

PROBLEMS OF ENSURING MILK QUALITY IN UKRAINE IN TERMS OF EUROPEAN STANDARDS IMPLEMENTATION

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Abstract

In the market of raw milk Ukraine major producers are small farms and private courtyard (more than 75% of the total). They are producing second grade milk, with the total bacterial contamination of ≤ 3000 thousand/cm³ and thousands ≤ 800 /cm³ somatic cells. In terms of European integration and Ukraine's transition to new standards governing the quality of milk, the problem is acute.

Database of research materials were: State Statistics Service of Ukraine, State Service of Ukraine on issues of food safety and consumer protection, the Law of Ukraine "On basic principles and requirements of food security", SSU 36662-97 "Whole cow milk. Requirements for the procurement", SSU 3662: 2015 "Raw milk whole. Technical conditions", and EU Regulation № 853/2004. The method of comparison was used in the analysis of the largest world and Ukrainian milk producers and the comparison of milk quality parameters in Ukraine and the EU, the method of structural analysis was used in analysing the volumes of varying quality milk, purchased by processing enterprises from enterprises and households.

The study found that milk that according to Ukrainian standards corresponds to the grades "extra» and "higher» and is defined as high quality raw materials, is classified by the EU as "tolerable» according to the requirements of the EU and refers to the lowest quality class, and milk raw materials of the first and second varieties are generally unsuitable for European milk processing

enterprises. The main reasons for the low quality of milk produced by Ukrainian producers are: violation of sanitary and hygienic norms in keeping cows, which leads to high bacterial contamination of milk; lack of breeding work, poor quality of cattle breeds and feed, which results in a low nutritional value of milk; a high proportion of human labour in production process, which negatively affects the quality of manufactured products; lack of primary milk processing and conditions for its cooling; breach of the requirements for milk storage; the lack of the possibility of the immediate transport of milk to milk processing enterprises; weak state control over milk quality and compliance with requirements during its production, and limited financial resources of households.

The most effective way to ensure the conditions for improving the quality of milk can be a union of cooperatives of producers, as evidenced by international experience. Such form of cooperation will allow the exchange experiences and knowledge, joint procurement and use of innovative equipment for the production, cooling and storing milk, and reduction of transport costs for milk collection, improvement and compliance with hygiene standards getting milk to attract government funding.

Key words: Milk, Milk quality, State standards, Cooperative, European integration.

1. Introduction

In Ukraine, as in the rest of the world, one of the important tasks of the agricultural sector is to increase the production of food, in particular milk and its processing products, improve their quality and ensure a balance in nutrients (Zablovskyi, [3]). Ukraine's accession to the WTO and the policy of integration into the European Union (EU) require improving the quality, safety and competitiveness of domestic dairy products in the domestic and global markets. However, due to the fact that many provisions of National legal acts do not comply with the requirements of European legislation, the level of implementation of the Acquis Communautaire (legal concept in the system of legal norms of the European Union) remains low, which causes difficulties during the export of Ukrainian food products and hinders the integration processes associated with the European choice of Ukraine [11]. An important prerequisite for improving the quality of dairy products is the harmonization of its evaluation system, according to the regulations of international organizations [1, 2].

2. Assessment of production and quality of milk in Ukraine

2.1 State of the dairy industry in Ukraine

The dairy industry is one of the key components of the Ukrainian agricultural sector. It involves more than 37 thousand people, which is more than 9% of the total number of employed in agriculture. The share of the dairy sector is 3.1% in the structure of gross agricultural production, and 11% in the structure of livestock production. Only in 2017, dairy farms paid to the budget 110,842,071.88 euros of taxes, and foreign exchange earnings from exports amounted to about 247,711,016.37 million euros. Today it is worth noting the increase in the value of dairy exports by 75.4%. In the structure of export of dairy products the leading position is oil-44.4% of total exports (Figure 1). In 2017, 30.4 tons were exported, which is 2.5 times more than in 2016.

