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Analysis of the Factors Having Effect on the Size of Animal Husbandry Farms: The Case of Erzurum Province

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Abstract: This study was conducted in 8 districts thought to represent Erzurum province regarding social, economic and cultural aspects with the aim to determine the factors having effects on the farm size. Study data were analysed by using cross tabulation and Ordinary Least Squares (OLS) techniques in GRETL statistical package software. Analysis of the data revealed that 60% of the respondents had an annual income between 5000 and 9000 TL as 66.6% of them had only primary school degree and 57.6% of them fell between 35 and 54 age group. It was also determined that 54.5% operated farm just only for family comsumpton while 54.5 had animal asset equal or <15 heads. As a determinant of farm size, number of big ruminants was considered. Factors having effect on the farm size were determined to be commercial production, forage crop acreage, age, education and income levels of the farmer, membership to the cooperatives and making use of agricultural supports. It was concluded that in order to increase the farm size extension studies and policy measures towards promoting farmers for commercial production, membership to cooperatives and increasing the acreage of forage crops should be considered.

Key words: Farm size, ordinary least squares, animal production, GRETL, animal husbandry, Turkey

INTRODUCTION

In Turkish economy the effect of agricultural economic policies will be of great importance. In achieving a steadily economic development animal production has more things to do since it has important role in supporting internal savings along with its bigger rate of returns when comparing to other sectors (Babacan, 2006; Turkyilmaz and Nazligul, 2002). In this context, come yield increases in animal and plant production at the top of the list of economic and public related problems that Turkiye has to tackle (Aruoba, 2009). One of the most important barriers preventing the development of plant and animal production is the small farm size (Turkyilmaz and Nazligul, 2002; Armagan, 2004).

Considering the animal asset as a measure of farm size, 59.7% has 1-4 heads as 25.4% has 10-19 heads in Türkiye (Anonymous, 2008). Whereas 10 and more has been recommended (Demircan *et al*., 2006).

There are many disadvantages of operating with small farms in animal production. Of all the most striking is that small farms have not been successful as much as the bigger ones in decreasing the production costs and marketing the animal products (Turkyilmaz and Nazligul, 2002; Varilci, 2009; Turkyilmaz and Aral, 2002; Macdonald *et al*., 2009; Joerger, 2002; Blackwood *et al*., 2009; Eastwood *et al*., 2004). The reason of this is that small farms do not have bargaining power as bigger size of farms have less unit costs not only in input purchases but also in marketing the products (Eastwood *et al*., 2004; Boussemart *et al*., 2006).

Moreover, with limited capacity, small scale farms can not adapt easily to marketing conditions and climate changes while bigger ones have the ability to use these changes as an oppurtunity for competitiveness (Babacan, 2006; Blackwood *et al*., 2009).

As in all enterprises the main purpose of the animal farms is to utilize the limited resources more efficiently (Petek, 2009). To this end, it is required to increase the number of optimum scale farms instead of small scale ones because modern farms can only be achieved with optimum farm size. So, more and quality animal production could be possible through the farms having competitive marketing power and mechanization possibility (Celik, 2000; Baydilli, 2009; Lund and Price, 1998). Studies have shown that the bigger the farm size the more the farm income (Turkyilmaz and Aral, 2002; Blackwood *et al*., 2009; Kellogg, 2002; Townsend *et al*., 1998; Gul *et al*., 2009). Bigger farm size is also of importance in harvesting good results from genetical animal breeding programs and the national animal production policies (Baydilli, 2009).

When considering the size of animal farms in EU number of cattle per farm is 38.7 heads in EU as is 3.9 heads in Turkiye. In case of membership to EU, modern, high technology level and competitive farms are required for conformity to EU (Babacan, 2006; Armagan, 2004).

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In this study, important factors affecting animal production were researched to help determine the strategies to be followed in attempts towards increasing the farm size.

MATERIALS AND METHODS

Primary material of the study is the face to face farmer interviews conducted in 8 districts of Erzurum province resulted in 165 completed questionnaires while relevant literature reviews and records of the public and private organizations were the secondary material.

Collection of the data: Farmer interviews were conducted in 8 purposively selected districts. To represent the Erzurum province with regard to socioeconomic and geographical aspects Ispir and Oltu in the North, Cat and Karayazi in the South, Askale in the West, Pasinler in the East, Yakutiye and Palandoken in the Central were selected.

Sample size was calculated from the big ruminant records of the 32065 farms registered to the Veterinary Information System of Ministry of Agriculture and Rural Affairs. In determination of sample size was used the following Formula of Simple Randomized Sampling Method (Cicek and Erkan, 1996).

$$n = \frac{N\sigma^2}{N-1D^2+\sigma^2} \qquad D = \left(\frac{d}{t}\right)^2$$

Where:

n = Sample size
N = Number of unit in the population
σ = Standard deviation
d = Acceptable error term ($\bar{x} \times 0.10$)
$\bar{x}$ = Average number of big ruminants (head)
t = t-distribution value for a given confidence interval

The given parameters were calculated as:

N = 32065
σ = 10.17
d = $\bar{x} \times 0.10$
$\bar{x}$ = 13.16 heads
t = 1.65

$$n = \frac{32065(10.17)^2}{32064\left(\frac{1.3}{1.65}\right)^2 + (10.17)^2} = 165$$

Sample size was calculated to be 165 and distributed to the districts proportionally regarding the total cattle farms (Table 1). Farms were selected randomly and face to face farmer interviews resulted in 165 completed questionnaires.

