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The functioning of the dairy product market in Ukraine

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Abstract. Dairy products remain an important part of the Ukrainian population's diet, but the industry faces a number of problems, including negative trends related to declining milk production, a shortage of high-quality raw materials, growing imports, low consumer purchasing power, logistical difficulties and the impact of the war. This requires new approaches to the development of the industry and an in-depth analysis of the dairy market. The aim of the article was to analyse the functioning of the milk and dairy market, identify its problems and propose measures for the successful development of the dairy industry. The following methods were used in the research: abstract-logical, statistical and tabular with the aim of collecting, processing and analysing information on milk production, milk supply to processing enterprises, the quality of raw milk, and the export and import of dairy products during 2017-2024; graphical analysis was used to analyse the export and import of dairy products, to rank regions by milk production in 2024, and to study the raw milk price index; correlation and regression analysis was used to study the dependence of drinking milk and butter consumption in 2023 on per capita production volumes. The results of the study showed that the supply of raw milk on the market did not correspond to the capacity utilisation of milk processing enterprises, as a result of which the volume of dairy products was below the norm of its consumption. The structure and share of Ukrainian dairy exports to countries around the world were outlined. The dependence of drinking milk and butter consumption on raw milk production was studied. The practical significance lies in the fact that research into the functioning of the dairy market can serve as a guide when making decisions on how to increase milk production and processing, increase the consumption of dairy products, and grow the export volumes of the dairy industry

Keywords: production; quality; price index; export; import

INTRODUCTION

Inadequate and unbalanced nutrition is a pressing issue that has a significant impact on human health and physiological development. A balanced diet is possible by including animal products in the diet, namely eggs, meat and dairy products. A diet rich in dairy products and other animal products, as a source of essential amino

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acids, vitamins and minerals, helps prevent deficiencies in essential nutrients. Dairy products are recognised as an important source of high-quality protein. Consumers are conscious about their diet and health, which is reflected in their consumption of dairy products. They try to consume organic and natural products, which leads to an increase in the range and improvement in the quality of dairy products. Therefore, the development of the dairy industry and the provision of dairy products to the population are of great importance.

Researcher O. Popko (2020) noted in his works that the use of the Brown method makes it possible to predict the dynamics of milk production and the growth in milk yields. In analysing the milk market, the author used the SWOT analysis method. Similar research was conducted by scientists M. Rakhman & D. Gryzlo (2021), who, after conducting their research on the milk market, concluded that based on the use of SWOT and PEST analysis methods, proposals can be made to improve the state of the milk and dairy products market. In their opinion, a combination of state support measures, entrepreneurial efforts, international experience and the use of resource-saving technologies will contribute to maintaining the country's food security and provide the population with high-quality dairy products, reducing imports.

According to researchers L. Ivashyna *et al*. (2024), the formation of the range of dairy products in Ukraine is influenced by consumer demand, competition, state policy, pricing policy, demographic and social trends. In their work, authors M. Talavyria *et al*. (2024) concluded that the main factors influencing the consumption of milk and dairy products are the price level of finished products, income level, and population size. The authors also found that the main factors affecting the supply of milk on the market are the purchase price of raw milk and cow productivity. Their research showed that with an increase in the number of cows, there is no increase in raw milk production, which is evidenced by the use of advanced technologies, the high productive genetic potential of cows, and investments in the dairy industry.

Researchers Yu. Danko & D. Zhivytsky (2024) noted that one of the promising ways to overcome the problems of dairy farming is the creation and development of dairy clusters. These clusters bring together milk producers, processing enterprises, suppliers, scientific institutions, and other organisations involved in the industry. This cluster approach contributes to achieving synergistic effects, increasing productivity and production efficiency, introducing innovations, diversifying activities, and strengthening the competitive position of market participants. The works of P. Borawski *et al*. (2020) examined the impact of global crises on milk production and analysed trends in the European dairy market. The authors M. Mysyuk *et al*. (2020) analysed the main trends in the Ukrainian milk market in relation to ensuring food security in Ukraine. Researchers L. Ivashyna *et al*. (2024) believed that the development of the milk and dairy products market can be improved by creating an effective legislative framework for milk processing enterprises; ending the slowdown in dairy production; ensuring conditions for healthy competition and protecting consumers from poor-quality products; finding ways to increase sales volumes in the domestic and foreign markets for dairy products; and forming an effective mechanism for monitoring the implementation and enforcement of a programme to improve labour efficiency in the milk and dairy products market. In their work, researchers L. Donets *et al*. (2024) noted that the situation on the milk market can be balanced by creating favourable conditions for transformation into dairy cooperatives and proposing a set of measures that include economic, legal and state support.

Authors L. Tulush *et al*. (2023) noted the need for a rational combination of market self-regulation mechanisms with instruments of state intervention in the development of the dairy sector as an important component of the agricultural market. The authors V. Ivchenko *et al*. (2024) pointed out in their work that overcoming the challenges and risks of the Ukrainian dairy market requires not only state but also international support. In turn, business development must respond to new realities, plans must be developed to increase milk production and strengthen export positions in the global market, logistics must be improved, and risks must be managed effectively. The aim of the study was to identify ways to halt the decline in milk production, improve milk quality in line with European requirements, and increase export of dairy products, which will improve the financial situation of producers and increase state support for enterprises in the dairy industry.

MATERIALS AND METHODS

The study used statistical information for the period 2015-2024, with the main sources of information being the section Livestock in Ukraine (2024) and the statistical yearbook Balances and consumption of main food products by the population of Ukraine (2024), which contains information on milk production, consumption of basic food products and the balance of dairy products. Information on the raw milk price index (milk sales prices by enterprises) and consumer prices for dairy products (cumulative indices) for the period January 2022 – December 2024 was based on data on the quantity and value of milk sales collected as part of the state

statistical observation Sales of agricultural products by enterprises and households (2024).

The theoretical basis of the study was the scientific works of Ukrainian and foreign scientists. The studies by P. Borawski *et al*. (2020), M. Rakhman & D. Gryzlo (2021), L. Donets *et al*. (2024) were analysed, which described the main research on the milk and dairy products market. The study used the dairy product consumption standards recommended by the WHO through its representative offices in Ukraine (Ministry of Health of Ukraine, n.d.). Material from the national programme for the development of dairy cattle breeding and processing enterprises in Ukraine until 2030 (AgroPolit, 2020) was also used. The object of the study was economic entities specialising in the production of dairy products – agricultural enterprises and private farms.

The general scientific research methods included the following: the analysis method, which was used to construct the research algorithm; the comparison method, which was used to compare the indicators of the dairy industry's development; and the abstract-logical method, which was used to form development prospects and conclusions. Correlation and regression analysis was used to construct and analyse the economic-mathematical model of the dependence of drinking milk and butter consumption on milk production per capita in the form of a regression equation for drinking milk y = 10.718x0.2554 and butter y = 0.5145e0.0001x, which provides an assessment of the strength of the relationship. Thus, for drinking milk, the reliability of the approximation is $R^2 = 0.653$, and for butter, $R^2 = 0.8063$, which indicates a high degree of correspondence between the results obtained.

Per capita consumption of dairy products was calculated using the formula:

$$C = \frac{CF}{P}, \quad (1)$$

where *C* – per capita consumption of dairy products, kg; *CF* – consumption fund, kg; *P* – population, persons.

The methodology for calculating raw milk price indices and consumer prices for dairy products included calculations of average selling price indices for raw milk and dairy products, as well as average price indices for purchased raw milk and dairy products. The determination of these indices was important for assessing the state and trends of the dairy industry, developing macroeconomic policy taking into account the interests of the agricultural sector, and making international comparisons. The indices of raw milk prices and consumer prices for dairy products were determined as the ratio of the average sales prices for the reporting month of the current year to the average annual sales prices for the corresponding types of products for the base period (year) ($I_{i/i-1}$) according to the formula:

$$I_{i/i-1} = \frac{P_i}{P_{i-1}} \times 100\%, \quad (2)$$

where P_i – the average selling price of raw milk and consumer prices for dairy products in the reporting month (*i*) of the current year (T); P_{i-1} – the average selling price of raw milk and consumer prices for dairy products in the base period (year) (*i-1*).

The study was conducted using the econometric method of data testing in Excel to identify the closeness of relationships that affect the indicators of the dairy industry's development. Tabular and graphical methods were used to improve the analytical perception of statistical information and to form conclusions regarding milk production, the supply of raw milk for processing, the export and import of dairy products, and the formation of supply and sales prices for milk. The sample for the study was formed using data from 24 regions of Ukraine, excluding statistical information from the temporarily occupied territory of the Autonomous Republic of Crimea, the city of Sevastopol, and part of the temporarily occupied territories in the Donetsk and Luhansk regions.