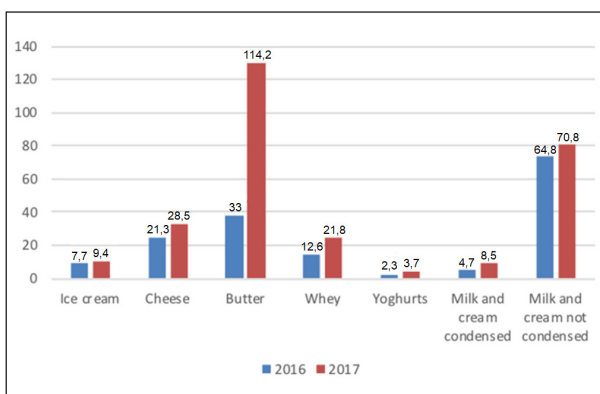


Figure 1. Export of milk and dairy products from Ukraine, million euros [4]

High butter prices in the world allowed three and a half times to increase its exports from Ukraine (which is almost 114.309 million euros) and become the second largest butter supplier to Europe, also Ukrainian butter was bought by Morocco (20.9% of all exports) and Turkey (18.7%). In addition, Ukrainian exporters have secured a stand cooperation with China, to which 46% of all exports of whey were delivered. The new partner country is Qatar - the largest buyer of milk and cream - 32% of all exports in 2017. In 2017 30.4 tons were exported, which is 2.5 times more than in 2016.

Access to the EU market for dairy products from Ukraine was opened on January 11, 2016. Then the first 10 Ukrainian producers received permission to export dairy products to the EU market. As of September 2017, the number of approved exporters from Ukraine to the EU has increased to 19.

Prices for Ukrainian milk and its products tend to increase. Thus, in September 2017 the average purchase price of milk from domestic farmers increased by 47.1% compared to the same period in 2016.

According to the State Statistics Service of Ukraine in January-November 2017, milk production in farms of all categories amounted to 9 million 681 thousand tons, which is 0.8% less than the corresponding period last year (Figure 2).

There is a tendency of decrease in milk production from households to agricultural enterprises, so agricultural enterprises in January - November 2017 produced 2545.9 thousand tons of raw milk, which is 1.9% more than in the corresponding period of 2016, and households - 7135.1 thousand tons, which is 1.5% less than in January - November 2016.

The introduction of a new standard for milk adapted to European requirements can have a serious impact on the volume of milk production. According to forecasts, this will lead to a reduction in the purchase of milk from the population, which will reduce the raw material base of the domestic dairy industry and will contribute to the growth of prices for milk and related products [5].

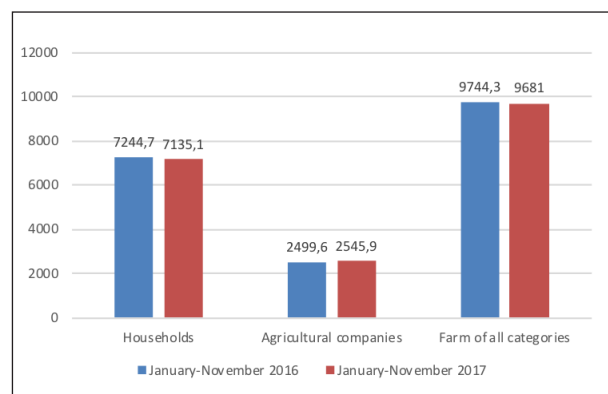


Figure 2. Volume of milk production in Ukraine in the period of 2016 - 2017 years, thousand tons

2.2 Comparison of milk quality standards in Ukraine and EU countries

Manufacturers and importers are responsible for the safety of the goods they sell. Each country should have bodies responsible for verifying compliance and withdrawing hazardous products from the market, if necessary.

