# IMPROVING THE EFFICIENCY OF QUALITY MANAGEMENT AND SAFETY OF DAIRY PRODUCTION IN UKRAINE IN THE CONDITIONS OF EUROPEAN INTEGRATION

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Dairy farming is one of the most important food industries in Ukraine, the purpose of which is to ensure milk production in volumes that are sufficient to load the production capacity of milk processing enterprises with the subsequent production of dairy products. The state of development of the agro-industrial complex, including its important component – the dairy industry, affects the social and economic stability of the economic system. A healthy nation is the key to a successful economy, and quality raw materials are the basis for the production of healthy products.

The quality management system allows to realize new opportunities of enterprise development. The company that has implemented an effective quality management system defines the main goals: overall improvement of work, profit, effective resource management, quality assurance of products and services, continuous improvement of the organization.

According to the Association Agreement with the EU, Ukraine has to adapt its regulations to European regulations. Standardization, quality certification, perfect expert legal framework is now a challenge of time. The two most important indicators of milk quality are the total allowable number of bacteria and the number of somatic cells in it. According to the Law of Ukraine "On Milk and Dairy Products" [1], the state standard significantly exceeds the requirements for bacterial contamination. This Law defines the legal and organizational basis for ensuring the safety and quality of milk and dairy products for life and health of the population and the environment during their production, transportation, processing, storage and sale, import into the customs territory and export from the customs territory of Ukraine. The presence of bacteria is allowed for milk of higher, first and second grades within, respectively, 300, 400 and 500 thousand cells per cm3. The presence of bacteria in premium milk meets the level of standards of foreign countries with developed dairy farming. In the Table 1 the requirements to physicochemical and microbiological indicators of milk according to operating (in part) DSTU 3662-97 [2] are presented (Table 1).

**Table 1. Requirements for physicochemical and microbiological parameters of milk in accordance with DSTU 3662-97**

| Indexes | EU (№853) | Ukraine (DSTU 3662-97) | | | |
|---|---|---|---|---|---|
| | | Extra | Top grade | I grade | II grade |
| Total bacterial contamination, thousand / cm3 | <100 | <100 | <300 | <500 | <3000 |
| Number of somatic cells, thousand / cm3 | <400 | <400 | <400 | <600 | <800 |
| Acidity, ° t | - | 16-17 | 16-17 | <19 | <20 |
| Degree of purity according to the standard | - | I | I | I | II |
| Mass fraction of dry matter | - | >12,2 | >11,8 | >11,5 | >10,6 |
| Fat and protein content, basis | 3.8 – 4.0 %<br>3.2 – 3.4 % | 3,4%<br>3,0% | | | |
| Freezing point, ° C | -0,515 | Not controlled | | | |
| Density, kg / m3, not less | - | 1027,0 | | | |

Today in Ukraine there are 4 varieties of milk. On January 1, 2019, the state standard DSTU 3662: 2018 “Raw cow's milk. Technical conditions" - a document that sets requirements for milk grades" extra "," higher "and" first "[3]. At the same time, the same order abolished the national standard DSTU 3662: 97 "Whole cow's milk. Procurement requirements” in terms of requirements for extra, higher and first grade milk and in terms of requirements for second grade milk – the standard will be valid until 01.01.2020. Until January 1, 2020, milk production by food processing enterprises will continue. From January 1, 2020 to January 1, 2022, such milk will continue to be purchased, but not for the production of non-food products. Currently, there is no ban on the purchase of milk from the population by processing enterprises. Improving the quality of milk from the second grade to the first does not require significant costs. It is a question of observance of hygiene of the personnel and animals.

The national standard from January 1, 2019 is replaced by DSTU 3662: 2015 "Raw milk. Specifications", which aims to increase the requirements for milk quality and permission to use second-grade milk only for non-food purposes. According to DSTU 3662: 2015 "Raw cow's milk. Technical conditions" there are three types of milk: extra, higher and the first – in contrast to the standard valid until 2019, which provides for the acceptance for processing of second grade milk. Regarding the requirements for second-grade milk, the national regulatory document DSTU 3662-97 "Whole cow's milk. Procurement requirements" will be abolished from January 1, 2020. A two-year transition period has been established, during which second-grade milk will be accepted, but only for technical purposes (animal feed, casein, etc.) (Table 2).

