

Practices in Milk Collection Centres for quality Milk Production: A Case from the Aegean Region of Turkey

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Jel classification: Q120, Q130

1. Introduction

In recent years, as a result of the consumer demand for high quality food in developed countries and in accordance with international trade, there are increasing expectations on the compliance of food products to safety and quality standards. Great expectations, especially as for the compliance with food quality and safety standards in the export sector, appear as restrictions causing difficulty in having direct access to EU markets (Demirbaş and Tosun, 2006). Turkey is one of the EU candidate countries where the agricultural sector has always been an important part of the economy. The dairy industry appears to be one of the most challenging topics that Turkey confronts in the race to join the EU. The main reasons for that could be explained by the fact that Turkey has no vertical integration between animal farming and milk industry as in the EU and that rates of contract of breeding farms and cooperatives are far below the EU levels (Demirbaş *et al.*, 2007).

Abstract

In Turkey, the most important problem for food safety is the supply of good-quality, safe raw material to the dairy industry. Milk collection centres (MCC) play an important role between the dairy farms and the dairy industry. In order to supply the high-quality, safe and adequate raw milk required by dairy processing firms, MCCs in the Turkish milk supply chain act as a bridge between the dairy farms and dairy processing industry. The aim of this paper is to demonstrate the role of MCCs in supplying good-quality, safe milk to the Turkish dairy sector. According to the results of this study, some problems appear evident because the milk is produced on small dairy farms. MCCs are also of small and medium size, therefore raw milk analyses cannot be fully achieved for the absence of qualified personnel and for equipment inadequacies. Subsidies and incentives must be made available in order to ensure the acquisition of technical equipment to be used in the analyses to determine the quality of the milk supplied to MCCs. Both the MCC personnel and the farmers must be educated on food safety and hygiene issues.

Keywords: Dairy Sector, Food Quality, Milk Collection Centres, Milk Farming, Turkey.

Résumé

En Turquie, le problème le plus important de la sécurité alimentaire c'est l'approvisionnement en matière première salubre et de bonne qualité pour l'industrie laitière. Les centres de collecte de lait jouent un rôle de liaison entre les exploitations et les industries du secteur laitier. Dans la filière turque d'approvisionnement en lait, ces centres servent en pont entre les exploitations laitières et les industries de transformation afin de fournir une quantité adéquate de lait cru de haute qualité et salubre. L'objectif de cet article est de décrire la fonction de ces centres de collecte en Turquie. D'après les résultats obtenus, il y a des problèmes évidents dérivant du fait que le lait est produit par des exploitations de petite taille. Même les centres de collecte de lait sont de petite et moyenne taille ; par conséquent, les analyses sur le lait cru ne peuvent être bien exécutées suite à l'absence de personnel qualifié et à l'insuffisance d'équipement. Il est d'importance fondamentale de fournir des subventions et de prendre des mesures d'incitation pour assurer l'achat d'équipement de laboratoire pour déterminer la qualité du lait délivré aux centres de collecte. Aussi bien le personnel des centres de collecte que les exploitants doivent être formés aux questions de sécurité et hygiène alimentaire.

Mots-clés: Secteur Laitier, Qualité Alimentaire, Centres de Collecte du Lait, Production Laitière, Turquie.

In Turkey, the proportion of animal products accounted for 27.25% of the overall agricultural production, and the value of the milk in animal products was 42.34% in the year 2007 (TÜİK, 2008). The dairy farms which are the source of raw material for the dairy industry display a small-scaled patrimonial structure. According to the data deriving from the latest General Agricultural Survey (2001), there are 3 million farming facilities in Turkey and only 2.36% of them are specialized livestock-rearing farms (TÜİK, 2001). In Turkey, the average figure of cattle per farm is between 1 and 9 heads. The proportion of these dairy farms is 81.7 % of the total number of dairy farms. The proportion of dairy farms with milking cattle over 101 heads is only 0.50 % (TZOB, 2005).

