

# **Importance of standardizing raw milk quality for the enhancement of Croatian market competitiveness**

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**Abstract.** In the European Union member states (EU), it is necessary to evaluate hygienic condition of milk in order to determine milk price. Similar requirement was set by the Republic of Croatia in 2000. The Rulebook defines minimal quality criteria that fresh raw milk must have in order to be purchased. Upon completion of analysis, milk is classified into quality classes, each having a defined price. Increased value of somatic cell count (SCC) (higher than 400.000/ml) and MO (higher than 100.000/ml) directly decreases the raw milk price, while higher content of fat and protein causes its increase. Since the system of market milk price formation was established, producers have been stimulated to produce milk of higher quality: in a total of milk being purchased, the highest quality milk share increased from 23.3% to 34.2%. Referring to a trend of milk purchase price reduction in the EU, and considering the current high milk purchase price in Croatia, Croatian producers have an opportunity to improve conditions in milk industry before the country joins the EU. Current milk production needs to be increased and milk quality also needs to be improved, in order to make Croatian milk production more competitive on the European, as well as world market.

**Keywords:** milk quality, competitiveness, market, Croatia

### **Introduction**

Due to unfavorable economic conditions over the last decade and inadequate technological and technical processing methods, many milk farms in Croatia failed to increase their milk production. Moreover, they were even faced with stagnation in milk quality.

Since January 1, 2003, the Republic of Croatia applies a new method of standardizing milk quality. Target price of fresh raw milk (cow's, sheep's and goat's) is determined by the Decision of Croatian Government (Official Journal No. 156/2002), and is formed on the basis of fat and protein content in milk. Somatic cell count (SCC) and number of microorganisms (MO) in milk are taken as criteria to evaluate hygienic condition of milk. Increased SCC in milk affects decrease of factors on the basis of which the raw milk price was calculated. As the somatic cells are a common component of milk, the problem is not in their presence, but rather in their increased number, as a greater number of these cells affects quality processing of milk (Antunac et al., 1998), as well as

production profitability (Mijić and Knežević, 2003). Increased SCC indicates poor health condition of cow's udders. According to Schallenberger (2002), poor health condition of udders can cause losses in milk yield of up to 1.300 kg per lactation, which directly lowers production profit of app. 665 EUR per one diseased animal. All of the above stated significantly influence milk production profitability. Competitiveness of milk producers on domestic and foreign milk market can be enhanced only through systematic approach. This paper presents first results obtained since the new standardization of raw milk quality has been applied in the Republic of Croatia.

### **Legal regulations**

Croatian Ministry of Agriculture, Forestry and Water Management was the first to adopt Regulations on fresh raw milk quality, which was published in Official Journal No. 102/2000. The Regulations define:

- basic criteria for milk quality,
- sampling of raw milk for determination of quality,
- determination of quality of raw milk,
- classification of raw milk,
- conditions for laboratory authorization.

Based on the Regulations, Croatian Government reached the Decision on fresh raw milk target price (Official Journal No. 156/2002), which is being in force since January 1, 2003. This Decision defines calculation methods and target price of cow, sheep and goat fresh raw milk. Target price per liter of standard quality milk that is being retailed on the Croatian market and collected on official purchase sites, is as follows: for cow milk 1.798 HRK, for sheep milk 4.620 HRK, for goat milk 2.384 HRK.

**Table 1.** Minimal criteria for quality of fresh milk in The Republic of Croatia by The Book of Regulations (Source: Official Journal No. 102/2000)

