Determination of dairy farmers' existing structure in Turkey and analysis of emerging issues in production

Hodnocení existující struktury farem orientovaných na produkci mléka v Turecku a analýza vznikajících produkčních problémů

M.O. Azabagaoglu

Trakya University, Tekirdag Faculty of Agriculture, Dept. of Agricultural Economics, Tekirdag, Turkey

Abstract: This paper aimed at revealing both dairy farmers' problems and structural issues of dairying in Turkey. First of all, majority of the dairy sector examined is compared to developed and developing country figures and practices. Next, Turkish dairy sector figures are argued with developing country examples. Consequently, problems that were faced by dairy farmers were studied and the data related to problems were examined with factor analysis. Research data were collected from 282 dairy farmers in Turkey. Results indicate that milk yield was found to be 4 443.5 kg/year/cow so that it is quite high compared to Turkey's average, closer to the EU average. The average number of dairy cow per farm was found very low at 4.6 units. The fodder consumption average was found to be 14.6 ton/year, producers silage consumption averages were found to be 47.1 tons/year and 8.18 tons/year mixed feed. The dairy farmers' response indicates that low raw milk price and fluctuations in market and higher feed prices are the major problem in Turkey. Factor analysis results indicate similar findings that the above-mentioned problems extracted from same group of issues, which is called more important.

Key words: dairy, farmer, milk, factor analysis, producer problem

Abstrakt: Práce je zaměřena jak na specifikaci problémů mléčné produkce na úrovni podniků, tak na strukturální problémy mléčné produkce v Turecku. V prvé řadě je zde provedeno srovnání převažující části sektoru produkce mléka se situací ve vyspělých a v rozvojových zemích. Dále jsou údaje týkající se produkce mléka v Turecku komparovány s příklady rozvojových zemí. Následně jsou zkoumány problémy, jimž musí čelit producenti mléka a relevantní data jsou podrobena faktorové analýze. Zkoumané údaje byly získány ze souboru 282 mléčných farem v Turecku. Výsledky ukazují, že dosažená mléčná užitkovost byla 4 443,5 kg/kus/rok, což je výrazně vysoká úroveň ve srovnání s průměrem tureckého zemědělství, blížící se průměru EU. Průměrný počet dojnic na jednu farmu je velmi nízký, 4,6 kusů. Průměrná spotřeba objemných krmiv byla zjištěna na úrovni 47,1 t/rok, průměrná spotřeba siláže 47,1 t a spotřeba krmných směsí 8,18 t/rok. Odpovědi farmářů v rámci výzkumu naznačují, že hlavními problémy mléčné produkce v Turecku jsou nízké ceny surového mléka, kolísání trhu a vysoké ceny krmiv. Faktorová analýza výše uvedené výsledky potvrzuje jako velmi významné.

Klíčová slova: mléčná produkce, zemědělec, faktorová analýza, problémy výrobců

INTRODUCTION

Dairy farming is the foremost agricultural activity in the world. Due to this, dairying is one of the most profitable sectors in agriculture; nations support their producers to improve milk production and yield. For instance, a family farm income per unit of unpaid labour in specialist dairy farms was € 25 500 in the European Union (EU), which is significantly higher than the € 15 000 average of all types of farms (Burrel 2000). The EU dairying system is originated from high input: high output farming system, in fact, herd size average is around 24 cows per farm, also this proportion 68.8 in UK, 50.8 in Denmark. EU is a major player on world markets for most dairy products and it produces 22% of world milk production (Arendok, Liinamo 2003). This figure is quite low in developing countries compared to the EU average. Nevertheless, Owango et al. (1998) mentioned that dairy production has played a major role in the economy of mixed farming at smallholder farms in developing countries. Staal et al. (1997) indicate that dairying is vital to future viability of small farms in East Africa. Researchers emphasise that dairy farming is also an essential agricultural activity for Turkey, both economically and socially (Inan 1989; Yilmaz 1996; Talim et al. 2000; Tan 2001).

Cattle population has been increasing in the world for years, but the increase was being observed in developing countries (FAO 2003). Although Turkey is placed in

the developing country category, manufactured milk and milk products have shown no progress. A major reason for this is falling off of animal production in the last decades. Animal production has taken a 25% share in the agricultural sector in Turkey even as it has taken a 60–70% share in developed countries (Azabagaoglu et al. 2003). Due to the decrease of cattle population by years, the animal and milk production share in agricultural production has been negatively influenced.