The number of milking cows was about 4,230 in 2007 in Turkey. The total milk production was

11,280 tons in the same year, while the average milk yield per cow was 2,667 kg. (TÜİK, 2008). The average milk yield (for 25 countries) was 5,492 kg in the EU in 2007 (EU, 2007).

About 35% of the raw milk is consumed on farm and 54% of the raw milk goes to traditional dairies and modern processing plants. The remaining 11% is sold in the streets. In

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contrast, 91.9% of the raw milk in the EU is sold to modern processing plants (TZOB, 2008). These facts not only hinder the utilization of knowledge and technology on the dairy farms, but also cripple food safety in the «from farm to fork» concept.

In the year 2004, in Turkey, the share of milk and milk by-products in the total production value of the food industry equalled 14.78 % (DPT, 2007). Food firms were 2,153, and 7.7 % of them were dairy processing firms. Most of these firms were owned by private proprietors (95.44 %); only 4.14 % of them were cooperatives and 0.42 % of them were state-owned. In the EU, 50 % of the dairy processing firms belong to cooperatives (TZOB, 2008).

The latest legal disposition is Law no. 5179, which gives the responsibility of all food issues to the Ministry of Agricultural and Rural Affairs. Through this law, suitable provisions were brought on food safety not only in technical issues but also for the adaptation to the EU Regulations. The new dispositions on regulations and notifications related to this latest law are still continuing. As a matter of course, there are some special regulations within the new provisions particularly for the dairy industry. However, in spite of all these positive developments in legislation, the structure of the dairy sector in Turkey is creating some problems for the adaptation of the sector to new arrangements. Mainly, the structural problems of dairy farming, the heterogenic structure of the dairy industry and the low level of integration between dairy farming and dairy industry bring some limitations to the implementation of new laws in the dairy sector (Demirbaş and Karagözlü, 2008).

In the current structure, milk collection centres (MCCs) are a logistical link between milk farming and milk processing industries. The main target of MCCs is to collect adequate milk volumes to meet the processing industry's demand; however, the industry demands good milk quality and adequate quantity. In this frame, the most important problem of Turkish MCCs is to supply quality raw milk because of the existence of too many unregistered and small milk farmers, who are producing unhygienic and low quality products. Over the last few years, the number of safe, high-quality facilities supplying products has increased in the Turkish dairy processing industry. However, there are many registered and some unregistered facilities which are producing unhygienic and low quality products. Food safety in Turkey cannot be fully achieved due to the small and inadequate structure of the facilities, the low educational level of the food sector employees, and also the lack of proper and adequate food monitoring services. However, food safety is one of the key topics in the agricultural and food policy of the EU, where 37% of Turkey processed and unprocessed agricultural products are exported (average of the last three years) (DTM, 2007).

All EU candidates should have strong and reliable governmental institutions and organizations to ensure food

safety and regulatory controls should also be established. Member states have closed down facilities not in compliance with the EU standards.

Milk quality starts on farms where primary production takes place. The milk produced should come from healthy cattle and should be preserved in proper conditions after milking. The small and inadequate structure of farms affects the scale of the milk processing facilities as well. Turkey's third largest city, İzmir, generally has milk-processing facilities that are small or medium in size. In such a structure, MCCs play an important role for milk farmers as and for milk processing firms. MCCs reduce the collection cost for the processing industry and provide market guarantee for the farmers. Due to their bridge function between the farmers and the processing industry, MCCs have an important role in food safety and quality assurance in the milk processing industry.

The aim of this study was to evaluate the practices used to supply quality raw milk to MCCs and to determine the problems and some solutions. Pricing was also discussed as an incentive to provide a high quality, safe supply of raw milk.

2. Materials and Methods

This paper consists of three data groups. The first is made up of statistics including the total number and addresses of MCCs in the İzmir province and other information, obtained from Rural Organizations of the Ministry of Agriculture. The second group of material consists of data directly collected by surveys from the MCC managers. The third group consists of related published material in Turkish and in foreign languages. The analysis of the data was performed by using E-views and SPSS statistics programmes.