RESULTS

The main task of dairy farming is to provide the population with high-quality dairy products. The biggest problem in this industry is the production of high-quality raw milk. Therefore, milk producers must focus on establishing high-yield and technologically advanced dairy farms. According to the State Statistics Service, the total volume of milk production in Ukraine in 2024 was 7.2 million tonnes, in 2020 it was 9.3 million, and in 2015 it was 10.6 million (Table 1). According to official Ukrainian statistics (Livestock in Ukraine, n.d.), total milk production during 2015-2024 decreased in all categories of farms by 32.1% – from 10.6 million tonnes to 7.2 million tonnes, or 1.5 times, and by 2.9% compared to 2023. The decrease in milk production is mainly due to a reduction in production by private households. In 2024, private households produced 4.261 million tonnes of milk, which is 46.3% less than in 2015, or 7.8% less than in 2023. Agricultural enterprises saw a slight increase of 10.3% between 2015 and 2024, or 5.1% compared to 2023. Comparing the war year of 2022 with the pre-war year of 2021, milk production decreased by 10.9% in all categories of farms, including agricultural enterprises by 5.4% and private farms by 13.4% (Pashchenko, 2024). Comparing 2024 with 2021, the pre-war period, shows (Table 1) that milk production in enterprises increased by 6.6%, while in private

households it decreased by 28.3%. During 2022-2024, i.e. the period of military operations, milk production in enterprises increased by 12.7%, while in private households it decreased by 17.2%. Despite the military operations on the territory of Ukraine, milk production in Ukraine as a whole shows signs of stabilisation. In 2022, according to official data from the State Statistics Service (Livestock in Ukraine, n.d.), 66.2% of milk was produced by private households and 33.8% by agricultural enterprises, while in 2024 the figures were 59.1% and 40.9% respectively. In 2024, two-quarters (40.9%) of the volume of milk produced was provided by enterprises, in 2022, one-third (33.8%), while in 2015, they produced one-quarter (25%).

Table 1. *Milk production in Ukraine during 2015-2024*

Indicator	Year								2024 as a % of	
	2015	2016	2019	2020	2021	2022	2023	2024	2015	2023
Milk production in all categories of farms:										
thousand tonnes	10,615	10,064	9,663	9,264	8,714	7,768	7,430	7,213	67.9	97.1
%	100	100	100	100	100	100	100	100	-	-
including:										
agricultural enterprises:										
thousand tonnes	2,669	2,756	2,729	2,761	2,768	2,621	2,810	2,952	110.6	105.1
%	25.1	27.4	28.2	29.8	31.8	33.8	37.8	40.9	-	-
household farms:										
thousand tonnes	7,946	7,309	6,935	6,502	5,946	5,147	4,621	4,261	53.6	92.2
%	74.9	72.6	71.8	70.2	68.2	66.2	62.2	59.1	-	-
Milk production per capita, kg	247.8	238.1	229.9	221.9	210.6	222	224	216	87.2	96.6

Note: *'-' indicates missing values for the indicator*
Source: *calculated by the authors based on Livestock in Ukraine (n.d.)*

Gradually, milk production in Ukraine is shifting towards production by enterprises. This is due to increased requirements for the technical level of production, safety and quality of milk. Agricultural enterprises are able to supply high-quality raw milk by improving the technological conditions of milk production, namely by mechanised milking, proper cleaning and cooling of milk, and they are also able to attract investment in the production, processing and sale of milk. Private farms are unable to ensure the proper level of technological processes for its production. During 2015-2021, Ukraine saw a concentration of dairy farms, as it is economically advantageous for enterprises to keep a larger number of cows. With this in mind, the number of specialised dairy farms and the number of cows kept by them increased in Ukraine (Ivchenko *et al.*, 2024). In other words, the consolidation of private farms into cooperatives provides greater opportunities for the restoration and maintenance of cows, improves the quality of raw milk, and increases the prices of milk and dairy products. In EU countries, farms do not sell milk from a single cow. For example, family farms in Poland keep 25-50 cows, and in Scandinavian countries, 50-100 cows (Ivashyna *et al.*, 2024). This contributes to the mechanisation of the process of keeping and milking cows and obtaining high-quality raw milk. The slow growth of milk production in enterprises cannot fully compensate for the decline in milk production in private households, and reaching the 3 million tonne mark would be a significant achievement for enterprises (Korman *et al.*, 2022). However, the further development of the dairy industry depends on government decisions, namely the tax burden, government support for livestock farming, milk production and processing. Ukraine has a problem with the competitiveness of raw milk, which needs to be addressed as it affects Ukraine's integration into global markets. It is also necessary to analyse regional milk production. Prior to Russia's full-scale invasion in 2015-2021, Ukraine saw a regional decline in milk production of 1,901 thousand tonnes, with growth observed only in the Khmelnytskyi region (73 thousand tonnes) and the Ternopil region (by 2 thousand tonnes) (Table 2).

Table 2. *Dynamics of milk production in 2015-2024 by region of Ukraine, thousand tonnes*

Regions	Year											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2024 to 2015, %	2024 to 2023, %
Ukraine	10,615	10,382	10,281	10,064	9,663	9,264	8,714	7,768	7,430	7,213	67.9	97.1
regions												
Vinnytsia	838	854	851	825	763	730	686	631	596	577	68.8	96.7
Volyn	425	412	412	391	369	354	338	324	291	279	65.7	95.9

Table 2, Continued

Regions	Year											
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2024 to 2015, %	2024 to 2023, %
Dnipropetrovsk	345	320	301	294	285	276	246	229	216	204	59.2	94.4
Donetsk	228	193	190	186	174	156	144	62	26	27	11.7	102.3
Zhytomyr	578	567	548	553	518	506	488	464	424	411	71.1	96.9
Zakarpattia	358	320	325	346	350	337	313	298	284	266	74.2	93.7
Zaporizhzhia	261	260	261	244	220	202	181	106	16	17	6.7	108.8
Ivano-Frankivsk	474	467	464	442	429	411	393	370	341	305	64.3	89.3
Kyiv	446	438	436	433	396	384	368	321	329	331	74.2	100.5
Kirovohrad	311	308	306	308	300	272	269	273	270	261	84.0	96.7
Luhansk	159	124	125	127	114	111	102	73	58	49	30.6	83.2
Lviv	571	543	528	507	481	460	425	388	323	285	49.9	88.3
Mykolaiv	344	342	342	325	299	279	246	197	190	201	58.4	105.7
Odesa	385	363	349	335	321	310	291	287	286	280	72.6	97.9
Poltava	795	797	792	762	759	734	691	663	660	668	84.0	101.1
Rivne	437	437	433	397	358	337	283	274	289	283	64.7	97.7
Sumy	418	415	416	411	396	386	355	293	278	257	61.5	92.3
Ternopil	461	454	451	450	455	468	463	494	505	513	111.3	101.6
Kharkiv	525	530	523	527	519	470	428	212	214	208	39.5	96.9
Kherson	300	296	293	284	283	266	238	65	70	60	19.9	85.6
Khmelnytskyi	581	590	597	624	636	652	654	673	679	656	112.8	96.5
Cherkasy	530	519	508	484	467	461	436	442	455	465	87.8	102.3
Chernivtsi	294	287	282	273	260	248	236	227	218	207	70.5	95.3
Chernihiv	553	550	549	537	511	457	442	402	410	404	73.1	98.6

Source: *calculated by the authors based on Livestock in Ukraine (n.d.)*

Table 2 shows that due to the war, Ukraine's dairy industry reduced its raw milk production by 1.5 million tonnes between 2021 and 2024. A significant decrease in production during 2021-2024 was observed in Donetsk (5.3 times), Zaporizhzhia (10.6 times), Kherson (4 times), and Luhansk (2.1 times), while in other regions the decrease averaged 10-35%. However, growth was also observed in Khmelnytskyi region by 0.3%, Cherkasy region by 6.7% and Ternopil region by 10.8%. A study of the ranking of regions by milk production in 2021 and 2024 showed that the leading positions in milk production are held by Poltava (691 and 668 thousand tonnes), Khmelnytskyi (654 and 656 thousand tonnes) and Vinnytsia (686 and 577 thousand tonnes) regions (Fig. 1a) and b)).