Table 1: Distribution of the sample size by districts

Districts	Sample size
Yakutiye	17
Palandgken	10
Aþkale	20
Pasinler	17
Oltu	13
Ispir	21
Cat	21
Karayazi	46
Total	165

Questionnaires were structured according to relavant literature reviews (Sezgin *et al*., 2008) and specialist opinions. Interviews were conducted after the forms were tested and required corrections were made.

Analysis of the data: The data were coded and typed to the computer and analysed with GRETL statistical package by using CROSSTAB and Ordinary Least Squares (OLS) models. Results were shown in Table 1 and 2. The functional form of the model is as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9)$$

Where:

Y = Number of big ruminant (cattle) in the farm,
X_1 = Characteristics of the farmer, the farm owner
X_2 = Characteristics of the farm
X_3 = The degree of making use of extension services

RESULTS

Descriptive analysis results: Data analysis revealed that about 60% of the respondents had an annual income of 5000-9000 TL. 23.1% had less as 3.6% had more income than 15000 TL. Considering the education level, 66.6, 10.9, 5.5 and 1.2% of the respondents had primary, secondary, high school and university degrees, respectively as the percentage of illiteracy and literacy were 7.3 and 8.5% in the total.

About 30.3% of the respondents fall between 45-54 age group and it was followed by 35-44, 25-34 groups with the percentages of 27.3 and 16.4, respectively. Around 74% of the respondent were between 25 and 54 ages as 4.8% was under the age of 24 and 6.1% was above 65. While 48.5% of the farms were self subsistent and 39.4% was commercial. About 12.1% was operated for both family consumption and commercial purposes. About 45.4% of the respondents had big ruminants in 6-15 heads followed by those having 16-25, 26-35 and 1-5 heads with percentages of 29.1, 10.9 and 9.1%, respectively as the farm owners with >35 heads was 5.5% in the total.

Table 2: Regression analysis results for the factors affecting number of cattle

Variables	Coefficient	SE	p-value
Constant	-7.7860	2.4862	0.0022***
Regional difference (Central districts = 1, others = 0)	0.0683	0.5891	0.9079
Age	-0.0555	0.0245	0.0250**
Income	0.0002	0.0001	0.0219**
Number of household members	0.2812	0.3780	0.4580
Education	0.3346	0.1425	0.0210**
Social security	0.0952	0.2450	0.6982
Membership to cooperatives	1.3677	0.7677	0.0768*
Purpose of production (Commercial = 1; family consumption = 0)	10.2624	0.4724	0.0001***
Animal breed (local = 1, crossbreed = 2, pure breed = 3)	0.2968	0.3614	0.4128
Utilization of agricultural supports	3.0077	0.9495	0.0019***
Participation and Utilization of Agricultural extension services	0.3940	1.0105	0.6972
Forage crops' acreage	0.0099	0.0034	0.0041***

$R^2 = 0.8676$; ***p<0.01; **p<0.05; *p<0.1

Regression analysis results: According to results OLS estimators were shown in Table 1. Coefficients of all parameters were found meaningful. The dummy variable to represent the regional differences on farm size is the location of farm (1 = if located in central district 0 = otherwise). Farms located in the district centres had more animals than the others. This suggests that district centres as a place of farm location affect farm size positively but this relationship was not statistically significant.

On the other hand, farmer age affected farm size negatively (p<0.05). That is, the older the farmer the less the farm size. Farm income was another factor affecting farm size significantly and positively (p<0.05). It could be inferred that farmers with more income had inclination to increase farm size.

Social security had positive but not significant effects on farm size. The model also suggested that the higher the education level of the farm owner the bigger the farm size and this relationship was also significant (p<0.05). According to the model cooperative membership had significant and positive effect on farm size (p<0.1). Study findings had shown that commercial producers had an inclination to increase the number of farm animals (p<0.01).

Animal breed, on the other hand, had positive but not significant effect on farm size. Likewise, making use of agricultural supports, participation to extension work and benefiting from extension activities had positive but insignificant effect on farm size (p>0.01). Also, forage crops acreage had positive and significant effect on farm size (p<0.01).

DISCUSSION

According to regression analysis results, commercial production, utilization of government supports and forage crops acreage have statistically significant effect on farm size (p<0.01). Similarly, it was determined that young, educated and rich farmers had significant inclinations on increasing farm size (p<0.05). Moreover, membership to cooperatives has positive and significant effect on farm size (p<0.1).

In conclusion, a reasonable farm income in animal production requires working with a farm of optimum size (Turkyilmaz and Nazligul, 2002; Aruoba, 2009; Anonymous, 2009; Armagan, 2004; Demircan *et al*., 2006; Eastwood *et al*., 2004; Baydilli, 2009). In achieving this, commercial farms should be supported and promoted. Since commercial production requires the power of capability to keep up with market conditions and take measures for the risks, producers will be willing to increase their farm sizes. Commercial production will help achieve higher income levels which in turn make possible to increase farm size.

Cooperative membership should be arranged and promoted with regulatory measures and training of the farmers towards convincing them for membership. Higher registration costs, an obstacle for cooperative membership should be reduced.

Present and previous studies (Engindeniz *et al*., 2006) suggest that farmer participation to the extension works is a factor affecting farm size positively so special emphasize should be paid on the farmer training activities in the study area to make aware them about the benefits of bigger farm size. On the other hand, according to the findings agricultural supports can be used as an effective tool to increase farm size.

CONCLUSION

Forage crops has very low share in total acreages (Demircan *et al*., 2006; Can and Can, 2006). For a profitable animal production it is of vital importance to obtain animal feeds from the farm production (Yavuz, 2006). For that

reason, forage production should be improved and promoted (Demircan *et al*., 2006) by regulatory measures and extension work.

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