COMPETITIVENESS OF DAIRY INDUSTRY PRODUCTS OF UKRAINE: CURRENT STATE AND PROSPECTS*

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The article considers the current state, trends and problems of development of the dairy industry of Ukraine in modern conditions. The subject of the research in the article is the competitiveness of Ukrainian dairy products in global markets. The goal is an identification of comparative advantages of the dairy industry of Ukraine and identified prospects for its further development. The purpose of the article is to find out the current state and dynamics of production, world prices, demand, exports of dairy products in Ukraine and the world, to determine the comparative advantages of Ukraine in the dairy industry based on the calculation of the Balass index, to review the environmental aspect of the industry. General scientific used research methods: system analysis – to determine the competitiveness of the dairy industry of Ukraine; historical method – to track trends in the global and Ukrainian dairy market; correlation analysis – to determine the interaction of price relations in the domestic market, statistical method – to reflect quantitative indicators, etc. The following results were obtained: based on the study revealed trends in reducing production and exports of dairy products, identified comparative advantages of the dairy industry of Ukraine in a larger regional territory of European markets and proposed ways of further development in accordance with current challenges in the world. Conclusions: the Ukrainian dairy industry is able to compete in world commodity markets, promising areas for export expansion may be Kazakhstan, Moldova, Kyrgyzstan, the Middle East. Given the overall reduction in the capacity of the dairy industry in Ukraine, producers propose to focus on intensifying production and implementing new technologies, taking into account the environmental component.

Key words: dairy industry, export, competitiveness, milk production, dairy industry, comparative advantages, environment.

Formulation of the problem. The dairy industry is one of the leading sectors of the national economy, which provides the population with food. It began to develop in ancient times, and still demand for dairy products is growing, primarily due to population growth.

For Ukraine, dairy production has been a traditionally developed sector, but in recent years total production has been steadily declining, dairy prices were constantly rising, and it’s getting harder and harder to export them. That is why we find it necessary to study current situation on the dairy market in Ukraine and determine the prospects for its further development.

Analysis of recent research and publications. The study of the functioning of the dairy market in Ukraine and other countries is devoted to the work of many authors. In particular, V. Dzhedzhula, I.Yepifanova and M. Dziubko analyse the efficiency of milk production and conclude on the need to diversify and increase of production which should make studied enterprise more competitive [3]. T. Mostenska emphasized that competitiveness of dairy products is directly depends on the prices and level of income in the country. It was stated that government should care not only about the stability of prices, but look into social sphere [7].

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N. Skopenko and A. Bovkun analyze Ukrainian dairy market and find that dairy industry has no homogeneous dynamic. Production of milk is constantly falls, but e.g. sour milk and ice cream have recovered last years [8].

Yu. Tarasova proposes to unite small producers in cooperatives and emphasizes the necessity for a state support for the industry [10]. Khvorost T. V. is confident that Ukraine should find new prospective markets and use modern foreign technologies to stay competitive on the global market [11]. Cherednichenko and O. Pashchenko propose several points, in particular optimization of farms and processing industry relations, improvement of the price mechanism formation of the dairy market and improvement of quality and range of dairy products [12].

F. Frick and J. Sauer study dairy market in Germany. They hypothesize that both extreme output price levels and market deregulation fostered efficient reallocation of production resources, but it wasn’t confirmed in the result of the research [17].

L. Pronko and T. Kolesnik highlighte the need of improving the qualifications of specialists of the industry, including an education system that will ensure the stability and reliability of production [19]. O. Varchenko and V. Radko emphasize a system of quality management and product safety should be established [23].

**The purpose of the article** is to identify the comparative advantages of the dairy industry of Ukraine and identify prospects for its further development, considering the environmental aspect of the issue.

**Research results.** As it is known, the dairy industry includes enterprises for the production of butter, whole milk products, canned milk, milk powder, cheese, brynza cheese, ice cream, casein and other dairy products [9].

According to FAO, the largest dairy producer in the world today is India, followed by the United States, Brazil, Pakistan and China [16].

To review the dynamics of world prices for dairy products, we use the food price index, which is calculated by the Food and Agriculture Organization of the United Nations (Fig. 1). The index consists of 5 sub-indices – dairy products, vegetable oils, cereals, meat and sugar, issues with recalculation are updated monthly.