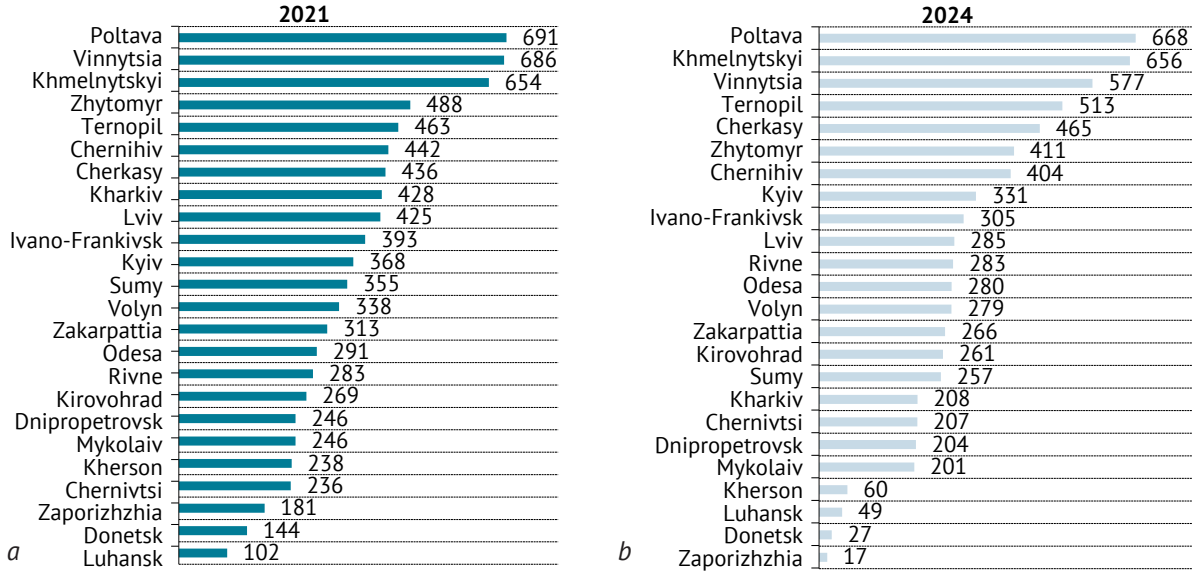


Figure 1. *Ranking of regions by milk production, thousand tonnes*

Source: *calculated by the authors based on Livestock in Ukraine (n.d.)*

Among the regions of the country, the largest volumes of milk in 2024 were produced by dairy farms in the Poltava (8.5% of the total volume in Ukraine), Khmelnytskyi (8.7% of the total volume in Ukraine), Poltava (8.5% of the total volume in Ukraine) and Vinnytsia (8.1% of the total volume in Ukraine) regions (Fig. 1b). The lowest positions in milk production in pre-war 2021 were held by Zaporizhzhia (181 thousand tonnes), Donetsk (144 thousand tonnes) and Luhansk (102 thousand tonnes) (Fig. 1a). During the war in 2024, the positions changed: Kherson (60 thousand tonnes), Luhansk (49 thousand tonnes), Donetsk (27 thousand tonnes), Zaporizhzhia (17 thousand tonnes).

It is important to provide milk processing enterprises with milk raw materials. After all, high-quality milk raw materials will contribute to the production of high-quality dairy products, which will ensure their existence, stable operation and improve the financial situation of enterprises in the dairy industry. According to the State Statistics Service, in 2024 (Livestock in Ukraine, n.d.), processing enterprises in Ukraine received 3,223 thousand tonnes of milk from agricultural enterprises and private households, which is only 43.39% of the total volume of milk produced in Ukraine (Table 3). The largest amount was purchased from agricultural enterprises, 2,887 thousand tonnes (in 2024), i.e. 327 thousand tonnes more in 2024 than in 2023, 582 thousand tonnes more in 2024 than in 2022, 173 thousand tonnes less in 2022 compared to 2021. In private households, 243 thousand tonnes (in 2024), which is 73 thousand tonnes less than in 2023, 110 thousand tonnes less in 2024 than in 2022, and 201 thousand tonnes less in 2022 than in 2021.

Table 3. *Milk deliveries to processing enterprises in Ukraine during 2015-2024, thousand tonnes*

	Year									
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Milk and dairy products – total	4,251	4,183	4,348	4,179	3,800	3,512	3,198	2,740	2,918	3,223
Purchased	4,090	3,710	3,928	3,809	3,462	3,289	3,032	2,657	2,875	3,130
including from:										
agricultural enterprises	2,413	2,512	2,689	2,720	2,610	2,556	2,478	2,305	2,560	2,887
%	59	67.7	68.4	71.4	75.4	77.7	81.7	86.7	89.0	92.2
private households	1,346	1,198	1,239	1,089	851	733	554	353	316	243
%	32.9	32.3	31.6	28.6	24.6	22.3	18.3	13.3	11.0	7.8
Accepted on a tolling basis	138	441	396	346	318	203	148	74.8	37.0	86.3
Received for processing milk produced by processing enterprises	23.6	32.1	24.6	25	20.4	20.1	17.8	7.8	6.0	6.2
Average purchase price, UAH per tonne										
Milk and dairy products – total										
Purchased	3,771	4,713	6,388	6,635	7,332	7,899	9,385	10,219	11,693	15,015
including from:										
agricultural enterprises	4,216	5,277	7,059	7,386	7,958	8,565	9,936	10,678	12,181	15,520
households	2,841	3,530	4,933	4,758	5,412	5,574	6,921	7,220	7,733	9,029

Source: *calculated by the authors based on Sales of agricultural products by enterprises and households (n.d.)*

In 2024, only 34.68% of milk produced in Ukraine was sent to processing enterprises, including 92.2% of raw milk produced by agricultural enterprises and 7.8% of raw milk produced by private households (Table 3). In European countries, almost 96% of milk is processed into dairy products. The share of raw milk supplies from private households decreased from 32.9% to 7.8% during 2015-2024, while from agricultural enterprises, on the contrary, it increased from 59% to 92.2%, and during 2021-2024, respectively, from 18.3% to 7.8% and from 81.7% to 92.2%. According to forecasts, milk production in private households will continue to decline until 2027-2030, and subsequently such milk will be used only for personal consumption (State and prospects of the dairy..., 2025). On a tolling basis and produced by processing enterprises, production decreased by 1.6 and 3.8 times during the corresponding period, but their volumes are insignificant and this did not affect the supply of raw materials to milk processing enterprises.

Problems in the dairy market also include price fluctuations. During 2020-2024, the purchase price of milk from agricultural enterprises and private households increased by 1.5 times, but this did not change the situation with the shortage of raw milk, i.e. the increase in the selling price of milk did not lead to an increase in its production volumes. In 2024, the purchase prices of milk from agricultural enterprises exceeded the purchase prices of private households by 71.89% (Table 3). This is due to the increase in the cost of dairy products and a decrease in their supply on the market, which is why the price of raw milk rose from 9,385 UAH/t in 2021 to 15,520 UAH/t in 2024 (Table 3). In 2015 and 2024, the purchase prices of

raw milk from private households were 1.48 and 1.72 times lower than the purchase prices from agricultural enterprises, which is associated with the low quality of raw milk. As a result, low profits for farmers, which does not encourage them to expand production, so they use most of the milk for their own needs and sell a small portion of it on informal markets. Under conditions of expanded production, commercial milk should be purchased from enterprises that have the capacity to cool and pasteurise it. After all, for the production of high-quality dairy products, it is more economically advantageous for processing enterprises to buy more expensive raw materials from enterprises than cheaper and lower quality raw materials from the population. Therefore, there is a shortage of raw milk suitable for processing enterprises on the domestic market, and demand exceeds supply. In 2021, under the influence of climate change and "green" laws, milk production in Europe began to decline, which alarmed processing enterprises, so they began to stimulate the restoration of its production (The price of milk in the EU..., 2022). The beginning of 2022 brought its own adjustments: Russia's war against Ukraine, sanctions against Russia, rising gas prices, market uncertainty and an increase in consumers forced European producers to raise the price of milk even further, resulting in a record high for the last 10 years in 2022, reaching EUR 58.3/100 kg in December (The price of milk in the EU..., 2022). The price increase does not compensate for the shortage of raw materials. The existing legislative framework is insufficient for the effective operation of the dairy industry. Therefore, there is a need for solidarity among all enterprises in the dairy industry in order to implement the National Programme for the Development of Dairy Farming and the Processing Industry for 2021-2030. The implementation of this programme will require UAH 90 billion over 10 years (UAH 9 billion per year, of which 50% will be state support), and an investment of EUR 750 million will be needed to increase production and processing. At the same time, it is necessary to increase milk production to 8 million tonnes per year, livestock numbers to 3 million head, milk processing volumes to 8 million tonnes, and dairy product consumption per capita to 250 kg, as well as to ensure the competitiveness of the dairy industry in export markets. State support for the dairy industry includes: state subsidies, use of the Agrarian Fund for financial and commodity interventions, state subsidies to stimulate exports of dairy products, state tender purchases of dairy products from producers, creation of a livestock support fund (25 head per 100 ha), the creation of an account for the accumulation of customs revenues from imports of dairy products, and exemption from VAT on imported equipment for the dairy industry (AgroPolit, 2020).