To date, all requirements for the production of raw milk, control, sanitary supervision, quality assurance of dairy products are regulated by the Law of Ukraine "on veterinary medicine" [6], "on safety and quality of food products" [7], and "on milk and dairy products" [8]. Requirements for the quality and safety of milk, when received by milk processing enterprises, are regulated by the state standard DSTU 3662-97 "Cow's whole milk: Requirements for procurement" [9]. The standard provides that all milk that is purchased must be obtained from healthy cows, be natural whole, have appropriate quality indicators and, depending on the level of bacterial contamination and the content of somatic cells is divided into extra, higher, first and second grades (Table 1).

In the EU countries, the main document that sets out requirements for food safety systems is EU Regulation No. 178/2002 "on the establishment of general principles and requirements of food legislation, the establishment of a European food safety authority and the establishment of appropriate procedures in matters related to food safety" [10]. In addition to it, there are a number of resolutions that are relevant today (Table 2).

Comparison of milk quality indicators in Ukraine and EU countries is given in Table 3.

Therefore, the level of bacterial contamination of milk of the highest grade according to the Ukrainian standards is much higher than the maximum permissible European quality standard, and only the supreme grade milk meets the EU requirements for the number of somatic cells. In Ukraine, milk processing enterprises mainly receive milk of the first and second grades. In developed countries, such milk is not even taken for processing.

During the analysis of the Table 3 there should be paid attention to the fact that in Ukraine the freezing point of milk is not controlled. This indicator makes it possible to establish the fact of falsification of milk. Since such cases have become more frequent in recent years and the effective method of determining falsification remains outside the control of the state, milk processing plants often receive adulterated milk, which leads to the discrepancy of the milk produced from it to the quality and safety requirements. In our opinion, the root cause of the poor quality of domestic milk and its processed products lies in the obsolescence of the DSTU and its non-compliance with international quality standards. Thus, such a gap in the state control has become one of the reasons for the need to develop a new standard.

Thus, the current Ukrainian standard DSTU 3662-97 from the first of January 2018 should be replaced by DSTU 3662: 2015 "Cow milk - raw materials. Technical conditions", which is aimed at increasing the requirements for the quality of milk and the regulation of the use of second class milk only for certain purposes. Major changes to the standard:

- Milk for industrial processing will be classified as extra, higher and first grade;
- The maximum content of somatic cells is ≤ 600 thousand/cm³;
- Number of mesophilic aerobic and facultatively anaerobic microorganisms is ≤ 500 thousand CFU/cm³;
- Freezing point set is minus 0.520 °C for all grades;
- Cooling of milk to 6 °C (the temperature is not set if the milk is processed no later than 2 hours after milking);
- Shelf life from the moment of milking, taking into account the time of transportation is established: at a temperature not higher than 4 °C - 24 h; not higher than 6 °C - 18 hours.

The main changes relate to the gradual reduction of requirements for the quality of raw milk in accordance with higher standards, eventually - with the so-called standard 100/400 (100 - the number of conventional

Table 1. Indicators of quality of milk in Ukraine according to DSTU 3662-97 "Cow's whole milk. Requirements for procurement" [9]

Indicators	Grades			
	Extra	Higher	First	Second
Total bacterial contamination, thousand/cm ³	≤ 100	≤ 300	≤ 500	≤ 3000
Number of somatic cells, thousand/cm ³	≤ 400	≤ 400	≤ 600	≤ 800
Acidity, °T	16 - 17	16 - 17	≤ 19	≤ 20
Degree of purity of the standard	I	I	I	II
Mass fraction of solids	> 12.2	> 11.8	> 11.5	> 10.6
Fat and protein content, basis	3.4% and 3.0%			
Freezing temperature, °C	not controlled			
Density, kg /m ³ , not less	1027.0			