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**Fig. 1. Index of food and dairy products prices (2010-2020) [6]**

According to the Food and Agriculture Organization, milk prices have fluctuated somewhat over the past decade. 2015-2016 were exceptional as a result of the global crisis, after which demand began to recover. Even in the special year 2020, this product remained one of the main products on world markets, despite the fact that milk prices are consistently high. This situation is explained by stable demand, as milk is one of the main products used in various sectors of the food industry, and its indispensability in human nutrition.

To verify the assertion of a consistently high world demand we consider the dynamics of dairy exports to the largest regions (Europe, Asia, Africa and America) (Fig. 2).

From this graph we can see that dairy exports are growing except in Africa. Production and exports to European countries are projected to be high. The African market is focused primarily on meeting their own demand, and the American market is developing less dynamically due to imports of cheaper dairy products from Asia. It can be assumed that the center of production and, as a result, the export center will soon move to Asia, because European countries are actively concerned with environmental issues. And the dairy industry is polluting the environment [5], which is why Europe is likely to start reducing its own production in the near future and, as a result, will be forced to import dairy products.

In Ukraine, the actual milk production is much lower than the required consumption, which affects the quality of food. The increase in milk production is constrained by the low profitability and the fact that the majority of the population of Ukraine cannot buy the required amount of dairy products due to its high cost.
Meanwhile, according to the State Statistics Service, in Ukraine since 2016, exports of dairy products are constantly growing (Fig. 3), while livestock is declining. Cheese production remains virtually unchanged due to low profitability. The growth of dairy exports can be explained by the fact that Ukrainian producers have followed the path of intensifying production. First of all, genetic engineering is used, although the quality of feed also contributes to the quantitative increase in milk yield.

Despite the fact that Ukraine has chosen crop production as its main specialization, animal husbandry in our country is focused primarily on dairy cattle. In our opinion, this is due to tough competition with European meat products (including Polish). Cheese production is mostly focused on covering domestic demand, which is currently being met, including due to imports [20]. The signed free trade agreement with the EU has made the Ukrainian cheese market unprotected, but the positive point is the abolition of duties on some cheese [4]. In monetary amount, according to the OEC, in 2018 Ukraine exported cheese worth 25.8 million US dollars. The largest consumers of Ukrainian cheese were Kazakhstan, Moldova, Egypt, Kyrgyzstan [18].

We consider it necessary to note that according to 2018, cheese exports increased compared to 2017, but the analysis of a longer period of time shows a sharp decrease in cheese exports – almost 10 times (Fig. 4). This situation is explained, first of all, by the devaluation of the Ukrainian currency against the dollar in 2014 and the contraction of markets after the severance of relations with Russia.
To identify the comparative advantages of Ukraine in the dairy industry in the main regional markets of the world, the Balassa index was calculated (Table 1).

**Table 1**

| Year | Region/Balass index | Africa | Europe | America | Asia | World |
|------|----------------------|--------|--------|---------|------|-------|
| 2013 |                      | 2,481512142 | 0,490953705 | 1,453909061 | 4,1908872 | 0,297066829 |
| 2014 |                      | 4,460172872 | 0,845738682 | 2,509126949 | 7,609781844 | 0,516379642 |
| 2015 |                      | 3,26251484  | 0,89781076  | 7,005995605 | 3,134889717 | 1,826567094 |
| 2016 |                      | 2,760146663 | 0,669576435 | 2,403983717 | 5,302170635 | 0,406444708 |
| 2017 |                      | 3,478983763 | 0,709932982 | 2,673024161 | 6,144826087 | 0,447853994 |
| 2018 |                      | 2,575084229 | 0,474277472 | 1,749675857 | 4,005512614 | 0,967924987 |
| 2019 |                      | 1,836931559 | 0,384874468 | 1,355208934 | 2,924930603 | 0,236831128 |

Developed by the authors based on materials: [1, 2, 9, 14, 16, 21]

As we can see, the Ukrainian dairy industry has relative comparative advantages on world markets. We have the greatest advantages over Asian countries, which is due primarily to the radically different specialization of Asian countries. In general, Ukraine is able to compete in most regional markets, except for the European one. After all, it is Europe that remains the world’s “hegemon” in dairy exports.

From the dynamic built on the basis of the received calculations (table 1) it is clear that Ukraine loses competitive advantages in export of dairy products. In our opinion, the situation can be improved by intensification through the renewal of the main dairy breeds in Ukraine to
more modern and productive ones, and as a result the production volumes will be increased.

As mentioned above, in recent years, the livestock that provides raw materials to the dairy industry of Ukraine is constantly declining (Fig. 6).