During 2015-2024, enterprises increased milk production from 2,669 to 2,952 thousand tonnes, but processing enterprises experienced a shortage as the volume of milk production by private farms decreased from 7,946 thousand tonnes in 2015 to 4,261 thousand tonnes in 2024. The reason for this is Order of the Ministry of Agrarian Policy and Food of Ukraine No. 118 (2019), the provisions of which are mandatory for all categories of farms. On 14 August 2024, the Ministry of Justice of Ukraine registered Order No. 2033 of the Ministry of Agrarian Policy and Food of Ukraine dated 11 July 2024 regarding amendments to the Requirements for the Safety and Quality of Milk and Dairy Products, which were approved by Order of the Ministry of Agrarian Policy and Food of Ukraine No. 118 dated 12 March 2019 (State Service of Ukraine on Food Safety and Consumer Protection, 2024a). Thus, the increase in requirements for raw milk has led to higher requirements for dairy products, so processors are interested in receiving high-quality raw materials for processing.

During 2015-2024, there has been an improvement in the quality of milk supplied for processing by agricultural enterprises, as they have the appropriate conditions for obtaining it and are able to purchase or breed cows with high genetic productivity. During the period 2015-2024, the share of "Extra" grade milk in the structure of output increased (from 10.3% to 54.5%, i.e. by 44.2%), but the share of higher grade milk decreased (from 35.2% to 32.6%, i.e. by 2.6%), first grade (from 49.6% to 17.1%, i.e. by 32.5%), and second grade (from 4.7% to 0.9%, i.e. by 3.8%) (Table 4). This is a positive development, as Ukrainian producers are seeking to enter European milk markets and their milk products must meet European quality standards. At the same time, during the period under review, private farms increased the volume of production of the highest grade (from 0.1% to 1%, i.e. by 0.9%), first grade (from 8.9% to 81.7%, i.e. by 72.8%), but second grade production decreased (from 86.2% to 17.2%, i.e. by 69%) (Livestock in Ukraine, n.d.).

Table 4. *Quality of milk supplied for industrial processing during 2015-2024, by grade*

Indicators	Year									
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	according to DSTU 3662:2018				according to DSTU 3662:2018					
Agricultural enterprises										
Volume of delivered milk, thous t	2,287	2,375	2,533	2,560	2,428	2,348	2,253	2,107	2,356	2,628
converted to basic fat content milk	2,413	2,512	2,688	2,720	2,610	2,556	2,478	2,305	2,560	2,886

Table 4, Continued

Indicators	Year									
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
including by grades:										
- extra	248	366	441	586	710	885	973	1,089	1,395	1,727
specific weight (share), %	10.3	14.6	16.4	21.6	27.2	34.6	39.3	47.2	59.9	54.5
- higher grade	850	923	987	1,036	938	874	875	750	703	730
specific weight (share), %	35.2	36.7	36.7	38.1	35.9	34.2	35.3	32.6	25.3	27.5
- Grade I	1,197	1,056	1,018	895	844	776	614	444	438	414
specific weight (share), %	49.6	42	37.9	32.9	32.3	30.4	24.8	19.3	14.3	17.1
- Grade II	113	160	235	194	97	16	16	21	24	12
specific weight (share), %	4.7	6.4	8.7	7.1	3.7	0.6	0.6	0.9	0.4	0.9
Non-grade	5	6	7	9	21	5	0.5	0.2	0	2
specific weight (share), %	0.2	0.3	0.3	0.3	0.8	0.2	0	0	0.1	0.0
Share in purchased milk, %										
- fat	3.59	3.6	3.6	3.6	3.66	3.7	3.74	3.72	3.69	3.73
- protein	3.05	3.06	3.06	3.1	3.13	3.16	3.19	3.2	3.24	3.24
Household farms										
Volume of delivered milk, thous t	1,312	1,161	1,200	1,054	822	708	531	337	304	233
converted to basic fat content milk	1,346	1,198	1,239	1,089	851	733	554	353	316	243
including by grades:										
Higher grade	1	0.6	1.6	2.3	0.8	1.6	0.7	13.7	3.2	0.1
specific weight (share), %	0.1	0.1	0.1	0.2	0.1	0.2	0.1	3.9	0.1	1.0
Grade I	119	108	110	136	102	586	436	272	258	195
specific weight (share), %	8.9	9	8.9	12.4	12	79.9	78.7	77.1	80.0	81.7
Grade II	1,163	1,028	1,081	904	708	135	108	67	54	48
specific weight (share), %	86.4	85.8	87.2	83	83.2	18.4	19.6	19	19.9	17.2
Non-grade	63	61	46	47	40	10.8	9.1	0.1	0	0
specific weight (share), %	4.7	5.1	3.7	4.3	4.8	1.5	1.6	0	0.0	0.1
Share in purchased milk, %									0.0	0.0
- fat	3.49	3.51	3.51	3.51	3.52	3.52	3.54	3.56	3.53	3.55
- protein	2.92	2.93	2.95	2.96	2.94	2.96	2.94	2.96	2.99	2.97

Source: *calculated by the authors based on Livestock in Ukraine (n.d.)*

In 2024, agricultural enterprises mainly supplied extra-grade milk (54.5%) and higher-grade milk (27.5%), while private households supplied grade I milk (87.1%) and did not produce any extra-grade milk at all. This was facilitated by the adoption of Law of Ukraine No. 2132-VI (2015), which provides for the promotion of high-quality milk production in Ukraine through additional payments of 25% for extra-grade milk and 20% for higher-grade milk. First grade milk is not subsidised at all (Order of the Ministry of Agrarian Policy and Food of Ukraine No. z1245-24, 2024). Thus, improving milk quality remains an important condition for the effective functioning and development of the dairy industry and increasing the competitiveness of its products, both on the domestic and foreign markets. Another feature of milk that affects the production of dairy products is its unsuitability for long-term storage and transportability over short distances. Therefore, the guarantee of milk supply to processing enterprises, which will help to provide the population with dairy products in the required quantities, is linked to the stability of sales channels and the coordinated activities of all components of the technological chain: "production-procurement-processing-sales".

The Ukrainian dairy market is competitive, which forces producers to constantly develop and expand their range of dairy products. In turn, competition among milk processors forces them to seek and apply new technologies and innovations in the production of dairy products, i.e., to modernise production, which results in the improvement of existing products and the emergence of new ones. Consumers are conscious about their health and consumption, which has affected the consumption of dairy products. The demand for organic and natural dairy products is increasing, prompting their producers to improve their range and offer new products. According to the State Statistics Committee of Ukraine (Statistical Yearbook of Ukraine, n.d.), during 2015-2022, the range of dairy products in Ukraine is diverse, but the volume of dairy production fluctuates, either increasing or decreasing. Thus, according to the consolidated nomenclature of 11 nomenclature items, 10 items reduced production volumes and only one item showed positive dynamics (Table 5).

Table 5. *Dynamics of production of main dairy products in Ukraine in 2015-2022, thousand tonnes*

Product names according to the industrial product nomenclature	Year							
	2015	2016	2017	2018	2019	2020	2021	2022
Milk and cream, non-condensed and without added sugar, fat content not exceeding 1%, in packages of more than 2 litres, thous t	461	467	464	443	435	434	335	312
Milk and cream, non-condensed and without added sugar, fat content exceeding 1% to 6%, in packages of no more than 2 litres, thous t	472	463	478	497	474	491	465	370
Milk and cream, non-concentrated and without added sugar, fat content over 21%, in packages of over 2 litres, thous t	51	53	48	49	51	46	45	77
Skimmed milk powder (milk and cream in dry matter, fat content not exceeding 1.5%), in packages of over 2.5 kg, thous t	51	49	48	38	35	36	30	34
Butter with a fat content of no more than 85%, thous t	101	102	108	105	92	86	73	68
Fresh cheese, thous t	68	70	68	73	64	79	84	59
Grated, powdered and other unmelted cheese, thous t	97	87	94	97	86	82	77	60
Processed cheese, thous t	27	26	27	29	30	31	28	22
Sweetened condensed milk and cream, thous t	52	44	43	35	35	37	34	30
Curdled milk and cream, yoghurt, kefir, sour cream, and other fermented products, thous t	297	293	272	275	280	309	300	228
Flavoured liquid yoghurt and fermented milk, thous t	106	112	116	126	136	139	141	103

Note: *due to the lack of statistical information for 2023-2024, the analysed period is limited to 2015-2022*
Source: *calculated by the authors based on Statistical Yearbook of Ukraine (n.d.)*

As shown in Table 5, between 2015 and 2022, the production of milk and cream without added sugar increased by 26 thousand tonnes. At the same time, the production of fresh cheese decreased by 9 thousand tonnes, processed cheese by 5 thousand tonnes, milk and cream without added sugar (no more than 1%) by 149 thousand tonnes, milk and cream without added sugar (no more than 1-6%) by 102 thousand tonnes, dry milk by 17 thousand tonnes, butter by 33 thousand tonnes, condensed milk and cream – 22 thousand tonnes, coagulated milk and cream, yoghurt, kefir, sour cream, etc. – 69 thousand tonnes, liquid yoghurt – 31 thousand tonnes, liquid yoghurt – 3 thousand tonnes. The decrease in the production of dairy products is due to a decrease in the consumption of milk and dairy products per capita caused by a decrease in the purchasing power of the population and an increase in the price of products sold.