İzmir is situated in the west of Turkey and it is the third largest city in Turkey in terms of population and economic indicators. Therefore, İzmir is the leading area in the country for dairy products. In 2006, 43 MCCs were detected in İzmir province. For this reason, face-to-face surveys were carried out with all of the MCC managers. The number of MCCs based in various districts of İzmir is as follows: Tire (1), Bayındır (15), Ödemiş (9), Kiraz (5), Menemen (2), Bergama (3), Dikili (1), Seferihisar (2), Foça (2), Aliağa (1), Beydağ (1) and Kınık (1).

Before the survey, a detailed questionnaire form was prepared. After some pre-surveys, the survey stage was carried out. In the questionnaires, firstly questions related to data on the characteristics of MCCs (staff data, technical infrastructure, etc.) and of their managers (age, educational level and experience, etc.) were asked. The Five-Point Likert Scale (Malhotra, 1996) was used in measuring the standard of food safety and quality practices in MCCs; one stands for «very low» and five for «very high». The grouping of the facilities was based on their milk collection capacity. According to this, facilities were divided into three groups (Table 1).

Table 1 – Grouping of MCCs according to their capacity.

MCC groups	MCC capacity boundaries (capacity, tons/year)	Number of MCCs	Percentage
Group 1	810-3,000	18	33.72
Group 2	3,001-7,199	14	27.91
Group 3	7,200-43,200	11	25.58
Total		43	100.00

Differences between groups in terms of the managers and MCC characteristics and quality practices in MCCs were determined by carrying out the Analysis of Variance (one-way ANOVA) (Anonymous, 2007) for the continuous variables, and using the Chi-Square analysis (Test of Independence) (Gill, 1978; Gujarati, 2005) for intermittent variables. The variables and the related subgroups analyzed by the Chi-Square analysis are given in Table 2. Only significant results have been summarized in the table.

Table 2 – Variables tested by the chi-square and groups belonging to these variables.

Name of the variable	Groups belonging to the variables
Age (yrs)	1 st group: 34 and under 34
	2 nd group: 35-44
	3 rd group: 45 and over 45
Education level (yrs)	1 st group: Primary and middle school
	2 nd group: High school
	3 rd group: University (2 and 4 yrs of education)
Experience in the sector (yrs)	1 st group: x ≥ 5
	2 nd group: 5 < x < 15
	3 rd group: x ≥ 15
Experience in a MCC (yrs)	1 st group: x ≥ 5
	2 nd group: 5 < x < 10
	3 rd group: x ≥ 10

For the continuous variables, a Normal Distribution test was applied by Jarque-Bera test (Gujarati, 2005; Akkaya and Pazarlıoğlu, 1998). For variables displaying normal distribution, the Analysis of Variance (one-way ANOVA) was performed. For the variables not displaying normal distribution, the Kruskal-Wallis test, which is a non-parametric, one-way variance analysis, was applied (Anonymous, 2007). It is often used for data obtained from more than one

independent sample to analyze whether data show the main trend for a single population. In the evaluation of the other data, descriptive statistics were applied. The surveys were held during the period of July-September 2006.

3. Results

3.1 General Characteristics of Milk Collection Centers and Managers

In the MCCs under investigation, managers were questioned about their age, total years of education, experience acquired in the sector and in a MCC as general specifications. These variables can affect the managers' practices, their approach and preferences with respect to food safety and quality. Regarding the MCC infrastructural properties, the number of personnel and storage tanks and their capacities were evaluated. In Table 3, variables such as age and educational level displaying normal distribution were analyzed by ANOVA, while variables not displaying a normal distribution were evaluated by Kruskal-Wallis Test.

Table 3 – The general characteristics of MCCs and of their managers.