The OECD and FAPRI foresee that the medium-term outlook for the dairy sector would remain dominated by a strong expansion in global demand for dairy products. The latter would reflect not only income growth in many regions of the world, but also changes in consumer preferences towards dairy products (European Commission 2002). It has indicated that the consumption of milk and milk products has great importance for public nutrition so that it has been offered to people with high quality and lower price if possible.

Developed countries support their dairy producer and milk consumer. The Turkish government has to carry out progressive agricultural policies for ensuring reasonable price levels for both producer and consumer. Because the dilemma is that the producer receives per 1 litre of milk the market price of 60–70% in developed countries, this proportion is just as 25% in Turkey. The average producer price for milk in the EU is about 300 €/ton (Burrel 2000). This figure is approximately 200 €/ton in Turkey. This situation is getting worste year by year so that to develop dairying sector some urgent measures must be taken from the producer basis.

The purpose of the paper is to reveal important issues that are faced by dairy farmers and to discuss the solutions.

MATERIAL AND METHODOLOGY

Original research data was collected from 282 dairy farmers via interviews (questionnaire) in the 2002. Sample size determination calculated by dairy cow population per village and sampling formulation extracted 141 villages. Randomly selected 2 dairy farmers in each village constitute sampling frame. Initially, producers' descriptive findings (distribution of cattle genus, proportion of milk yield, proportion of feed consumption, etc.) were determined. Furthermore, issues that were faced by dairy farmers were studied. The data related to problems was examined with factor analysis to determine the majority of issues.

Much of the research related to the dairy sector studies used factor analysis. Beforehand, research held by Solane et al. (2001) was used to factor analysis to determine Costa Rican dairy farmers' characteristics. Vukasinovic et al. (1997) used factor analysis to evaluate relationships between herd life for 18 different types of traits in Swiss Brown cattle. Fahey et al. (2002) studied variables that related to herd reproductive indices, calving events, stocking rate, disease, concentrate feeding,

fertiliser usage, milk production and economic performance using factor analysis. Alimba and Akubuilo (2002) used this analysis in the assessment of variables relating to the adoption of changed technologies and other factors thought to relate to the consequences of technology changes on entrepreneurs.

Mathematically, factor analysis is somewhat similar to multiple regression analysis, in that each variable is expressed as a linear combination of the underlying factors (Malhotra 1993). A factor model may be represented as:

$$\chi_t = A_{i1}F_1 + A_{i2}F_2 + \ldots + A_{im}F_m + V_iU_i$$

where:

χ_i = ith standardised variable
A_{i1} = standardised multiple regression coefficient of variable i on common factor j
F = common factor
V_i = standardised regression coefficient of variable i on unique factor i
U_i = the unique factor for variable i
m = number of common factors

The unique factors are un-correlated with each other and with the common factors. The common factors themselves can be expressed as linear combinations of the observed variables.

$$F_i = W_{i1}c_1 + W_{i2}c_2 + \ldots + W_{ik}c_k$$

where:

F_i = estimate of ith factor
W_i = weight or factor score coefficient
k = number of variables

Major statistics associated with factor analysis are as follows:

Bartlett's test of sphericity: This is a test statistic used to examine the hypothesis that the variables are un-correlated in the population (chi-square was being used).

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy: KMO measure is an index used to examine the appropriateness of factor analysis. High values (greater than 0.5) indicate that factor analysis is appropriate.

RESULTS

Due to producing high prolific cattle genus (Holstein – 73.8%) at the research area, findings on cattle production and yield have been found to be above Turkey's overall average. Milk production of 89.7% provided form dairy cattle in Turkey. However, milk yield per cow was found to be 4 443.5 kg/year so that it is quite high compared to Turkey's average. This figure is closer to the EU average (European Commission 2002), which is 5.8 tons/year. Because of the farmers that carried out livelihood milk producing and raising unproductive cattle at some regions of Turkey, the calculated overall milk production average per unit is very low. The average number of dairy cow per farm was found as 4.6 units, so it is quite low

compared to developed country average. Stabling conditions are not on satisfactory level compared to developing countries with respect to insufficient ventilation, lighting and substructure.