Table 2. EU regulations and their main characteristics

Regulation of the European Parliament and Council	Application field
No. 178/2002 “on the establishment of general principles and requirements of the food code, the establishment of bodies for food safety and the establishment of measures for food safety”	<p>The regulation provides a framework for ensuring a high level of protection of human health and consumers’ interests with regard to food products, in particular, taking into account the diversity in the supply of food products, including traditional products, ensuring the effective functioning of the domestic market. It establishes general principles and responsibilities, the means of creating a strong science base, efficient organizational arrangements and procedures that lead to decision-making in matters of food safety and feed.</p> <p>The regulation establishes general principles applicable to food products and animal feed in general, and food products and animal feed safety, in particular at the community and national level.</p>
No. 852/2004 “on the hygiene of food products”	<p>The resolution establishes general rules for all stages of production, processing and sale of food products regarding food hygiene, in particular: responsibility for food safety is assigned to the food industry; the need to ensure the safety of food products at all stages of the food chain, from the stage of production of raw materials; it is important that food products that cannot be safely stored at ambient temperatures, especially frozen food products, are kept at the same temperature at all stages of the food chain; the general application of procedures, based on the principles of HACCP, along with the application of responsible sanitary practices, should raise the level of responsibility in the food industry.</p>
No. 853/2004 “on the establishment of special hygienic rules to be applied to food products of animal origin”	<p>The regulation establishes special rules for entrepreneurs of the food sector, applicable to food products of animal origin. These rules are an addition to the rules established by Regulation (EC) No. 852/2004. They are to be applied to processed or unprocessed animal products. Unless expressly provided otherwise, this Regulation does not apply to food products containing plant-based products and processed animal products. However, processed products of animal origin used for the preparation of such food products must be obtained and processed in accordance with the requirements of this Regulation.</p>
No. 854/2004 “on the departmental control of certain animal products intended for human consumption”	<p>The regulation establishes special rules for the organization of official control over products of animal origin. The provisions of this Regulation shall apply in addition to EC Regulation 882/2004. The regulation contains separate articles: Permission to carry out activities of enterprises; General principles of official control in respect of all products of animal origin, which fall within the scope of this Regulation; Fresh meat; Live shellfish; Fish products; Raw milk and dairy products. This Regulation also contains procedures concerning imports.</p>
No. 882/2004 “on official controls that are applied to ensure compliance with feed and food legislation, animal health and protection regulations”	<p>The regulation establishes general rules for carrying out official control activities to confirm compliance with the rules aimed in particular at preventing, eliminating or reducing to acceptable levels the risk to people and animals directly or through the surrounding natural environment; guaranteeing fair practices in trade of feed and food products and protection of consumer interests, including labelling of food and feed products and other forms of consumer information.</p>
No. 2073/2005 “on microbiological criteria applied to food”	<p>The regulation establishes the microbiological criteria applicable to certain micro-organisms and the rules to be observed by food market participants when they implement general and specific hygiene measures specified in article 4 of Regulation (EC) 852/2004. The competent authorities shall verify compliance with the rules and criteria set out in this Regulation in accordance with Regulation (EC) 882/2004 without prejudice to their rights to further sampling and analysis in order to identify and measure other microorganisms, their toxins or metabolites, and without prejudice to their rights to inspect food products suspected of being hazardous.</p>

Table 3. Comparison of milk quality indicators in the EU and Ukraine

Milk quality parameters in EU countries in accordance with EU Regulation 853/2004			Parameters of milk quality in Ukraine according to DSTU 3662-97		
Classification	CSC (thousand cm ³)	Bacterial contamination (thousand cm ³)	Classification	CSC (thousand cm ³)	Bacterial contamination (thousand cm ³)
Very good	< 100	30	-	-	-
Good	100 - 200	30 - 50	-	-	-
Medium	200 - 350	50 - 300	-	-	-
Tolerable	350 - 500	300 - 500	Extra	< 400	≤ 100
			Higher	≤ 400	≤ 300
			First grade	≤ 600	≤ 500
Unfit	> 500	500	Second grade	≤ 800	≤ 3,000

units of mesophilic aerobic and facultatively anaerobic microorganisms in 1,400 thousand of somatic cells in 1 cm³ of milk of households out of 4.1 million), which corresponds to the European regulations.