MCC Groups	Variables					
	Age of the managers (yrs)	Education level (yrs)	Experience in the sector (yrs)	Experience in MCC (yrs)	Number of staff	Number of tanks
Group 1 (n=18)	40.94	8.11	10.30	6.47	5.76	1.64
Group 2 (n=14)	37.35	8.42	7.42	6.21	4.71	2.57
Group 3 (n=11)	41.18	8.54	11.18	10.67	11.54	35.80
Total (n=43)	39.83	8.32	10.01	6.39	6.64	9.68
F value**	-	-	0.139	0.030	0.001	0.000
Chi-Square Value	-	-	3.840	7.009	13.161	20.439
F value***	0.581	0.040	-	-	-	-
F value	0.551	0.042	-	-	-	-

** Kruskal-Wallis test
*** One-Way Anova test
Significant for p<0.05

The results are as follows: the average age of managers was 39.8 years and the average education period of the managers was 9.3 years. The job experience period of managers in the milk sector was 10.1 years. No significant statistical difference was found between the group averages ($p < 0.05$).

The average experience period spent by managers at the same MCC is 6.4 years. There is a statistically significant difference among the averages ($p = 0.03$); likewise, the managers working in larger size MCCs have more experience.

The average number of staff employed in the MCCs is 6.6 employees and the number of tanks is 9.7. Significant differences were found between the group averages for the employed staff ($p = 0.001$) and for storage tanks ($p = 0.000$). Naturally, the number of staff employed in larger MCCs and the number of tanks are both higher, as expected. When the capacities of MCCs are considered, the proportion of fa-

cilities with a capacity up to 7199 tons/year is 75%, and the proportion of MCCs with a relatively higher capacity is around 25%. The capacity average for the first group of MCCs is 1921.5 tons/year, for the second group is 4110.6 tons/year and, finally, for the third group it is calculated to be 23310.0 tons/year. The small capacity of the facilities affects the amount of milk collected daily. According to this, more than one-half of the MCCs purchase 1-6 tons of milk per day.

When the legal structure of MCCs is considered, 20 of them are cooperatives, private proprietors own 20 of them, the village authority owns two of them and the Farmer Association established only one of them.

In 86% of MCCs, no food or agricultural engineer was employed. Similarly, 72% of facilities had no food technician. Almost 81% of facilities are member of an organization and the remaining ones are not registered. Finally, 82% of MCCs had been in business for 4 years or less.

MCCs purchase milk from farmers twice per day, once in the morning and once in the afternoon. Point Collection Centres (PCCs) are the intermediate collection points that appear in wide rural areas in which an MCC must collect milk from many farms (Delaval, 2006; Draaijer, 2002). The farmers who are a long distance from the MCC can easily sell their milk to these PCCs. In PCCs, the purchased milk is analyzed for its quality, then immediately cooled down in tanks and transferred to the main MCC.

Regarding the finding that 37% of MCCs had at least one PCC, this kind of organization mostly appears in cooperatives.

3.2 Some issues that are considered in the Raw Milk Supply

In Turkey, the milk is collected on the farms either through the farmers' vehicles (cooled/uncooled) or by the MCCs' vehicles. At the collection step, the collector examines the milk according to its general appearance and odour. Some MCCs apply an alcohol test at the collection step. When the milk reaches the MCC, the manager applies the same test to the raw milk again.

According to the Turkish Food Codex, milk must be collected in a clean place, in which no negative effect for the raw milk is present. If the milk is not to be collected within 2 hours after the milking process, it must be cooled down at 8° C, if it is collected daily it must be cooled down at less than 8° C, and if it is not collected daily it must be cooled down under 6° C. When the milk is transferred from the MCC to a dairy processing facility, its temperature must not exceed 10° C. If the milk can be transferred to the processing facility within 2 hours after milking, no cooling is necessary (Resmi Gazete, 2000).