**Table 2. Microbiological indicators of milk according to DSTU 3662: 2015**

| Name of indicator, unit | Norm for measuring grades | | | Control methods |
|---|---|---|---|---|
| | extra | higher | first | |
| Number of mesophilic aerobic and facultative anaerobic microorganisms (KMAFAM), thousand CFU / cm³ | < 100 | < 300 | < 500 | According to DSTU 7357, DSTU 7089, DSTU ISO 4833, DSTU IDF 100B |
| Number of somatic cells, thousand / cm | < 400 | < 400 | < 500 | According to DSTU ISO 13366-1, DSTU ISO 13366-2, DSTU 7672 |

It should be noted that the EU has established uniform requirements for raw milk without division into grades (Regulation (EU) № 853/2004 of the European Parliament and of the Council of 29 April 2004). Thus, the introduction of a new standard partially solves the issue of harmonization of regulatory requirements for raw milk, but the introduction of a new standard does not solve the problem of shortage of raw milk and improve its quality.

Classification of milk by varieties in the statistical reporting of enterprises until 2019 is in accordance with GOST 3662-97 "Whole cow's milk. Requirements for procurement." The standard stipulates that all milk, depending on the level of bacterial contamination and somatic cell content, is divided into extra, higher, first and second grade.

The study of milk quality indicators received for processing from enterprises shows that only for the last 4 years the quantity of "extra" class milk has increased by 94% – from 366.4 to 710.3 thousand tons, premium grade – by 1.6% – from 923 to 937.4 thousand tons, which indicates an increase in overall quality indicators (Table 3).

In contrast to enterprises, households are not able to provide quality characteristics of raw milk, which is confirmed by its structure by varieties – in 2019 they did not sell milk of "extra" class, the share of premium milk – 0.1%, the first – 12, 0%, the second – 40.5% and non-grade – 4.7%. Enterprises processed 77.6% of milk chilled to 10 o C, and households – only 43.1%. The indicators of mass fraction of fat (by 0.14%) and protein (by 0.19%) are lower in the milk of households.

Improving the quality of milk delivered by households to processors is economically feasible, as compliance with technological requirements for hygiene and safety of production does not require significant financial resources, but the cost of premium milk reimburses the costs incurred.

**Table 3. Quality of whole cow's milk purchased by processing enterprises by grades**

| Indexes | Enterprises | | | | | Population | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | 2017 | 2018 | 2019 | 2019 in % to 2016 | 2016 | 2017 | 2018 | 2019 | 2019 in % to 2016 |
| Weight of raw cow's milk, thousand t | 2375,5 | 2533,1 | 2560,1 | 2428,1 | 102,2 | 1161,50 | 1199,80 | 1054 | 822 | 70,8 |
| in terms of raw milk of the established basic fat content | 2511,9 | 2688,5 | 2719,9 | 2610,4 | 103,9 | 1197,70 | 1239,30 | 1089 | 851 | 71,1 |
| including by grades: | | | | | | | | | | |
| extra | 366,4 | 441,1 | 586,2 | 710,3 | 193,9 | 0,10 | 0,40 | - | - | - |
| specific weight, % | 14,6 | 16,4 | 21,6 | 27,2 | x | 0,00 | 0,10 | - | - | - |
| of the highest grade | 923, | 987,1 | 1036,2 | 937,9 | 101,6 | 0,60 | 1,60 | 2 | 1 | 137,0 |
| specific weight, % | 36,7 | 36,7 | 38,1 | 35,9 | x | 0,10 | 0,10 | 0,2 | 0,1 | x |
| I grade | 1056 | 1018,1 | 894,6 | 844,4 | 80,0 | 107,80 | 110,40 | 136 | 102 | 94,5 |
| specific weight, % | 42 | 37,9 | 32,9 | 32,3 | x | 9,00 | 8,90 | 12,5 | 12,0 | x |
| II grade | 160,2 | 234,7 | 193,8 | 97,1 | 60,6 | 1028,20 | 1081,00 | 904 | 708 | 68,9 |
| specific weight, % | 6,4 | 8,7 | 7,1 | 3,7 | x | 85,80 | 87,20 | 83,0 | 83,2 | x |
| non-grade | 6,3 | 7,4 | 9,0 | 20,6 | 327,6 | 61,10 | 45,90 | 47 | 40 | 66,3 |
| specific weight, % | 0,3 | 0,3 | 0,3 | 0,8 | x | 5,10 | 3,70 | 4,3 | 4,7 | x |
| Of the total mass of raw cow's milk in kind | | | | | | | | | | |
| cooled to 10° C | 1760,1 | 1947,8 | 217,3 | 1884,1 | 107,0 | 489,40 | 544,00 | 559 | 354 | 72,4 |
| specific weight, % | 74,1 | 76,9 | 84,9 | 77,6 | x | 42,10 | 45,30 | 53,0 | 43,1 | x |
| Mass fraction in purchased raw cow's milk,% | | | | | | | | | | |
| fat | 3,6 | 3,61 | 3,61 | 3,66 | x | 3,51 | 3,51 | 3,51 | 3,52 | x |
| squirrel | 3,06 | 3,08 | 3,11 | 3,13 | x | 2,93 | 2,95 | 2,96 | 2,94 | x |