The range of dairy products in Ukraine is quite large, but there are products that contain varying amounts of milk, namely dairy products such as spreads, ice cream, condensed milk analogues, cheese products, etc. In such dairy products, the milk content is difficult to determine and may change over time for a single product from a single manufacturer. The composition of all products manufactured in the country will also change, as will the milk content in dairy products. In this regard, it is impossible to specify the norm for the use of raw milk in some dairy products, although there are average base coefficients, such as the production of one kilogram of butter requires an average of about 20 kilograms of milk, hard cheese – 10 kilograms, dry skimmed milk – 11 kilograms, dry whole milk – 8 kilograms, yoghurt – 1.1 kg, sour cream – 5 kg. Several products can be produced simultaneously from the same volume of milk. For example, after milk separation, cream is used to make butter and skimmed milk, and the rest is used to make dry powder (Korman *et al.*, 2022).

Despite the war, Ukraine's milk processing enterprises are trying to maintain their capacity, but the dairy industry needs further development and modernisation. The domestic dairy market in Ukraine is underestimated. With the established physiological norm of dairy product consumption at 380 kg per person per year, the country's population consumed 201.5 kg in 2021, only 195.6 kg in 2022, and 196.8 kg in 2024, which is 12.8 kg less than in 2015 and 4.7 kg less than in 2021. 196.8 kg, which is 12.8 kg less than in 2015 and 4.7 kg less than in 2021, and 53.8% and 51.8% of the scientifically based consumption norm of 380 kg (Table 6). This indicator is lower than in EU countries, where annual consumption of dairy products per capita is 260 kg. This indicates significant potential for the domestic dairy market, in which it is possible to invest.

Table 6. *Volume of milk consumption in Ukraine in 2015-2024*

Indicators	Year								2024 to 2015	
	2015	2018	2019	2020	2021	2022	2023	2024	+/-	%
Consumption volume, thousand tonnes	8,995	8,355	8,428	8,430	8,337	6,845	6,686	6,565	-2,430	73.0
% of consumption volume from total production volume	84.7	83.0	87.2	91.0	95.7	88.1	90.0	91.0	6.3	-

Table 6, Continued

Indicators	Year								2024 to 2015	
	2015	2018	2019	2020	2021	2022	2023	2024	+/-	%
per capita, kg	210	198	200.5	201.9	201.5	195.6	201.4	196.8	-13.1	93.7
% of recommended consumption of milk and dairy products	53.8	50.7	52.8	53.1	53.0	51.5	53.0	51.8	-2.0	96.2

Source: *calculated by the authors based on Balances and consumption of main food products by the population of Ukraine (n.d.)*

Per capita consumption of dairy products during 2015-2023 (the study was conducted for the limited period of 2015-2023 due to the lack of statistical information for 2024) was determined using formula 1 (specified in the methodology) and fluctuates from year to year. Thus, milk consumption decreased from 117.65 kg to 102.06 kg by 15.59 kg, butter from 2.12 kg to 1.40 kg by 0.72 kg, and SMP from 0.44 kg to 0.24 kg by 0.2 kg. but cheese consumption increased from 4.02 kg to 4.24 kg, or 0.22 kg (Table 7). A study of the dependence of drinking milk and butter consumption on per capita production in 2023 calculated a regression equation (Fig. 2 and Fig. 3).

Table 7. *Consumption per capita in Ukraine during 2015-2023, kg*

Year	Milk	Butter	Cheese	SMP
2015	117.62	2.12	4.02	0.44
2016	114.89	2.04	4.1	0.44
2017	110.0	1.8	4.14	0.37
2018	107.54	1.68	4.38	0.53
2019	110.48	1.78	4.56	0.36
2020	112.47	1.86	4.97	0.47
2021	111.97	1.63	5.19	0.47
2022	106.87	1.27	4.26	0.10
2023	102.06	1.40	4.24	0.24

Note: *SMP – skimmed milk powder*
Source: *calculated by the authors based on Statistical Yearbook of Ukraine (n.d.)*

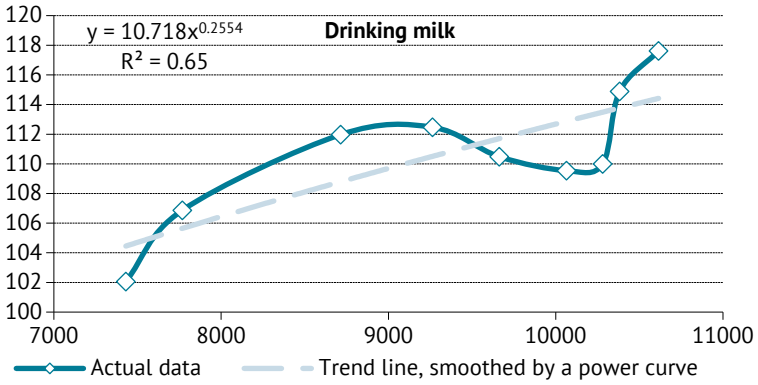


Figure 2. *Dependence of per capita consumption of drinking milk on milk production in Ukraine*
Source: *calculated by the authors based on Statistical Yearbook of Ukraine (n.d.)*

Analysing the data presented, it can be concluded that there is a direct correlation between the consumption of drinking milk and its production, as evidenced by the coefficient of determination – more than 0.653. Based on the coefficient of determination, it can be concluded that the consumption of drinking milk depends on milk production by 65.3%. The graph (Figure 2) clearly shows the trend of milk consumption growth from its production and can be described by the equation $y = 10.718x^{0.2554}$, with the approximation reliability value $R^2 = 0.653$, which indicates a high correspondence of the obtained model. Thus, a 1 kg increase in milk production per capita increases drinking milk consumption by 10.718 kg relative to the average values in the sample.

The coefficient of determination of 0.8063 for butter indicates a direct relationship and a close link between milk production and butter consumption. Based on the coefficient of determination, it can

be concluded that butter consumption depends on milk production by 80.63%. The graph (Fig. 3) clearly shows the trend of increasing butter consumption from its production and can be described by the equation $y = 0.5145e^{0.0001x}$, with the approximation reliability value $R^2 = 0.8063$, which indicates a high correspondence of the obtained model. Thus, an increase in butter production per capita by 1 kg increases consumption by 0.5145 kg relative to the average values in the sample.

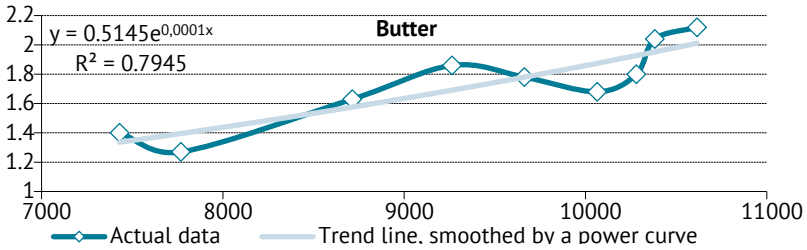


Figure 3. *Dependence of per capita butter consumption on milk production in Ukraine*
Source: *calculated by the authors based on Statistical Yearbook of Ukraine (n.d.)*

The increase in purchase prices for raw milk during 2022-2024 contributed to the rise in prices for dairy products to world levels, which led to a decline in sales and ensured adequate prices for raw milk producers (Fig. 4). Thus, during the period under review, the raw milk price index rose from 1 to almost 1.8. Purchase prices are also subject to seasonality. In the summer, they decrease due to an increase in the supply of raw milk, and in the winter, they increase due to a decrease in the supply of milk. This situation is also characteristic of dairy products.