Examining the feed consumption, results indicated that the fodder consumption average was found to be 14.6 ton per year, producers silage consumption averages were found to be 47.1 tons/year and 8.18 tons/year mixed feed. Approximately, as a whole, they grew their own fodder plants especially they produce required silage feed. This result indicates that producers should be conscious and concentrate on their job.

Raw milk is most preferably sold by the way of milk co-operatives. Dairies and other milk manufacturers were being chosen second place. This is beneficial progress for the co-operatives that have been constructed by dairy cattle producers that gather 53.7% of the total raw milk supply. Cooperatives that collect and distribute raw milk reach the share of 90% in developed South European countries (Inan 1989). However, despite this situation, milk prices formation in the milk marketing system is setting by the dairies and milk product manufacturers. The major reason of this problem is co-operatives have not got a plant to process raw milk.

Major problems being faced by dairy farmers, arranged by priority level; (closer to 1 shows more unimportant, closer to 5 shows more important):
– Low raw milk price and fluctuations (4.76)
– Higher feed price (4.75)
– Higher veterinary costs (3.65)
– Unsatisfactory barn conditions (2.52)
– Marketing problems (2.36)

The producers' response indicates that there is a major problem in low raw milk price and fluctuations. This problem is followed by higher feed prices and veterinary costs. The previous study held by Akman (1993) suggests similar results that low raw milk prices and higher feed prices are important problems for dairy producers.

The response to issues is evaluated by factor analysis. Underlying reasons for issues that producers being faced revealed with factor analysis. Factor analysis results are shown in Table 1. Initially, validity of variables was tested with KMO and Bartlett's test of sphericity. The KMO value was being calculated as 0.605 – it has to be higher than 0.5 – this indicates data is appropriate for factor analysis. Bartlett's value was being calculated as 124.76, this indicates variables un-correlated each other at 99% confidence level. Next, factor groups were being formed with varimax rotation and the distribution of variables according to rotated matrix given in Table 1.

The first factor group was formed by low quality mixed feed, lack of co-operation, marketing problems, insufficient technical knowledge and unsatisfactory barn conditions. Producers perceived these issues as *originated from us,* and their importance is not more serious than other problems. Low raw milk price and fluctuations, higher feed price and veterinary costs appeared to be in the second factor group. This group perceived *more important issues* because the problem increased operation

Table 1. Factor analysis results

KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy		0.605
Bartlett's test sphericity	approx. chi-square	124.766
	df	0.036
	sig.	0.000

Rotated component matrix[a]

	Factor group		
	1	2	3
Low quality mixed level	0.796	6.626E-02	7.329E-04
Lack of cooperation	0.671	0.228	–0.307
Marketing problems	0.651	–7.84E-02	0.154
Insufficient technical knowledge	0.591	0.345	0.163
Unsatisfactory barn condition	0.510	–0.203	–0.123
Low raw milk price and	5.933E-02	0.788	4.276E-02
Higher feed price	–0.114	0.764	–0.303
Higher veterinary costs	0.104	0.632	0.327
Problems related to preparing silage	–3.78E-02	3.933E-02	0.912

Extraction method: Principal Component Analysis
Rotation method: Varimax with Kaiser Normalization

a = Rotation converged in 4 iterations

costs. Due to lower raw milk price level and the opposition of higher feed prices, it is difficult to pursue dairy farming. To develop dairy farming the price of raw milk has to improve and precautionary measures have to be taken for fluctuations. Considering problems related to preparing silage formed the third factor group. Research findings indicate that they have not had any problems related to preparing silage, because the knowledge of preparing silage was found to be very high at the research area.

DISCUSSION

Even as the number of dairy cattle and the amount of raw milk has increased in the world over the years, the Turkish dairy sector has decreased both in number of dairy cattle and the amount of raw milk. Although cattle population reached 16 million units on 1980, the following years' population is decreasing and number has dropped to 11 million units today (Turkish Ministry of Agriculture 2003). Despite the serious descent on cattle units, amount of raw milk is decreasing very slowly due to increasing high prolific genus cattle proportion. The total quantity of raw milk is approximately 10 million tons in Turkey, but raw milk amounts dropped due to the effect of low prices in the past years. Factor analysis results emphasise that more important issue is high operation cost, so that it has influenced number of dairy cattle progress.