Therefore, it is advisable for milk producers to implement innovative measures to comply with sanitary and hygienic working conditions and keeping cows.

With the transition to higher standards, the problem of increasing milk production and improving quality will not be solved immediately. To improve the quality of milk, it is necessary to provide equipment to each farm, to organize milking parlors, to purchase refrigeration and filtration equipment. Such measures are necessary not only to obtain the highest quality milk, but also to encourage the population to create family farms and cooperatives. This requires funds, so the budget

for 2018 was laid 1 billion UAH, aimed at the development of cooperation and farming. In Europe, the cooperative movement is a common phenomenon that gives small farmers the opportunity to share machinery, equipment, sales system and more favorable lending conditions [4, 5].

Significantly increase the quality of raw milk from households is possible through the introduction of world experience in establishing cooperatives, family dairy farms and dairy business development with the involvement of international technical assistance projects aimed at reconstruction and efficiency. It is advisable to study and implement the experience of European countries in the field in order to increase its competitiveness, in particular Poland. The main factors that enabled Polish milk producers not only to rebuild the industry, but also to enter the top 5 leaders of the European Union are cooperation, association of milk producers with processors, as well as the introduction of the latest technologies. The association of producers in cooperatives is an effective form of doing business, because cost optimization opens up many prospects for expanding production, and as a result – increasing profits.

The sanitary and hygienic quality of milk production is a complex problem, which is determined by a number of factors, which are united by the concept of "technology and culture of production". Analysis of the factors that negatively affect the quality of milk in terms of its production, shows that the main of them – contamination during the milking process. Therefore, in order to have milk of high sanitary quality, it is necessary to clean the milking equipment as thoroughly as possible before using it.

Further development of the domestic dairy industry and dairy industry will depend on how quickly Ukraine will master the quality management system of milk production and processing at all stages of the technological link: complex – plant – consumer. For milk producers, the most effective product quality management system is the HACCP system (Hazard Analysis and Critical Control Points) – risk analysis and critical control points (CCP). The definition of CCP allows you to identify in a timely manner the reasons for the decline in the quality of indicators and take corrective action. In addition, the identification of risks includes an assessment of the likelihood, entry or spread of a dangerous agent in terms of applicable sanitary and phytosanitary measures, as well as an assessment of the associated biological and economic consequences, or an assessment of the potential adverse health effects [6]. Critical Control Point (CTC) is the stage of production at which control is possible and which is crucial to prevent or remove a hazard or reduce it to an acceptable level. It can be raw materials, technological operation, process. If at a certain point in the process line there is a high probability of potential danger, then such a point is considered critical. The definition of CPC consists of the following elements: – identification of dangerous factors, assessment of their degree of danger and probability of occurrence; – identification of critical control points necessary to control the identified hazards; – determination of critical limits in a specific critical control point; – creation and implementation of a monitoring system; – elimination of shortcomings in excess of critical limits; – checking the system and accounting [7, 8].