Indicator of milk quality	Quality of cow fresh milk	Quality of ewe fresh milk	Quality of goat fresh milk
<b>1. Chemical and physical characteristics</b>			
- fat contents	3.2 %	4.0 %	2.8 %
- protein contents	3.0 %	3.8 %	2.5 %
- fatless dry substance contents	8.5 %	9,5 %	7.5 %
- density	1.028 – 1.034 g/cm <sup>3</sup>	1.034 - 1.042 g/cm	1.024 - 1.040 g/cm
- degree of acidity	6.6 – 6.8 <sup>0</sup> SH	8.0 – 12.0 <sup>0</sup> SH	6.5 – 8.0 <sup>0</sup> SH
- pH value	6.5 – 6.7	6.5 - 6.8	6.4 – 6.7
- freezing point	< - 0.517 <sup>0</sup> C	< - 0.56 <sup>0</sup> C	< - 0.54 <sup>0</sup> C
- alcohol test with 72 % ethyl alcohol	negative	-	-
<b>2. Number of microbes</b>	≤ 100,000	≤ 1,500,000	≤ 1,500,000
<b>3. Number of somatic cells</b>	≤ 400,000	-	-

Milk of standard quality meets requirements set by the Regulations (as in Table 1). In terms of fat and protein content and number of microorganisms and SCC, such milk contains:

- in cow milk: 3.7 % fat and 3.2 % protein, and 400.000 somatic cells and 100.000 microorganisms in 1ml;
- in sheep milk: 6.0 % fat and 4.0 % protein, and 1,500.000 microorganisms in 1ml;
- in goat milk: 3.5 % fat and 2.6 % protein, and 1,500.000 microorganisms in 1ml.

### Methods of payment for milk

Basic milk price is calculated on the basis of percentage of fat and protein and their money unit, according to the formula:

$$MPB = (F \times v_1) + (P \times v_2)$$

whereas:

MPB = Milk Price Basis

F = % of fat in milk

P = % of protein in milk

v<sub>1</sub> = money unit of fat, as follows:

- cow milk 0.236 HRK,

- sheep milk 0.270 HRK,
  - goat milk 0.280 HRK,
- $v_2$  = money unit of protein, as follows:
- cow milk 0.289 HRK,
  - sheep milk 0.750 HRK,
  - goat milk 0.546 HRK.

Basic milk price is adjusted by applying correction values for standard quality milk as classified to classes according to the number of microorganisms in all milk types, and in cow milk according to SCC, as well.

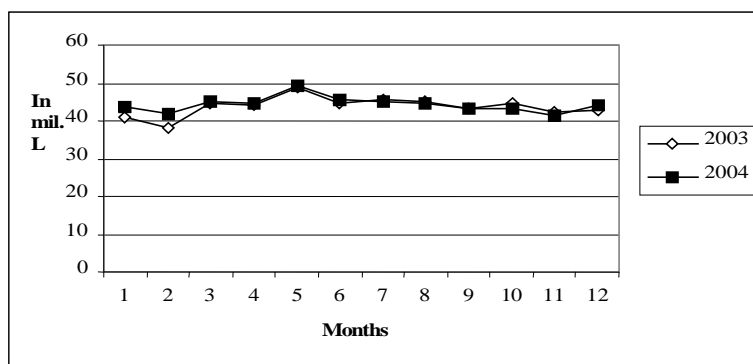
**Table 2.** Correction factors for fresh raw milk (Official Journal No. 156/2002)

Correcti on values	Cow milk			Sheep and goat milk		
	Classification		SCC	Correcti on values	Classification	
	Clas s	MO			Class	MO
1.15	E	≤ 80.000	≤ 400.000	1.10	E	≤ 1,200.000
1.00	I	≤ 100.000	≤ 400.000	1.00	I	≤ 1,500.000
0.95	II	≤ 400.000	≤ 600.000	0.95	II	≤ 6,000.000
0.90	III	> 400.000	> 600.000	0.90	III	> 6,000.000

### Obtained results

According to the latest estimations, there are 100.000 family farms in Croatia that deal with cattle production. They have a herd of three cows on average. There are also several companies that own farms with greater number of cows. Cattle production in our country refers to both milk and meat production from combined cattle breeds (Simmental and Brown). There are also farms specialized in milk production from Holstein breed. In the cattle production on small family farms, there is less concern put into technological process and feeding regime, which results in low milk yield per cow. Milk yield is about 2.500 liters per cow a year. If adding milk that is consumed by a growing calf, this amount refers to total of 3.100 liters of milk per cow a year.