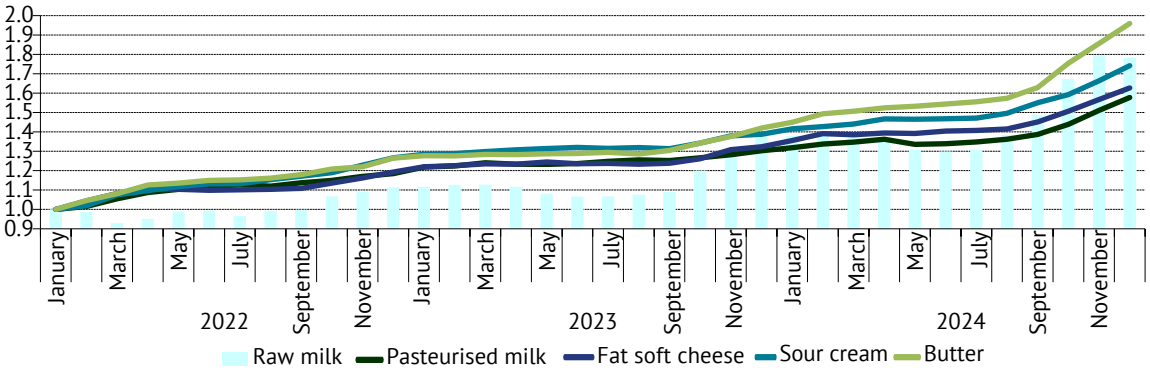
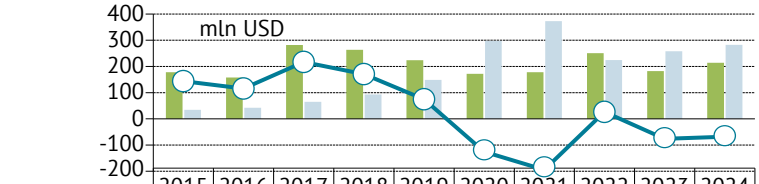


Figure 4. *Indices of raw milk prices (milk sales prices by enterprises) and consumer prices for dairy products (cumulative indices for January 2022 – December 2024)*
Note: *the price study was conducted using a price index calculated according to formula 2*
Source: *calculated by the authors based on Sales of agricultural products by enterprises and households (n.d.)*

The dairy product price index for January 2022 to December 2024 (only three years were taken into account because the study was conducted on a monthly basis) rose from 1 to almost 2. One of the reasons for this is the increase in the price of raw milk. The highest growth index was observed for butter and sour cream. IFCN analysts note that the global supply of milk is limited due to high production costs caused by rising prices for fuel and lubricants, logistics, and new legislative requirements based on greening production and improving animal welfare (Association of Milk Producers, 2024). A study of the dynamics of dairy product exports and imports shows an increase in export and growth in import (Fig. 5). Between 2015 and 2024, dairy product export increased from USD 178 million to USD 214 million, i.e. by USD 36 million, while import grew from USD 34 million in 2015 to USD 283 million in 2024, i.e. by USD 249 million. Between 2015 and 2019, Ukraine exported more than it imported, as evidenced by a positive balance of USD 144 million in 2015 to USD 75 million in 2019, although this figure decreased by USD 69 million during 2015-2019. During 2020-2024, except for 2022, Ukraine saw imports exceed export, resulting in a negative balance of -126 million US dollars in 2020 to -68 million US dollars in 2024.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Export	178	158	282	264	224	172	178	251	182	214
Import	34	42	65	93	149	298	373	225	258	283
Balance	144	116	217	171	75	-126	-195	26	-76	-68

Figure 5. *Export and import of dairy products during 2015-2024*
Source: *calculated by the authors based on Sales of agricultural products by enterprises and households (n.d.)*

During the period 2022-2024, exports decreased by 14.74%, while imports increased by 12.78%. In 2022, the foreign trade balance was positive (+26 million US dollars), as Ukraine exported more than it imported. During 2023-2024, Ukraine imported more than it exported, as evidenced by a negative balance of -76 and -68 million US dollars. In 2022, compared to 2021, imports of dairy products to Ukraine decreased by USD 148 million for obvious reasons – the outflow of population abroad and changes in the exchange rate. In 2023 and 2024, the situation changed, with an increase of USD 33 million and USD 58 million compared to 2021. There was a shortage of raw milk in 2021, 2023 and 2024, when dairy products worth USD 195 million, USD 76 million and USD 68 million were imported into Ukraine. In 2024, the main categories of dairy products exported were (in million tonnes): milk and cream, condensed – 29.5; milk and cream, non-condensed – 26.6; whey – 18.7; cheese – 12.4; butter – 7.2; fermented milk products – 4.4 (Table 8). According to Table 8, the structure of dairy product exports in 2015-2024 showed a 50% decrease in exports of condensed milk and cream, a 29.4% decrease in whey, and a 38.5% decrease in butter. However, in monetary terms, the volume of funds from exports of fermented milk products increased by 78.8%, butter by 63% and cheese by 5.9%. There was a threefold increase in the export of milk and non-condensed cream and a 24% increase in cheese exports, which was due to growing demand for these products. In monetary terms, exports of milk and non-condensed cream increased 3.8 times during the period under review, while cheese exports increased by 54.9%

Table 8. *Exports of major dairy products from Ukraine during 2015-2024*

Code UKT ZED	Products	Year									
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Volume, thous t										
0401	Milk and cream, non-condensed	8.8	10.5	14.1	20.8	25.2	18.6	14.9	29.4	28.3	26.6
0402	Milk and cream, condensed	59.0	51.9	46.8	35.6	35.8	27.4	22.4	26.7	27.7	29.5
0403	Fermented milk products	3.8	2.9	3.7	5.5	6.1	5.7	5.5	3.1	3.4	4.4
0404	Milk whey	26.5	23.9	31.9	31.9	24.1	26.9	22.2	15.3	16.2	18.7
0405	Butter and other fats	11.7	12.1	30.4	30.4	18.3	11.2	10.9	14.1	7.8	7.2
0406	Cheese	10.8	8.1	9.1	8.3	7.2	6.4	6.9	9.0	8.9	12.4
	Value, mln USD										
0401	Milk and cream, non-condensed	4.6	5.4	9.7	14.7	15.3	12.0	10.4	16.4	16.6	17.6
0402	Milk and cream, condensed	89.4	73.7	80.6	59.2	76.2	55.5	57.4	90.0	68.7	74.3
0403	Fermented milk products	3.3	2.6	4.2	8.5	9.9	9.0	8.6	4.7	4.2	5.9
0404	Milk whey	15.5	14.3	24.8	21.9	18.3	22.3	22.8	15.8	10.9	13.4
0405	Butter and other fats	30.0	37.6	129.9	128.6	77.1	48.8	52.3	81.7	41.8	48.9
0406	Cheese	35.0	24.3	32.5	30.8	26.9	24.4	26.7	42.3	40.0	54.2
	0401-0406 total	177.9	158.0	281.7	263.7	223.7	172.0	178.2	250.8	182.0	214.3

Note: *UKT ZED – names of dairy products*
Source: *calculated by the authors based on Per capita Consumption (n.d.)*

In 2023, 92.3 million tonnes of dairy products were exported, worth USD 182.0 million. In 2024, 98.8 million tonnes of dairy products were exported, worth USD 214.3 million (Table 8). Compared to 2023, in 2024, the volume of exports increased by 7%, and total revenue from dairy exports in 2024 increased by 17.7%

compared to 2023. In 2024, compared to 2023, revenues from exports of milk and non-condensed cream (+6%), condensed milk and cream (+8.2%), fermented milk products (+40.5%), milk whey (+22.9%), butter (+17%), and cheese (+35.5%). The growth in dairy exports was driven by increased demand on the global market. In 2024, the volume of dairy product imports reached 58.7 million tonnes (Table 9), which is 0.5% more than in 2023. In monetary terms, imports in 2024 amounted to 282.7 million, which is 9.5% more than in 2023. During 2023-2024, imports of butter in monetary terms increased by 12.1%, milk and condensed cream by 12.8%, while other dairy products saw a decline (Per capita Consumption, n.d.).

Table 9. *Import of major dairy products to Ukraine in 2015-2024*

Code UKT ZED	Products	Year									
		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
		Volume, thous t									
0401	Milk and cream, non-condensed	0.4	0.6	0.8	1.3	3.6	13.0	14.4	9.4	5.1	2.0
0402	Milk and cream, condensed	0.8	1.1	1.7	2.4	2.6	6.1	7.8	1.2	1.3	1.5
0403	Fermented milk products	2.7	2.6	3.6	4.9	6.2	9.9	14.0	9.5	8.7	8.2
0404	Milk whey	1.1	0.7	1.4	2.1	3.2	5.1	9.6	4.9	6.9	6.1
0405	Butter and other fats	0.7	1.1	0.8	1.1	3.4	10.0	9.1	1.1	2.7	2.6
0406	Cheese	5.4	7.1	10.0	13.7	23.7	46.8	55.2	33.8	33.7	38.3
		Value, mln USD									
0401	Milk and cream, non-condensed	0.8	1.1	1.4	2.1	3.6	11.6	13.4	8.6	6.1	4.0
0402	Milk and cream, condensed	1.7	2.1	3.8	5.7	5.8	14.0	21.2	4.0	4.7	5.3
0403	Fermented milk products	3.7	3.9	5.6	7.9	9.1	14.0	20.0	14.9	17.4	16.8
0404	Milk whey	2.1	1.6	2.4	3.1	5.2	6.9	12.3	6.9	12.5	10.8
0405	Butter and other fats	2.6	3.8	4.5	7.5	16.5	40.6	45.5	7.9	16.6	18.6
0406	Cheese	23.5	29.9	47.1	66.8	108.9	210.5	260.3	182.2	200.8	227.1
	0401-0406 total	34.3	42.4	64.8	93.1	148.9	297.6	372.8	224.5	258.1	282.7

