

PAPER • OPEN ACCESS

The Ukrainian milk processing enterprises export orientations development in the martial law conditions and under the migration processes influence

To cite this article: O Shubalyi *et al* 2023 *IOP Conf. Ser.: Earth Environ. Sci.* **1269** 012027

View the [article online](#) for updates and enhancements.

You may also like

- [Monitoring of resource-efficient provision of Ukrainian dairy processing enterprises with high-quality raw milk on the basis of international requirements](#)
N Kushnir, A Ventsuryk, A Zhemba et al.
- [Key development directions of the milk market of the region](#)
O Charykova, E Salnikova and N Polunina
- [Theoretical and Practical Aspects of Increasing the Milk Production Efficiency](#)
L P Semkiv

The Ukrainian milk processing enterprises export orientations development in the martial law conditions and under the migration processes influence

O Shubalyi¹, O Stakhiv² and D Tsaruk³

¹ Lutsk National Technical University, Lutsk, 75 Lvivska Street, Ukraine

^{2,3} National University of Water and Environmental Engineering, Rivne, 75 Oleksi Novaka Street, Ukraine

E-mail: d.s.tsaruk@nuwm.edu.ua

Abstract. The article outlines the Ukrainian milk processing enterprises sustainability ensuring issues under the martial law conditions and migration processes. The main obstacles faced by the dairy industry during 2022 were associated with dairy farming decrease, production capacity loss, production costs increase, high competitive pressure, government dairy business support programs reduction. The article considers the planning logistics chains importance due to the dairy products peculiarities comparing other industrial products. Sustainable milk and dairy production, consumer balances achievement are important to ensure Ukrainian food security during the martial law. It is essential to use engineering management methods in dairy production in order to achieve the appropriate products quality under the transition to international dairy products quality standards terms. The production and export-import trends study made it possible to analyze the Ukrainian milk processing enterprises export potential to the EU, MENA, Asia, CIS countries, using effective logistics chains planning. It was determined that exports change in the geography contributes to the production leveling, which was excessive due to the large number refugees and internal migration. The main milk processing enterprises development prospects in the expanding export opportunities direction, cooperation with European partners and using the government grant programs opportunities have been determined.

1. Introduction

In recent years, Ukraine has increasingly integrated into the global economic space. Therefore, the world market puts forward new requirements for environmental protection and Ukrainian producers product quality. Ecological production and sustainable development elements must be implemented at all stages from the procurement of raw materials to the final products shipment. The dairy industry occupies an important place in the Ukrainian economy and provides a significant share of the population's food needs. Capacities of milk processing enterprises are spread over the entire territory of Ukraine and depend on the location and raw material bases concentration. In the conditions of the realities that have developed in Ukraine due to the full-scale invasion, a large number of milk processing enterprises have been affected by such factors as a decrease in the consumers purchasing power, the closure of some foreign markets, a reduction in dairy cattle breeding, an insufficient raw milk amount, supply logistics deterioration, production capacity loss on occupied territories of Ukraine and the impossibility of relocation to other regions. Therefore, the competitive dairy products production from high-quality raw materials based on the implementation of engineering management in operational activities are urgent problems for modern producers who seek to increase the efficiency of their activities due to the expansion of export opportunities.

2. Related works

The milk processing industry problems are now comprehensively considered at all-Ukrainian forums and the Ukrainian dairy producers possibilities are being discussed in terms of supporting dairy farming, optimizing logistics chains, and expanding product export borders thanks to the joint efforts of the government, producers, traders and international partners. A large number of analytical portals and dairy



market experts, such as Infagro Media [1], Agrobusiness [2], Association of Milk Producers [3], MilkUA Portal [4] participate in the industry prospects assessment and Ukrainian population food security study.

Among the Ukrainian economists who considered the milk processing industry sustainable economy problems, studied the level of population dairy food products providing, production balances, export-import trends in the dairy raw materials and milk products market, and analyzed the milk processing enterprises logistics chains, it is worth mentioning such scientists as I Komarynyskyi [5], O Moshkovska [6], V Rossokha [7]. Professor I Ippolitova [8] studies the problems dairy products competitiveness of Ukrainian producers. The trends analysis in the Ukrainian enterprises adaptation to international and European quality standards for dairy raw materials and final products is carried out by T Rutkevich [9] and I Zhalinska [10]. Regarding the optimization of product sales channels by milk processing enterprises, studies in this field were carried out by such economists as L Melnyk [11], S Sharay [12] and O Zgurska [13].

However, in the full-scale invasion conditions, the realities of milk processing enterprises functioning have changed significantly, which requires in-depth researches of the political and economic factors influence in this area during 2022-2023. Therefore, the issues of raw milk supply, the dairy production efficiency evaluation and cost control in modern conditions, the provision of logistical supplies during martial law, as well as the sales problems study taking into account demographic changes, remain uncovered.

3. Results

Engineering management in the milk processing industry of Ukraine in modern conditions is being transformed under the market functioning peculiarities, changes in demand for products, the new types of products appearance, the reduction of the industry's products life cycle, the need to quickly respond to changes in the external environment influence. Therefore, the engineering field of milk processing enterprises is closely related to the logistics system management. Logistics principles are integrated into the plans of enterprises' engineering and technical services, and resource costs for managing raw milk flows, material flows, and finished product flows are related to production and technological efficiency.