The Turkish Food Codex assigns the responsibility for regulation on the cattle's health, well-being, maintenance and nutrition to the milk processing facilities. Milk processing facilities have different legal structures and can either purchase raw milk directly from farms or from MCCs (Demirbaş and Karagözü, 2007). In this way, the monitor-

ing of the hygiene and health conditions on farms can be carried out by MCCs as well. In this study, the Five-Point Likert Scale measured the controllability of the animal well-being and certain quality attributes in raw milk on farms by MCCs. According to this, MCCs that «frequently» or «very frequently» monitor the related conditions on farms account for 25.6%; the facilities that «never», «rarely» and «sometimes» monitor represent nearly 41.9%. The proportion of MCCs that apply sensory control before purchasing raw milk from the farms is approximately 70% (Table 4).

Table 4 – The issues considered in Mccs during raw milk purchase (% distribution).

Issue	Frequency answer					Total	
	Never	Rarely	Sometimes	Frequently	Very		
Milk supplied from farms	7.0	4.7	30.2	30.2	25.6	2.3	100.0
who controlled hygiene conditions							
Sensory properties like colour and taste	7.0	7.0	11.6	32.6	37.2	4.5	100.0
Chemical composition	39.5	2.3	4.7	11.6	32.6	9.3	100.0
Microbiological quality	48.9	–	11.6	4.7	25.6	9.3	100.0
Milk supplied by contractual farms	55.6	2.3	0.0	2.3	30.2	11.6	100.0
Milk supplied by farmers who are cooperative members	18.6	4.7	4.7	2.3	51.1	18.6	100.0
Milk supplied by large-scale farms	30.8	4.7	9.3	23.2	37.2	4.7	100.0

The proportion of managers that «very frequently» monitor the chemical composition of the raw milk is approximately 33%, while the managers stating that they monitor the microbiological quality «very frequently» constitute approximately 26%. The purchase of raw milk from contracted farms was determined to be not widespread. MCCs «very frequently» purchase milk from farmers who are cooperative members (51%). In this result, the fact that most of MCCs are cooperatives plays an important role. MCCs «frequently» and/or «very frequently» purchase raw milk from large-scale farms (61%). According to the survey results, the most widely applied form of quality testing of the raw milk is the sensory evaluation.

3.3 Basic Quality Problems in Raw Milk in MCCs

The Five Point Likert Scale (Table 5) measured the problems encountered in raw milk. According to the results, the most important problems are the water addition to the raw milk by 63%, the use of antibiotics by 72% and specific chemicals by 77% with the frequencies «never» or «rarely». The probabilities of the presence of hydrogen peroxide (sometimes – 2.3%), lime (frequently – 2.3%) or somatic cells (frequently – 4.7%) are very low. It can be concluded that no important problem is present from the qual-

ity perspective according to the managers' declarations. Nearly 61% of MCCs declared that they «never» encountered somatic cells in the raw milk, but ironically, these facilities did not regularly apply this analysis in their facilities. Only some MCCs that collect milk for large processing firms analyzed raw milk in their own laboratories or in the processing firms' laboratories.

Table 5 – Basic quality problems in the supplied raw milk (% distribution).

N=45	Never	Rarely	Sometimes	Frequently	Very frequently	No answer	Total
Water added to raw milk	30.2	17.0	25.6	11.6	-	-	100.0
Antibiotics	30.2	41.9	20.9	2.3	-	4.7	100.0
Specific chemicals	53.4	23.3	16.3	2.3	-	4.7	100.0
Hydrogen peroxide	68.1	7.0	2.1	-	-	25.6	100.0
Lime	74.4	4.7	9.1	2.3	-	9.3	100.0
Somatic cell	60.8	9.3	2.1	4.7	-	23.2	100.0

3.3 Raw Milk Prices in MCCs, Payment Conditions and Quality

The assurance of quality in raw milk is related to the application of the hygiene and health conditions listed in the Turkish Food Codex by farmers, MCCs and processing firms as a whole. In addition, the realization of the standards by milk farms is directly related to the educational level of the farmers and incentives paid for quality. In the short term, the most effective incentive is the increasing of farmer incomes by paying a premium for quality milk. For this reason, the way in which milk prices were determined and how quality payments were made to the farmers was evaluated. Almost 60% of MCCs pay a premium for high-quality raw milk. The types of payments for purchased milk

Table 6 – The situation of premium payment and the payment types in MCCs.