In spite of the population growth in Turkey, decreasing amounts of milk and milk products consumption is creating a great contradiction. Manufacturing needs to improve in order for a balanced diet and healthy nutrition of community. Improving the quantity of milk and milk products is not directly related to the increase in number of cattle unit. Mainly, the population of prolific cattle must be raised throughout Turkey.

SEK (Milk Industry Foundation) was established in 1963 to encourage the development of the dairy industry in Turkey. However, SEK has carried out the task of arranging milk market via determination of raw milk price until the privatisation. Privatisation of SEK, without any substitution, has been detrimental to the improvement of dairy cattle producing. As a result of privatisation, the determination of raw milk prices has been formed between the producer and manufacturer; nevertheless, the prices are usually not beneficial to the producer. The government is carrying out a support policy as a premium per litre. However, this promotion is only 1% of the raw milk price and it is not an attribute to promote milk production.

The cost is another dimension to the issues. Feed, which is major input, constitutes approximately 60–70% of the total operation cost in cattle production. Producers always criticise feed prices compared to raw milk prices. If the price of 1 kg of feed exceeds the price of 1 litre raw milk, they become frustrated and tend to leave dairy farming. This comparison has not favoured the producer for many years in the past.

There are three urgent measurements to take into consideration:
- First, the dairy cattle population must increase and the proportion of prolific cattle in the overall population should improve. The government imported 342 000 unit of prolific dairy cattle between 1987–1997 years to improve the dairy sector. This support urgently takes into account that the form of importing should be changed from live animals to cattle sperm. In this manner, this prolific cattle's sperm will inseminate indigenous dairy cattle artificially so that the raw milk yield of indigenous generation should be improved. The number of prolific dairy cattle has shown a little progress last 8 years. Productive dairy cattle units must be moved up to 3.5 million units at the first stage. If this can be accomplished, raw milk production will raise to 14 million tons. Yilmaz (1996) emphasised that only 15 million tons of milk will recover domestic demand.
- Next, a producer organisation has to construct with government support to arrange a raw milk market. This organisation has to be of a co-operative type like in the developed country cases. Yavuz et al. (2001) express that dairy farmers have to coerce to construct co-operative for solving the technical and economical issues. For instance, the co-operative collects and distributes the total produced milk in Norway and the consumer price is equal to the producers' price that is promoted by the government. This figure is approximately 60–70% of the consumer price in Germany. In contrast, dairy cattle producers receive just 25–30% of the consumer price in Turkey. A constructed co-operative will have to provide a lower price input, financial credit, technology and information support to improve productiveness. This organisation task is not only to collect and distribute; nevertheless, all marketing activities should be done by a co-operative. The corollary of the above, milk collection using the cold chain system (according to the EC standards) processed in the factory, to take into consideration the consumers' desires, promoted the whole market and constructed effective distribution.
- Finally, specialist dairy farmers should be encouraged by the co-operative system. By examining the Turkish dairy cattle producers' structure, it is clear that the proportion of small family producers is very high. The specialist dairy farm system in the EU accounts for 83% of total dairy cow numbers and 85% of total milk production (Arendok, Liinamo 2003). The number of dairy cows per agricultural unit is approximately 2 in Turkey, so this figure is indicated as the primary problem by Tan (2001) regarding obstacles of dairy sector improvement. The main work activity of these family producers is grain and vegetable production, so dairy cow production is mainly for family consumption. Due to transforming these producers to the specialist dairy cattle producers, the government should give financial support and the producers should change their sowing area to fodder plants. Being a specialist producer brings high productivity at a lower cost.

Consequently, the development of the community has been achieved by promoting healthy human resources. Healthy human resources have been provided by a quality, balanced diet. In addition, milk and milk products are serious foods for the balanced diet. Consumers should purchase these quality products at a convenient price. The government revised its agricultural policy and paid more attention to the dairy sector to ensure this harmony.

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Contact address:

M. Omer Azabagaoglu, Trakya University, Tekirdag Faculty of Agriculture, Dept. of Agricultural Economics, Tekirdag, Turkey
telefax: +902 822 931 453, e-mail: azabagaoglu@tu.tzf.edu.tr