Note: *UKT ZED – classification of goods used by the customs service of Ukraine*
Source: *calculated by the authors based on Per capita Consumption (n.d.)*

According to Table 9, the structure of dairy product imports in 2015-2024 showed a fivefold increase in imports of milk and cream in physical volume and monetary terms, fermented milk products increased 2.3 and 3 times, respectively, milk whey increased 5.5 and 5.1 times, butter increased 3.7 and 7.2 times, and cheese increased 7.1 and 9.7 times. This may be due to a shortage of raw milk on the domestic market and higher prices for goods from Ukrainian producers. In 2024, the natural volume of dairy product imports reached 58.7 million tonnes, which is 0.5% more than in 2023. In monetary terms, imports in 2024 amounted to 282.7 million, which is 9.5% more than in 2023. During 2023-2024, imports of butter increased by 12.1% in monetary terms, milk and condensed cream by 12.8%, while other dairy products saw a decline (Per capita Consumption, n.d.).

In 2024, 58 companies specialising in the production of raw milk, ice cream, dairy products, colostrum and colostrum-based products have permits to export dairy products from Ukraine to the EU (Ukrinform, 2024). In 2024, Ukraine exported 30% of its total dairy exports to EU countries. Between 2015 and 2024, milk processing enterprises exported condensed milk and cream, whey, butter and cheese (Table 10). The information is taken from the gap between 2015-2016 and 2021-2024 in order to more clearly show the change in exports by country.

Table 10. *Geography of Ukrainian dairy product exports in 2015-2024 (% of total exports for the product group)*

2015		2016		2021		2022		2023		2024	
Country	%	Country	%	Country	%	Country	%	Country	%	Country	%
0402 - Condensed milk and cream											
Bangladesh	11.8	Kazakhstan	20.6	Israel	10.5	Poland	21.1	Poland	21.9	Poland	21.8
Georgia	8.6	Bangladesh	10.6	Malaysia	8.4	Israel	9.3	Bulgaria	10.1	Bulgaria	17.7
Kazakhstan	8.5	Turkmenistan	10.4	Bangladesh	7.8	Netherlands	8.0	Bangladesh	10.1	Israel	8.6
Turkmenistan	8.0	Armenia	8.0	Armenia	7.4	Lithuania	7.4	Israel	8.8	Germany	7.7
Armenia	6.5	Malaysia	5.1	Algeria	6.8	Bangladesh	7.2	Georgia	4.6	Romania	6.5
other countries	56.6	other countries	45.3	other countries	59.2	other countries	47.1	other countries	44.4	other countries	37.7

Table 10, Continued

2015		2016		2021		2022		2023		2024	
Country	%	Country	%	Country	%	Country	%	Country	%	Country	%
0404 – Milk whey											
Kazakhstan	12.0	China	14.8	China	28.1	China	27.0	China	37.2	Poland	26.4
Pakistan	11.5	Vietnam	14.6	Philippines	11.9	Poland	14.8	Poland	16.3	China	21.5
Vietnam	10.3	Pakistan	14.3	Vietnam	11.1	Malaysia	14.7	Jordan	6.9	Philippines	9.2
Egypt	8.1	Kazakhstan	11.1	Pakistan	8.1	Vietnam	7.3	Egypt	5.7	Vietnam	6.8
Myanmar	6.8	Uzbekistan	8.5	Malaysia	7.6	Pakistan	7.3	Turkey	3.7	Egypt	6.4
other countries	51.5	other countries	36.6	other countries	33.1	other countries	28.9	other countries	30.2	other countries	
0405 – Butter and other fats											
Morocco	18.9	Kazakhstan	26.4	Moldova	30.0	Poland	40.8	Moldova	40.5	Moldova	43.9
Azerbaijan	15.6	Georgia	14.7	Azerbaijan	22.3	Moldova	19.0	Azerbaijan	16.0	Azerbaijan	14.5
Egypt	15.2	Egypt	10.8	Kazakhstan	13.4	Azerbaijan	9.7	Israel	11.0	Bulgaria	7.6
Kazakhstan	9.3	Morocco	9.9	Georgia	10.4	Netherlands	5.5	Kazakhstan	10.4	Israel	6.3
Georgia	8.6	Netherlands	6.6	Israel	7.0	Israel	5.3	Poland	4.0	Poland	5.1
other countries	32.4	other countries	31.7	other countries	16.8	other countries	19.7	other countries	18.1	other countries	29.7
0406 – Cheese											
Kazakhstan	38.7	Kazakhstan	53.7	Kazakhstan	47.4	Kazakhstan	38.0	Kazakhstan	45.6	Moldova	33.2
russia	27.2	Moldova	26.8	Moldova	35.2	Poland	25.6	Moldova	31.5	Kazakhstan	30.4
Moldova	18.8	Egypt	7.8	Azerbaijan	4.2	Moldova	21.3	Latvia	6.8	Germany	9.5
Azerbaijan	5.5	Azerbaijan	3.5	Georgia	3.3	Latvia	3.3	Azerbaijan	2.8	Latvia	6.2
Uzbekistan	1.7	UAE	1.6	USA	2.5	Uzbekistan	2.0	USA	2.5	USA	3.3
other countries	8.1	other countries	6.6	other countries	7.4	other countries	9.7	other countries	10.7	other countries	22.6

Source: *calculated by the authors based on Per capita Consumption (n.d.)*

Table 10 shows that in 2015, the main consumers of condensed milk and cream exports were Bangladesh (11.8%), Georgia (8.6%), Kazakhstan (8.5%), whey – Kazakhstan (12%), Pakistan (11.5%) , Vietnam (10.3%), butter – Morocco (18.9%), Azerbaijan (15.6%), Egypt (15.2%), cheese – Kazakhstan (38.7%), Russia (27.2%), Moldova (18.8%). In 2024, the geography of dairy product exports changed. The main consumers of milk and condensed cream exports were Poland (21.8%), Bulgaria (17.7%), Israel (8.6%), whey – Poland (26.4%), China (21.5%), the Philippines (9.2%), butter – Moldova (43.9%), Azerbaijan (14.5%), Bulgaria (7.6%), cheese – Moldova (33.2%), Kazakhstan (30.4%), Germany (9.5%). The State Service of Ukraine on Food Safety and Consumer Protection has opened access for Ukrainian dairy products to the markets of EU countries, as well as countries such as Canada, Japan, Korea, Great Britain, China, the Persian Gulf countries, and African countries, which is 29 countries worldwide (State Service of Ukraine on Food Safety and Consumer Protection, 2024b). The issue of exporting dairy products to Saudi Arabia and Morocco is being raised, as these countries have a high demand for dairy products, which creates opportunities for Ukrainian producers. Exporters and producers of dairy products could include Chile, Indonesia, India, Costa Rica, Colombia, Brazil, Venezuela, etc. (Prospects for the entry of Ukrainian dairy, 2024). The successful export of dairy products by Ukrainian producers will depend on their adaptation to the requirements of international markets, the transformation of the export capabilities of Ukrainian dairy producers in compliance with international standards, taking into account consumer specifics and competitive conditions, increasing investment in the dairy industry, and improving logistics, despite the fact that raw milk production is carried out in wartime conditions.

Despite the challenges and consequences of the war, Ukraine's dairy industry continues to develop, invest in productivity and technology, increase the volume and quality of raw milk, improve the regulatory framework in line with European requirements, which is positively perceived by market participants, and supply dairy products to Ukrainians and countries around the world. However, its development requires state support, so Ukrainian legislation in the dairy industry must be adapted to EU requirements. Thus, dairy producers are attracting funds from charitable organisations, increasing credit limits under the Affordable Loans 5-7-9 programme (State programme Affordable Loans 5-7-9%, 2024), trying to establish transparent and objective payment terms for dairy products, and expanding state support for investments in the dairy industry. In EU countries, the state compensates 50% of investments in the dairy industry (Gladiy &

Prosovych, 2022), and it would be good if this were also the case in Ukraine. With the help of investments, enterprises will be able to increase milk production, build new factories, modernise existing milk production and processing enterprises, increase exports of dairy products, and introduce innovative technologies that will promote the production of dairy products that meet global quality requirements, reduce production costs, and increase efficiency. Milk producers are also trying to improve the professional and qualification level of personnel involved in the dairy industry, using the experience of practitioners from foreign countries who have the necessary knowledge, innovative technologies and the development of cooperation between milk producers and processors.