This trend shows that the livestock is declining every year, with the percentage of cattle suffering the most, and the number of sheep and goats is also declining, but at a slow pace. Periods of reduction in the number of sheep and goats were replaced by periods of recovery. For example, between 2007 and 2011, the population increased by 200,000, and during 2011-2014 it remained at the same level. The recession in 2015-2020 is not critical, but due to the crisis related to the spread of coronavirus disease, rising feed prices and lack of government support for the industry, recovery in the coming years is questionable.

The reduction in livestock has directly affected the Ukrainian dairy market. In order to check its influence we can compare the dynamics of prices for dairy products (Fig. 7) with production volumes (Fig. 8). It is true that such an analysis does not consider inflation, but the correlation between the two will help to understand how much the reduction in livestock affects the selling prices of enterprises.

We propose to conduct a correlation analysis to track the relationship between market prices and production volumes. The correlation coefficient is calculated by this formula:

$$ r = \frac{1}{n} \sum (x-\bar{x})(y-\bar{y}) \sigma_x \sigma_y $$

where:
- $r$ – correlation coefficient;
- $n$ – number of periods (years);
- $\sum |x-\bar{x}| |y-\bar{y}|$ – the sum of the central deviations;
- $\sigma_x, \sigma_y$ – standard deviations.
The average price of milk sold by enterprises, UAH / ton [2]

Developed by the authors based on materials: [2].

\[
\sigma_x = \sqrt{\frac{\sum(x_i - \bar{x})^2}{10}} = 589,0832591
\]

\[
\sigma_y = \sqrt{\frac{\sum(y_i - \bar{y})^2}{10}} = 2015,090871
\]

\[
\rho = \frac{1}{\sigma_x \sigma_y} \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{10} = -0.953485862
\]

After conducting a correlation analysis, we found that the price depends entirely on the volume of production, although it could be assumed that a decrease in volume would increase both the quality and, consequently, the price. However, a negative, very high (-95.4%) correlation coefficient was obtained. This means that the increase in the price of dairy products is directly related to the reduction in the number of livestock, and, as a consequence, the reduction in milk production [22, 23]. Therefore, the intensification of production and increase in the number of livestock will reduce the price and, as a consequence, increase the competitiveness of Ukrainian dairy products on world markets.

However, the environmental aspect of the issue needs to be considered, as the dairy industry may become an accelerator of global warming. There is evidence that 1 cow emits about 4 liters of methane per day, so we can assume that the dairy industry in Ukraine in 2020 produced about 110 billion liters of methane. Although more cars with carbon dioxide emissions are now blamed for warming, methane is 20 times more dangerous [5].

Increasing labor intensity in the field of animal husbandry will also help to increase competitiveness. To do this, we compare the dynamics of labor productivity in crop production and animal husbandry and understand how viable and competitive animal husbandry is.
This infographic shows that if earlier animal husbandry was more productive, then from 2018 the situation has changed. These indicators could be affected by rising grain prices in foreign markets and, as a consequence, rising prices for animal feed. The methodology of calculation of the State Statistics Service has also changed, because in 2016-17 the base year was 2010, and accordingly in 2018-19 - 2015.

The competitiveness of the national economy as a whole is affected not only by the quality of technology, demand for products in foreign and domestic markets, macroeconomic climate, but also effective government policy to support this industry. Legal regulation, government incentives, which are used in conjunction with the policy of “reasonable protectionism” facilitate the situation of the industry both within the country and ensure competitiveness when entering the foreign market. Thus, state support is declared in Article 16 of the Law of Ukraine “On Milk and Dairy Products” of 2004. In particular, this law provides for the support of selection work, as well as the provision of soft loans, grants and more. However, since 2010, the nature of subsidy policy has changed, which has directly affected the profitability of production.

**Conclusions.**

After conducting this study, it was found that the Ukrainian dairy industry is able to compete in world commodity markets. Global demand for these products is projected to grow, which is why the focus on dairy products in domestic production and exports will allow Ukraine to increase competitiveness.

Prospects for the development of the industry we propose to increase exports to partner countries (Kazakhstan, Moldova, Kyrgyzstan, the Middle East), as Ukraine is able to compete in most regional markets, except Europe.

However, in the future the situation may change radically due to the environmental component of milk and dairy production. Therefore, Europe may begin to reduce its own production and will be forced to import dairy products.