HACCP methodology is a direct logical control system based on the prevention of hazards at all stages of production of a particular food product, from raw materials to the sale of finished products. For each technological operation it is necessary to identify hazardous factors that may threaten the safety of products, and to ensure process management, which eliminates the influence of these factors. The HACCP system has recently become widespread internationally, and many governments now see it as a way to address food safety and quality issues. As a result of violation of the rules and techniques of production and primary processing and transportation of milk, it may have various shortcomings due to the causes of feed, bacterial, technical, technological and physico-chemical origin. Such raw materials are unsuitable for processing, and it is impossible to produce high quality products from such milk [9,10]. Milk quality is formed during the whole technological process, starting from feed and ending with the sale of milk, so the HACCP quality system in the technology of milk production on the farm should be divided into the following stages: preparatory work before milking, the milking process and the subsequent route of milk: cleaning, cooling, storage and transportation to processing plants [11].

Prospects for European integration of the dairy industry of Ukraine and supply of products to the EU depend on the implementation of a set of requirements at the state level and individual producers: – implementation of the HACCP system and ensuring traceability of the movement of raw milk and dairy products; – production of dairy products only from milk of "extra" grade; – compliance

with the established requirements for proper identification and registration of animals, labeling of dairy products [12].

Today, the domestic dairy industry is not ready for fierce competition with powerful international companies. Therefore, further work is needed to continue the harmonization of existing standards to European and global requirements, the introduction of ISO quality management systems and HACCP safety management systems. The quality system should be considered as a target subsystem of organization management and as a multifaceted mechanism for managing processes and resources of all components of the enterprise, improving product quality management system provide an overall increase in quality costs in the structure of production costs. One of the main issues that needs to be addressed immediately is that the main volume of milk production (71.8%) has moved to the small private sector, so there is a strong need for a program to develop these farms and improve the quality of raw materials to improve the competitiveness of dairy products.

Based on the analysis, it can be concluded that among the main problems in the market of milk and dairy products of Ukraine should be mentioned the insufficient amount of milk as a raw material; quite significant seasonality of production and low quality of dairy raw materials, which clearly has a negative impact on the production of dairy products and exacerbates the problem of sales, especially in foreign markets; lack of quality standards for dairy products that would meet the requirements of the European level, which inhibits the entry of domestic products into foreign markets; insufficient protection of consumers from low-quality dairy products (with a high content of harmful substances to human health, replacement of milk fat with vegetable, etc.); reducing consumption.

It should be noted that one of the priorities of further development of the domestic dairy industry is to improve the quality of raw milk, because it also affects the markets for finished products. Until recently, a significant share of dairy products produced in Ukraine was exported to Russia, as Russian and Ukrainian standards were very close to each other, and the requirements for milk quality were lower than in Europe. A significant reason that limits the export of our dairy products to the EU is that most milk is produced by households that do not have the necessary technology to store it. Efforts should be made to improve the quality of milk through the purchase and use of modern milking and refrigeration equipment. Therefore, we believe that households engaged in the production of raw milk today need financial assistance and attention from the public sector.

In Ukraine, the crisis processes in the field of dairy farming have not stopped: milk production is constantly declining, the level of milk consumption by the population is declining, the volume of exports. This is due to the fact that most farms refuse to keep cows, and the number of industrial and family farms is not increasing. At the same time, the quality of the product coming for processing is improved at the expense of enterprises on the basis of harmonization of regulations on the quality of milk to European requirements. The problems of raw milk quality are especially acute for households. The prices for milk of enterprises are much higher than the prices for households precisely because of the qualitative characteristics of milk. The real situation in the dairy industry shows that the volume of second-grade milk occupies a significant share in the structure of milk processing of many enterprises and households. Therefore, in order for Ukrainian milk to be competitive with entry into the European market, it is necessary to bring it to high quality standards.