Premium payment for quality	The number of MCCs	%
-Yes	25	58.2
-No	18	41.8
Payment types	The number of MCCs	%
-Advance	18	32.2
-Cash	5	8.9
-Installments	33	58.9
Total	56*	100.0
Average term in payment by instalments (day)	17.6	-

*Different payment types can be applied in a Milk Collection Centre

were by advance, cash or by installment. Approximately 59% of MCCs pay the total sum by installment and 32% of them in advance. The average term in payment by installment is 17.6 days (Table 6).

Managers were asked about the satisfaction level of farmers regarding prices and type of payments and the Likert Scale was used to analyze the answers. The scale average for the prices was found to be 2.12. According to this result, the farmers were not satisfied with the milk prices. The farmers' satisfaction level regarding the type of payments was higher (3.80) (Table 7).

Table 7 – Farmer satisfaction level as for milk price and type of payment.

	N	Never	Low	Medium	High	Too much	No answer	Average of scale
Milk price	42	19	5	11	4	1	1	2.12
Type of payment	41	4	1	10	14	13	2	3.80

The raw milk price levels paid to farmers can vary in MCCs. In 2006, 5.50 cents/l were added to the base price of MCCs for the farms being members of the Cattle Breeders' Association of Turkey (CBAT), which is determined by the government¹². Processing firms that purchase milk pay premiums that vary with the MCCs' quality standards. Premiums paid for the milk also depend on the predetermined quality criteria of MCCs and on the particular processing firm. The highest premium is paid by large modern processing firms, which have the greatest quality expectations. According to the milk quality, the premium determined by the collaborating processing firms is added to the base price that the MCC pays. According to this, if a farmer is not registered with the producers' union and cannot achieve the level of quality (listed in Table 8) determined by the processing firms, he only receives the base price. In 70% of MCCs, the base price is determined on the

Table 8 – Quality criteria for raw milk in the MCCs.

Criteria	Number of MCCs	%
Fat	12	19.4
Dry matter	14	22.6
Bacteria (Total viable cell count)	7	11.3
Water addition	7	11.3
Hygiene (Milk can)	1	1.6
Antibiotics	3	4.8
Microbiological	1	1.6
Refuse to answer	17	27.4
Total	62*	100.0

*More than one answer was obtained

basis of the market price. On the contrary, if the farmer is registered with CBAT and has high-quality milk, he gets the highest possible premium according to the incentive policy.

The difference that could affect the premium-paying MCCs and non premium-paying MCCs mentioned in the Methods section is analyzed for significance by the Chi-Square Analysis. In Table 9, it is shown that there is a significant difference between the groups according to their capacities. As the capacity of the MCCs increases, a higher payment for good quality milk was expected. As expected result, large processing firms prefer to collaborate with higher capacity MCCs.

Table 9 – Applying price differentiation for quality milk by capacity groups in the MCCs.

Capacity	Price differentiation		Chi-Square		
	Apply	Does not apply	Value	sd	p*
810-3000	7	11	7.600	2	0.022
3001-7199	8	6			
7200-43200	10	1			

*Significant for P ≤ 0.05.

4. Discussion

The quality of the raw milk supply is a great problem for medium and large milk processing firms, which process products in compliance with the Turkish food law and existing standards in the dairy sector. The sustainability of high-quality raw milk production must be guaranteed, in order to fulfil the obligations of the EU membership (OJ 1992; OJ 1994; OJ 1999; OJ 2004a; OJ 2004b) and to guarantee the consumer's health and export opportunities. The small size and inadequacy of farms in Turkey negatively affect the level of the technology used in the facilities. In addition, the ignorance of the farmers on food safety practices hinders the milk quality on the first step of the supply chain.