At the same time, understanding the realities of the industry and the need for a gradual transition, the Ministry of Agrarian Policy initiated the postponement of the entry into force of the updated standard, which was supported by the National standardization body. The Ministry of Agrarian Policy postponed the introduction of new dairy standards from January 1 to July 1, 2018. The new standards will significantly improve the safety of milk in Ukraine. The adoption of these standards is one of the obligations of Ukraine under the Association Agreement with the EU.

2.3 Quality problems of Ukrainian dairy products

The norms of 1997, established by the current standard, the validity of which is extended to July 2018, provide for several times more permissible contamination for second-grade milk. According to EU requirements, all "dangerous" milk, which today is about 75% of all milk produced in the country, should disappear from the Ukrainian market (Figure 2). This means that private households will be the most affected by innovation, as they produce low-quality raw materials. But the order to ban the purchase has a transitional period of implementation until 2022. Thus, the use of second-grade milk for technological processes of food production after the transition period will be limited. But it is allowed to use non-food products, such as animal feed or casein in the production.

In the structure of raw milk, which is accepted by milk processing enterprises, milk of the second grade takes about a third, mainly from households (Figures 3 and 4). That is, in total it is 22% of milk from the amount of milk, including 15% of the produced in the households (up to 180 thousand households out of 4.1 million are involved).

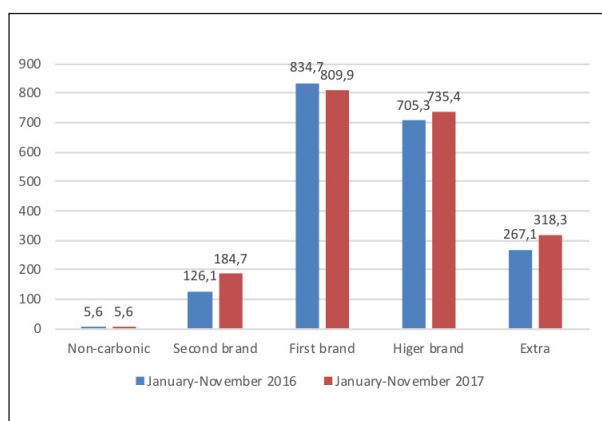


Figure 3. Quality of the milk purchased by processing enterprises of Ukraine from enterprises in the 2016 - 2017, (in thousand tons)

The main reasons for the poor quality of milk of Ukrainian producers are: violation of sanitary and hygienic standards in the content of cows, which leads to high bacterial contamination of milk; lack of breeding, poor quality of livestock cows and feed, resulting in low nutritional value of milk; high proportion of human labour in the production process, which adversely affects the quality of manufactured products; lack of primary processing of milk and conditions for its cooling; violation of requirements for the storage of milk; lack of possibility of immediate transportation of milk to milk processing enterprises; weak state control over the quality of milk and compliance with the requirements during its production; and limited financial resources of households.

2.4 Ways to improve the quality of milk in Ukraine

The law of Ukraine "on basic principles and requirements for safety and quality of food products" [12], establishes the obligation to develop, implement and apply permanent procedures based on the principles of the system of analysis of hazards and control at critical points (HACCP). In this context, there were set key dates for businesses operating with food products, which include raw animal ingredients (except the small capacities), up to September 20, 2018, for the small capacity - up to September 20, 2019. Responsibility for the absence or violation of the requirements to ensure the traceability of the HACCP system is established.