Ukraine has embarked on a path of positive changes in improving the quality of milk and bringing it closer to European standards. The best solution for small and medium-sized producers in this situation is to unite in cooperatives. For small farms, cooperation is a guarantee and a necessary condition for the implementation of measures to improve the quality of milk and compliance with the new legislation on the industry. On the basis of merging households and small farms into cooperatives, the issues of purchase and commissioning of the necessary equipment, establishment of effective sales channels, provision of appropriate sanitary and veterinary control will be resolved. The potential of cooperatives in the dairy industry at the present stage is realized at a low level.

## References

1. Zakon Ukrainy «Pro moloko ta molochni produkty» Vidomosti Verkhovnoi Rady Ukrainy (VVR), 2004, N 47, st.513 (Redaktsiia vid 05.04.2015) https://zakon.rada.gov.ua/laws/show/1870-15.

2. Antoshchenkova V.V., Kopytko O.V. (2018) State regulation and support of the dairy industry in the context of European integration. Visnyk KhNAU. Seriia "Ekonomichni nauky" : zb. nauk. pr. / Khark. nats. ahrar. un-t im. V.V. Dokuchaieva. – Kharkiv : KhNAU, no.4, pp.201

3. DSTU 3662:2018 «Moloko-syrovyna korov`iache. Tekhnichni umovy», nakaz Derzhavnoho pidpryiemstva «Ukrainskyi naukovo-doslidnyi i navchalnyi tsentr problem standartyzatsii, sertyfikatsii ta yakosti» (DP «UkrNDNTs») vid 27.06.2018 r. № 188.

http://uas.org.ua/ua/services/standartizatsiya/109-2/.

4. How can the population switch to the production of quality milk? https://www.segodnya.ua/opinion/marchukcolumn/yaknaselennyupereytinavirobnictvoyaksnogomoloka1107634.html

5. Second-rate product: what will lead to the refusal of milk "from the population"http://avmua.org/uk/post/drugosortnijproduktdocogoprizvedevid mova vidmolokavidnaselenna

6. Palii A.P.(2015) Determination of critical control points in the production of high quality milk. Naukovyi visnyk Lvivskoho natsionalnoho universytetu veterynarnoi medytsyny ta biotekhnolohii im. S.Z. Hzhytskoho. Lviv, Seriia: "Veterynarni nauky", "Silskohospodarski nauky", Vol. 17, 3 (63). pp. 277–281.

7. Palii A.P. (2015) Vyznachennia yakosti vykonannia tekhnolohichnoi operatsii z ochyshchennia molokoprovodu. Naukovo – tekhnichnyi biuleten 113. Kharkiv, pp. 178–182.

8. Burykina I.M. Shhemeleva M.V., Hitrova G.V. (2004). Sistema NASSR na predprijatijah promyshlennosti. Molochnaja promyshlennost'. 5. pp. 16–17.

9. Suhacheva V.Ju. (2008). Chto prakticheski daet HACCP predprijatiju. Molochnaja promyshlennost'. 2. pp. 25–28.

10. Loretc O.G., Barashkin M.I. (2012). Povyshenie kachestva moloka-syr'ja s ispol'zovaniem principov HASSP. Agrarnyj vestnik Urala. 8. pp. 41–42.

11. Belov Yu.P. (2005) Rozrobka ta vprovadzhennia systemy upravlinnia bezpechnistiu kharchovykh produktiv NASSR. Svit Yakosti Ukrainy. 2. pp. 42–45.

12. Poiasniuvalna zapyska do proektu pershoi redaktsii DSTU 3662:2015 "Molokosyrovyna koroviache. Tekhnichni umovy". http:// iprkyiv.com/index.php/87poyasnyuvalnazapyskadoproektupershoiredaktsiid stu36622015molokosyrovynakoroviache tekhnichniumovy

13. Kravchenko Yu.M., Antoshchenkova V.V. (2017) Factors of sustainable development of the agrarian sector. Bulletin of Kharkiv Petro Vasylenko National Technical University of Agriculture. Economic sciences, 174-183. ISBN 5-7987-0176X

14. Kravchenko Yu.M., Antoshchenkova V.V. (2019) Environmental security and quality of agricultural products and its competitiveness under international integration. Bulletin of Kharkiv Petro Vasylenko National Technical University of Agriculture. Economic sciences., 202, 84-92. ISBN 5-7987-0176X