairy cattle (kg)
GPVbc = Gross Production Value of beef cattle ($)
TWCbc = Temporary Worker Cost of beef cattle ($)
VCbc = Veterinarian Cost of beef cattle ($)
CFCbc = Concentrated Feed Cost of beef cattle (kg)
HCbc = Hay Cost of beef cattle (kg)

Model SHAZAM was estimated at econometric computer programme (White, 1997). Least squares method was used to estimate the model obtained from farms (Gujarati, 1995; Studenmund, 2006). GPV for dairy and beef farms was dependent factors while the costs of labor, hay, concentrated feed and veterinarian were independents variables.

RESULTS AND DISCUSSION

The models of Gross Production Value for dairy and beef farms were explained with high R^2 value as 0.918 and 0.973, respectively (Table 2 and 3).

All parameters obtained from the model explained by 4 different factors affecting Gross Production Value of beef cattle were found to be logical (Table 2). The temporary worker cost was found to be negative dairy cattle breeding. That means when worker wages increases, the profitability of dairy cattle decreases. Concentrated feed cost was significant too. Hay cost and veterinarian cost were not statistically significant for dairy cattle breeding ($p = 0.05$). High t-rate as 18.60 of concentrated feed cost parameter showed that this factor is more effective than other factors as explaining by the model (Table 2).

Table 2: Estimated gross production value model of dairy cattle breeding

$R^2 = 0.918$

	Coefficient	SE	T	p-value	Elasticity
TWCdc	-1.57	0.71	-2.20	0.030	-0.059
VCdc	3.01	1.81	1.66	0.101	0.017
CFCdc	0.61	0.03	18.60	0.000	0.213
HCdc	0.02	0.21	0.07	0.941	0.004

Table 3: Estimated Gross production value model of beef cattle breeding

$R^2 = 0.973$

	Coefficient	SE	T	p-value	Elasticity
TWCbc	-31.65	3.87	-8.18	0.230	-0.643
VCbc	13.09	2.53	5.17	0.451	0.085
CFCbc	0.91	0.10	9.62	0.000	0.184
HCbc	0.99	0.12	8.47	0.000	0.199

In beef cattle farms the model was determined as a high value of R^2 such as 0.973 by 4 independent variables affecting Gross Production Value. In the model, sings of independent variables were found to be logical. Concentrated feed cost and hay cost were found statistically significant for beef cattle breeding where temporary worker cost and veterinarian cost were not significant ($p = 0.05$).

CONCLUSION

It seems that Gross Production Value (GPV) was affected significantly by concentrated feed cost and hay cost for beef farms while it was affected significantly by concentrated feed cost and temporary worker cost for dairy farms. As estimation, the farmer trends will be specialized on beef production instead of dairy since worker wages (temporary worker cost) and concentrated feed cost has been increasing very fast while hay cost almost stable due to government support in the area.

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