In fact, improving the quality of milk from the second grade to the first does not require significant costs. First of all, it is necessary to adhere to the hygienic requirements for the process of milk production. We are talking about the hygiene of the staff and the animals themselves. The personnel involved in the work with cows must wear clean clothes, use clean gloves, wash hands with soap or disinfect them. For milking it is necessary to use clean containers, preferably a milking

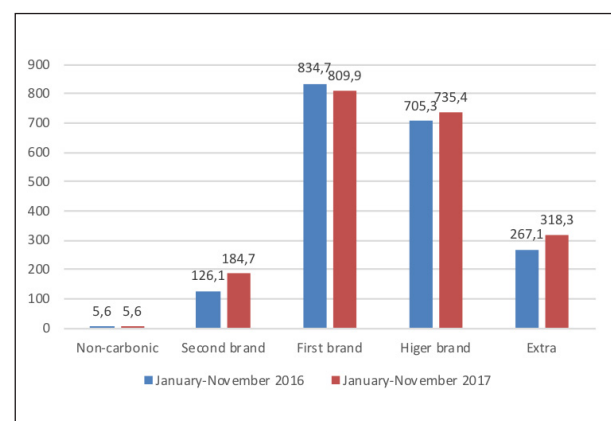


Figure 4. Quality of milk purchased by processing enterprises of Ukraine in households in 2016-2017, thousand tons

machine or a milking machine, which must be washed and disinfected after each milking. Cows should be subject to veterinary care.

Progressive is the introduction of certain innovations in the dairy sector, such as: the Innovative principles of the system of voluntary milking of dairy cows known as voluntary milking system (VMS), modular dairy mini-plants, loose housing system of cows maintenance, system of semi-automatic and automatic control of movement of animals, the system of voluntary milking, the robotic arm of the milking robot, the creation of functional food, manufacturing of spreads, projects for the development of cooperatives with a focus on support for family farmers, etc. [13].

The most effective way to ensure the conditions for improving the quality of milk can be the association of producers in cooperatives, as evidenced by international experience. For example, the revenue of the New Zealand dairy giant Fonterra in 2015 amounted to 15.3 billion euros, and the processing volume has reached 21.6 million tonnes. The company consists of about 10.5 thousand farms. It is the exchange Fonterra that sets the price of milk, which is focused on the whole world. Another example of a successful dairy cooperative is Dairy Farmers of America. The cooperative brings together 15 thousand farmers from 48 States. In 2016, the company's processing volume amounted to 17.1 million tons, revenue amounted to 11.4 billion euros. A good example of cooperation in the Netherlands is Friesland Campina. By 2016, the company processed 10 million tons of milk, its revenue amounted to 11.8 billion euros. The list of successful dairy cooperative societies can continue with: the Danish cooperative Arla Foods, the Latvian Pienas LT, and the Polish Mlekovita (Zhupinas, [14]).

Domestic farmers are often wary of cooperation, by and large over the past negative experience. The development of cooperatives has been repeatedly raised by the Ministry of Agrarian Production, and various organizations and companies at numerous events. In addition, Ukraine has a number of successful cooperatives in the dairy sector.

In August 2017, the processing enterprise LLC "Ternopil dairy" and milk producers LLC "Dzendzelivske" and LLC "Kishchentsi" created the first cooperative in Ukraine for the production of dairy products from extra-grade milk. The first project of cooperation of producers and processors of milk in Ukraine was introduced with the support of UN Food and Agriculture Organization, the European Bank for Reconstruction and Development, and the Association of milk producers. Within the framework of the cooperative, the company undertakes to buy all volumes of extra-grade milk produced by the partners. Also, milk producers will receive part of the profits from the sale of products that will be produced from their raw materials.

3. Conclusions

- Most of the milk production in Ukraine is concentrated mainly in the private households, which comply with difficult conditions for obtaining high-quality raw materials to control this production impossible.

- The form of cooperation in the form of cooperatives will provide an opportunity to exchange experience and knowledge, joint purchase and use of innovative equipment for the production, cooling and storage of milk, reducing transport costs for milk production, improving and compliance with hygienic standards of milk production, attracting state financial assistance.

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