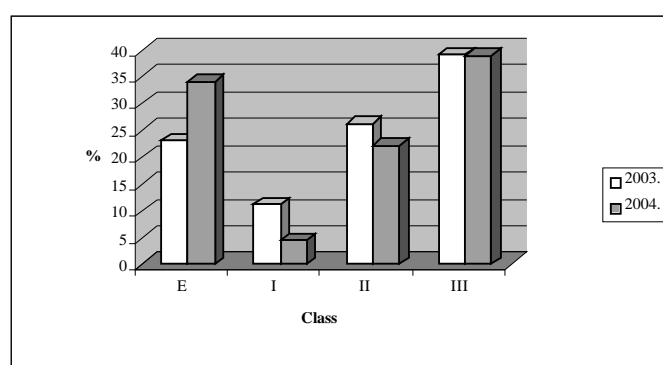
Only smaller number of family farms has greater number of cattle and applies up-to-date technological processing methods, thus being able to compete with modern European farms. During 2004, there was 532,841.845 liters of milk purchased, which was 1.46% more than in 2003 (Figure 1).



**Figure 1.** Total amount of purchased milk in Croatia (mil. of liters) in 2003 and 2004  
(Croatian Livestock Centre, 2005)

Before the new system of controlling and paying for milk in Croatia has been introduced, some researches were carried out to determine conditions of purchased milk. Hadžiosmanović et al. (1998) determined that 31% of joint milk samples had SCC higher than 400.000/ml, while physical and chemical indicators of milk quality met existing requirements. Mijić et al. (2004) separately analyzed milk samples and obtained even worse results. They determined that only several milk samples (28.6%) had  $\leq 100.000$  MO/ml. Depending on a farm, there were 65.7 do 77.3% of milk samples with  $\leq 400.000$  SCC/ml. According to chemical composition, there were 44.4 - 71.2% milk samples of standard quality to fat, and 63.0 - 94.6% to protein.

The first records obtained upon establishing of the Central laboratory for milk control are encouraging. In 2004, the highest E quality class of milk increased from 23.3% to 34.2%. At the same time, shares of milk in the I and II class decreased. Unfortunately, share of the III class milk remained constantly high, being 39.0% (Figure 2).



**Figure 2.** Classes of purchased raw milk referring to number of MO and SCC in 2003 and 2004 (Croatian Livestock Centre, 2005)

At the same time, costs of milk production (veterinary costs) and milk processing significantly increased. This was confirmed in summer of 2005, when some diaries refused to purchase such milk. If taking into consideration portion of SCC per classes, there is a noticeable trend in

increase of milk portion in the class up to 400.000 somatic cells, and a slight decrease in other two classes. However, if considering number of milk producers, after an increase in 2002 when the system was established, no significant rise was observed over the next two years. This is explained by the fact that there is a constant number of producers that do not comply with minimal hygienic and sanitary requirements while milking their cows. This refers mostly to small family farms with unfavorable age structure of employees that do not gain new knowledge and skills necessary to improve their production process (Ivkić et al. 2006).

Such high SCC in milk has the most negative effect on cheese production (Antunac et al. 1997). The changes are marked in unfavorable ratio of casein fractions, increased pH values, altered coagulation properties, decrease in randman and quality of final product. In order to produce hygienically clean milk products that are healthy for human nutrition, it is of great importance to pay attention to cleanness of hands, milk glands, milking area and other milking equipment (Pavičić and Hađina, 2001). For that reason, it is necessary to permanently educate milk producers.

## **Conclusion**

Standardizing fresh raw milk quality brings novelty to classification and milk price formation. Producers will have to pay more attention to technical phases of milk production, to feeding regime and animal health protection. All of these are necessary because of parameters that are monitored and controlled in milk according to the new Regulations. Each mistake and belated reaction of producers or veterinarians will be reflected negatively in financial output. Milk market in the Republic of Croatia is still underdeveloped, and significant state subventions are expected in order to enhance milk production. An important step forward is the adoption of Regulations on milk quality standardization, which will definitely contribute to milk production competitiveness not only on domestic but also on the European market.

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