Given the overall reduction in the capacity of the dairy industry in Ukraine, producers need to choose the path of the most effective development through the intensification of production and the introduction of new technologies. As Ukraine, like most European countries, strives for climate neutrality, the production of environmentally friendly products is the most important area.

As an alternative, we can offer the development of eco-farms – small farms with a well-established material and technical base, which would not pollute the environment. The main buyers of such products could be including EU countries. However, the selling price of dairy products may be too high for the domestic buyer.

**Конкурентоспроможність продукції молочної промисловості України: сучасний стан та перспективи розвитку**

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В статті розглянуто сучасний стан, тенденції та проблеми розвитку молочної промисловості України в сучасних умовах. Предметом дослідження в статті є конкурентоспроможність української молочної продукції на глобальних ринках. Мета полягає у виявленні порівняльних переваг молочної промисловості України та визначення перспектив для її подальшого розвитку. Завдання: дослідити сучасний стан і динаміку виробництва, світових цін, попиту, експорту молочної продукції в Україні та світі, визначити порівняльні переваги України в молочній галузі на основі розрахунку індексу Балласа, розглянути екологічну сторону розвитку галузі. У статті використовуються загальнонаукові методи: системний аналіз – для визначення конкурентоспроможності молочної продукції України; історичний метод – для відстеження тенденцій світового та українського ринку молочної продукції; кореляційний аналіз – для визначення взаємозв’язку цін на внутрішньому ринку, статистичний метод – для відображення кількісних показників та ін. Отримані такі результати: на основі проведенного дослідження виявлені тенденції зниження обсягів виробництва та експорту молочної продукції, визначено порівняльні переваги молочної галузі України на більшості регіональних ринків світу крім європейського та запропоновано шляхи подальшого розвитку галузі відповідно до сучасних викликів в глобалізованому світі. Висновки: українська молочна галузь здатна конкурувати на світових товарних ринках, перспективними напрямами розширення експорту може стати Казахстан, Молдова, Киргизстан, країни Балкського Подніжчя. З огляду на загальне скорочення потужностей молочної галузі в Україні виробникам пропонується сконцентруватись на інтensiфікації виробництва і впровадження новітніх технологій, враховуючи екологічну складову.

**Ключові слова:** молочна промисловість, експорт, конкурентоспроможність, виробництво молока, молочна галузь, порівняльні переваги, екологія.

**КОНКУРЕНТОСПОСОБНОСТЬ ПРОДУКЦІЇ МОЛОЧНОЇ ПРОМІЩЕННОСТІ УКРАЇНИ: СОВРЕМЕННОЕ СОСТОЯНИЕ И ПЕРСПЕКТИВЫ РАЗВИТИЯ**

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В статье рассматривается современное состояние, тенденции и проблемы развития молочной отрасли Украины в современных условиях. Предметом исследования в статье является конкурентоспособность украинской молочной продукции на мировых рынках. Цель состоит в выявлении сравнительных преимуществ молочной промышленности Украины и определении перспектив для ее дальнейшего развития. Задача: исследовать современное состояние и динамику производства, мировых цен, спроса, экспорта молочной продукции в Украине и мире, определить сравнительные преимущества Украины в молочной отрасли на основе расчета индекса Балласа, рассмотреть экологическую сторону развития отрасли. В статье используются общенаучные методы: системный анализ - для определения конкурентоспособности молочной промышленности Украины; исторический метод - для отслеживания тенденций мирового и украинского рынка молочной продукции; корреляционный анализ - для определения взаимосвязи цен на внутреннем рынке, статистический метод - для отражения количественных показателей и др. Были получены следующие результаты: на основе проведенного исследования выявлены снижения объемов производства и экспорта молочной продукции, выявлены сравнительные преимущества молочной отрасли Украины на большинстве региональных рынков мира кроме европейского и предложены пути дальнейшего развития отрасли в соответствии с современными вызовами в глобализированном мире. Выводы: украинская молочная отрасль способна конкурировать на мировых товарных рынках, перспективными направлениями расширения экспорта может стать Казахстан, Молдова, Кыргызстан, страны Балкского Востока. Учитывая общее сокращение мощностей молочной отрасли в Украине, производителям предлагается сконцентрироваться на интенсификации производства и внедрении новых технологий, учитывая экологическую составляющую.

**Ключевые слова:** молочная промышленность, экспорт, конкурентоспособность, производство молока, молочная отрасль, сравнительные преимущества, экология.

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