It is difficult to speak of a long-term national agricultural policy related to dairy farming in Turkey. The underdevelopment of the dairy industry can be deduced from the high rate of population increase and low production rate in the last 20 years (Eskiyörük, 2007).

Moreover, there exists a lack of various policies on milk marketing in Turkey. Another problem in the Turkish dairy industry to be dealt with is that a considerable amount of milk remains in the village economy and a great volume of milk is processed in small local facilities. As a result, only a limited volume is used in the few modern milk-processing firms (Demirbaş and Karagözlü, 2006).

The most distinctive characteristics of the market are the lack of milk industrialists against a great number of milk farmers and the existence of off-the-record facilities. Only 2.5-3 million tons of milk production are recorded out of a

total production of 11 million tons. One of the current problems of the milk market is the inadequate level of quality standards. The shortcomings in agricultural extension and counselling services result in the continuation of the problems in raw milk quality standards (Günaydın, 2007).

One of the most distinctive differences between the EU and Turkey is related to the level of organization achieved by farmers. The low rate of cooperative membership leads to a great number of retailers in milk marketing and low price attainment of farmers. The representation of the farmer organizations that operate at all stages of agricultural production, i.e. animal husbandry in the EU Commission, is observed to play an active role in the establishment of agricultural policies and the decision making process. It is possible to solve a great number of problems related to the small size of facilities in Turkey by an effective organization. This seems to be mainly achieved by the setting up of cooperatives, which facilitate the cheap supply of inputs and profitable marketing of outputs. Through cooperatives, services such as common usage of machinery, production of rough and concentrated feed, common usage of the milking plant and maintenance of the cold chain, which affect quality and production directly, can be achieved. Actually, this is the valid structure in the EU.

Many organizations have been established in the technical and economic arrangement of dairy farming in Turkey. They can be listed as: Cooperatives for Village Development and Other Agricultural Purposes, the Cattle Breeders' Association of Turkey, the Animal Husbandry Cooperative and Milk Producers Association. The technical and economic fields of these organizations encroach upon each other and sometimes disputes can occur. It is vital to reduce this abundance of organizations and facilitate the membership conditions of small farmers.

It can be concluded that the subsidies granted to dairy farming have encouraged cooperativization in recent years, motivating the development of an organization culture. However, the small and medium farmers who form the majority of milk farmers benefit from these subsidies only at a low degree. Among the reasons, there are the fact that at least five registered cows are compulsory for the Cattle Breeders' Association of Turkey membership, there is a lack of pedigree records and, due to the low volume of the milk produced, milk is supplied to small local processing dairy facilities instead of large dairy factories.

In the structure of the current dairy sector, MCCs play an important role especially in supplying raw milk of high quality and adequate quantity to the dairy industry. It is fundamental that food safety and quality applications and procedures must be installed in MCCs. One of the key results of the study is the finding that microbiological and chemical analyses on raw milk are misapplied due to the lack of qualified personnel and to equipment inadequacies. The most widely applied control is the sensory analysis of the raw milk. Only in MCCs that collaborate with large processing firms, the purchased raw milk was analyzed in the

processing firms' laboratories. An extra incentive was paid to the farmer for good quality milk. This practice is an important incentive method because it directly affects the farmers' revenues. Although it does not have an immediate short-term effect like premium payment, the organization of hygiene and food safety seminars for farmers could affect quality milk production in the long term. These seminars could be held with the collaboration of The Ministry of Agriculture, processing firms and universities. In the meantime, the educational level of the MCC staff must be regulated and harmonized with the desired work. Qualified personnel should be employed in MCCs and the continuity of education programs and seminars on food safety and quality must be guaranteed. Incentives such as low rate credits and support should be given in order to maintain the equipment necessary to perform raw milk quality analyses.

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