The dairy industry provides the population with dairy products, which are part of the country's food security. The efficiency of its activities affects the standard of living of the country's population. Authors V. Sobolev *et al*. (2024) noted that the consumption of dairy products by the population depends on consumption traditions, socio-cultural characteristics, habits, trends in consumption culture, etc. However, the main factor limiting the consumption of dairy products in accordance with rational norms is the low income of the majority of the population. The authors agried with this study, as dairy products are an important element of a healthy diet and a healthy lifestyle for the population. However, as noted by researchers V. Antoshchenkova & Ya. Kravchenko (2022) in their work, consumers' growing interest in plant-based substitutes for animal milk has led to an increase in the production of animal product analogues. In this regard, in order to maintain the competitiveness of natural milk, it is necessary to convince consumers of its beneficial properties, provide complete and reliable information about the dangers of alternative products, and combat unfair competition and the increase in counterfeit dairy products. Similar research on the development of the dairy industry in Ukraine was conducted by Z. Rozhko *et al*. (2020), who used a systematic approach to the development of the dairy industry in Ukraine and noted that its development depends on investments in this industry, improved customs regulation of product exports, improved logistics, and the benchmarks could be: a balanced chain, supply, technological innovations and automation of production processes, consumer orientation, introduction of new product quality standards, investment in personnel, use of data and analytics, which will allow dairy industry enterprises to have information on the state of the dairy product market and facilitate strategic decision-making.

Researchers O. Kozak & O. Hryshchenko (2022) studied the distribution of dairy farms by herd size. According to their research, in 2021, only 3% of farms worldwide had more than 10 cows, which accounted for 37% of the dairy herd and produced 63% of milk, and only 213,000 farms, or 0.2%, were commercial farms, but their share in milk production is 42%. In their opinion, the decrease in the number of dairy farms was accompanied by an increase in their size. The similarity of their research with the authors was that in order to increase the production of high-quality milk raw materials, it is necessary to merge the farms of the population, which are the main producers of milk, into peasant farms or cooperatives, where, in addition to procurement, raw milk is processed and dairy products are sold, which are jointly owned by the producers. The same opinion was expressed by researcher O. Shpychak (2021), who noted that efforts to restructure milk production by increasing the number of cows on farms from 1-3 to 15-40 will contribute to the creation of mini-farms, the elimination of its depersonalisation in terms of sales, and the combination of the producer and seller of dairy products in a single process. Their research also indicated that large integrated milk production and processing systems can be formed on the basis of dairy cooperatives. Scientists S. Poperechny & O. Salamin (2022) believed that cooperatives are viable if, in addition to procurement on a cooperative basis, they also process milk and sell dairy products, and the products produced are jointly owned by the producers of raw materials. The authors of this study agried with this opinion, since the coordination of interests of all participants in the cooperative ensures proper coordination of activities in the field of production and processing of raw milk. It was also emphasised that the key factor regulating market relations and the volume of dairy production is price, which influences the pace and proportions of development of enterprises and industries, as well as ensuring their profitability.

V. Kotelevich *et al*. (2023) noted that in order to ensure the production of safe dairy products, their competitiveness in the foreign market and demand in the domestic market, it is advisable to introduce international standards and an effective HACCP (Hazard Analysis and Critical Control Points) system, which makes it possible to avoid potential risks during the production of raw materials, processing, storage, transportation, sale and use of milk and dairy products and ensures control and responsibility of producers throughout the food chain from farm to table. Joint cooperation between governments, producers and consumers of milk and dairy products will contribute to safety and appropriate quality. Scientists V. Bondarenko & O. Omelyanenko (2024) proposed the use of SWOT analysis to understand the problems and opportunities of the dairy industry, which allows identifying the strengths and weaknesses of the dairy industry. Among the strengths, they noted the

introduction of innovative technologies, an effective organisational structure and management style, compliance with international quality standards, a wide range of products, and the use of "extra" milk. These factors will contribute to increasing the competitiveness of the dairy industry in times of crisis, which will weaken the position of competitors, creating opportunities for expanding export markets and entering new segments.

Similar to the authors' research, researcher A. Uzhva (2024) noted that the dairy industry should receive state support. After all, milk production and processing must be profitable, and the mechanisms of state support for the industry must be clear and guaranteed, as the country has the potential for this (land, traditions of dairy farming, skilled labour, water). Scientists M. Gladiy & O. Prosovych (2022) share this opinion and concluded in their research that it is possible to revitalise the dairy business, but this requires increased state support, namely investments, grants, subsidies and funding for the dairy industry. Only close contact, interaction and consideration of the interests of all stakeholders – producers, processors and the state – as well as the development of a strategy and the implementation of an effective mechanism for its implementation can ensure the sustainable growth of the dairy industry in the long term.

In conclusion, it can be stated that the further development of the dairy sector depends on the coordinated cooperation of all participants in the production of raw milk, processing, storage, transportation, sale and use of dairy products. State funds should be directed towards supporting milk and dairy product producers and increasing their competitiveness in both domestic and foreign markets.

CONCLUSIONS

The dairy market is an important segment in providing the population with valuable food products. Research into its functioning in Ukraine during 2015-2024 showed negative trends, namely a 34% decrease in milk production; an eightfold increase in dairy imports; fluctuations in prices on the milk market; the low technological level of milk production in private households resulted in low-quality raw materials, and the lack of coordination between them and milk processing enterprises led to dairy products not meeting international quality standards. Since private farms are the main milk producers, all efforts should be focused on improving milk quality by purchasing modern milking and cooling equipment and facilitating the creation of conditions for their transformation into dairy cooperatives.

Ukraine has the potential to develop its dairy industry, namely favourable natural and climatic conditions, developed livestock farming and qualified personnel. The successful development of the dairy industry depends on cooperation between milk producers, processors and consumers; compliance with international standards of quality and safety of Ukrainian dairy products, which will contribute to the expansion of the range, increase in the volume and scale of dairy exports, expansion or entry into new international markets, increase in the production of organic and lactose-free dairy products, which are oriented towards consumers who prefer healthy food; adequate state support, namely a regulatory and legislative framework, standards, grants, subsidies, support programmes for raw milk producers, export promotion, and partial indexation of the modernisation of the dairy industry. State support for the development of the dairy industry is important because it will help create opportunities for dairy companies to develop and produce dairy products in accordance with international sanitary standards and will facilitate the entry of dairy products into world markets. Through the joint efforts of the state and dairy producers, the domestic dairy market can successfully sell dairy products on world markets and generate profits for the state and producers. Prospects for further research lie in the development of mechanisms to increase the competitiveness of Ukrainian dairy products on international markets by improving production technologies, ensuring quality and effective state support.

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CONFLICT OF INTEREST

The study relied on reliable information and included references to other scientific works. The authors believe that this fact does not affect the objectivity of data collection, analysis, or the writing of the manuscript. The other authors declare that they have no conflict of interest.

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Функціонування ринку молокопродукції в Україні

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Анотація. Молочні продукти залишаються важливою складовою харчування населення України, однак галузь стикається з низкою проблем, спостерігаються негативні процеси, пов'язані із зменшенням обсягів виробництва молока, дефіцит якісної сировини, зростання імпорту, низька платоспроможність споживачів, логістичні труднощі та вплив війни. Це вимагає нових підходів до розвитку галузі та поглибленого аналізу ринку молокопродуктів. Метою статті було проаналізувати функціонування ринку молока і молокопродукції, виокремити його проблеми та запропонувати заходи успішного розвитку молочної галузі. У процесі дослідження використано такі методи: абстрактно-логічий, статистичний й табличний із ціллю зібрання, обробки й аналізу інформації щодо виробництва молока, надходження молока на переробні підприємства, якості молока-сировини, експорту та імпорту молокопродукції протягом 2017-2024 рр.; графічний був використаний для аналізу експорту й імпорту молокопродукції, при формуванні рейтингу регіонів за виробництвом молока у 2024 р., при дослідженні індексу цін молока-сировини; при дослідженні залежності споживання питного молока та масла у 2023 р. від обсягів виробництва на 1 особу використано кореляційно-регресійний аналіз. Результати дослідження показали невідповідність пропозиції молоко-сировини на ринку щодо завантаженості молокопереробних підприємств, як результат, обсяг молокопродукції нижче норми її споживання. Окреслено структуру й частку експорту української молокопродукції у країни світу. Досліджено залежність споживання молока питного та масла від виробництва молока-сировини. Практичне значення полягає в тому, що дослідження функціонування ринку молокопродуктії можуть бути орієнтиром при ухваленні рішень стосовно напрямків збільшення обсягів виробництва й переробки молока, збільшення споживання молокопродуктів та зростанні обсягів експорту продукції молочної галузі

Ключові слова: виробництво; якість; індекс цін; експорт; імпорт