Building the information flows at a milk processing enterprise is an important part of its engineering management and logistics system. Monitoring of information that is coming from external channels (macro- and microenvironment), internal divisions (data on resource capabilities, organizational and management information) is used by managers in the complex with methods and criteria determination for its processing (Fig. 1). Milk processing enterprises activities optimized planning depends significantly on the processing of incoming information flows in order to build an enterprise's effective logistics system, which will be flexible to various options of operational and production planning decisions.

The engineering management organization complexity depends on the level of the enterprise's logistics environment (Fig. 2). In particular, four logistics systems levels can be distinguished at milk processing companies. The first logistics level processes rational organization at the enterprise includes the tasks of loading final products that are ready to be sent to consumers and their transportation. The second logistics system level is represented by the processes organization, which, in addition to internal company warehouses, stages of shipment and delivery of products to consumers, also involve the presence of external logistics intermediaries complex. At the third level, there are such logistics systems, which task is to ensure production and sales. That is, goals are diversified by such activities types as management of raw materials, semi-finished products and components for production procurement and transportation and stocks of work-in-progress management. The most complex logistics systems, which belong to the fourth level, manage processes starting from cooperation with raw milk suppliers, its purchase, and ending with the delivery of finished products and final consumer service [14].

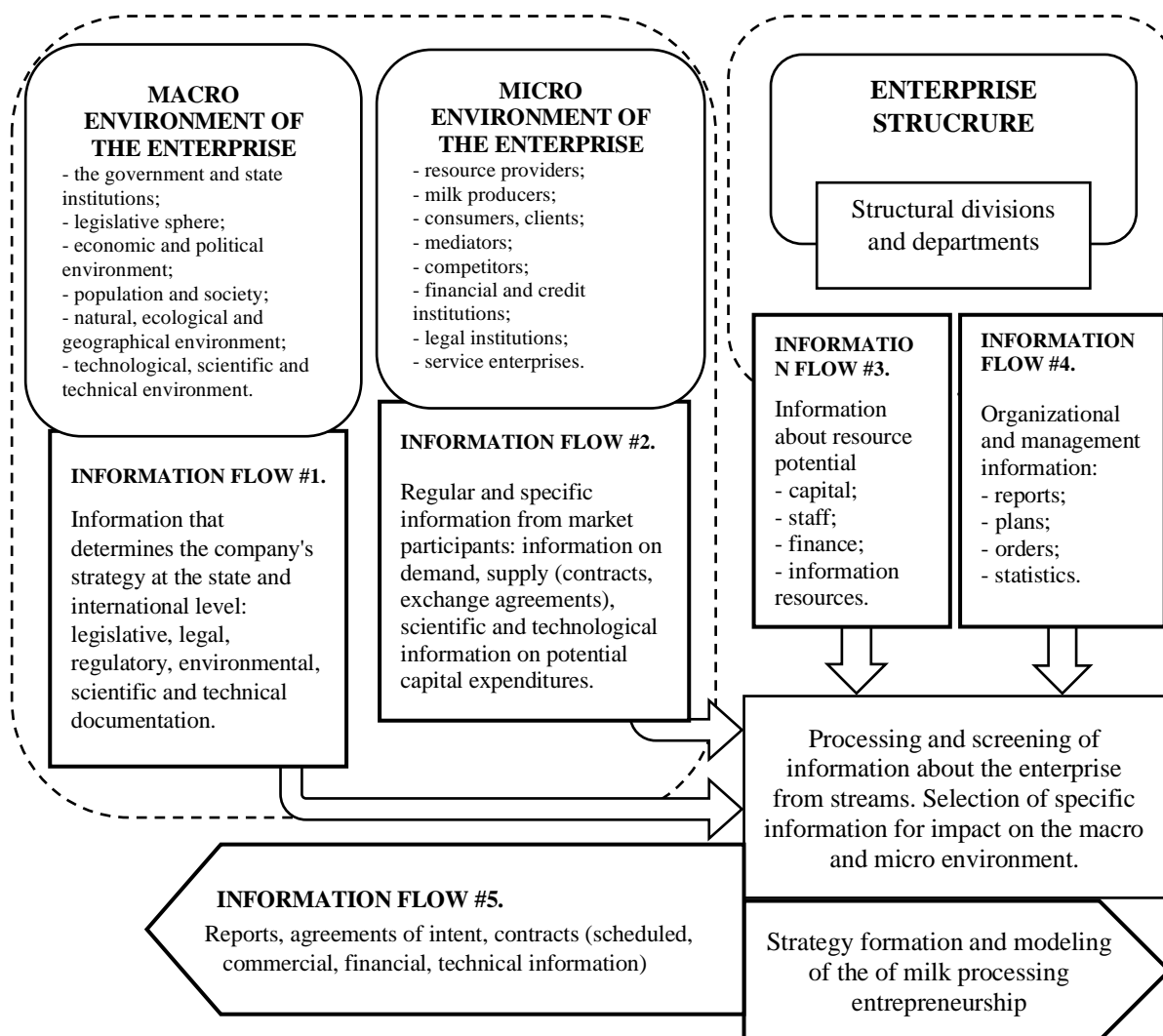


Figure 1. Information flow diagram of a milk processing enterprises [14]

Milk processing and dairy products creation technology is characterized by the production processes continuity. The reception and processing of milk is an important production stage, since it is during this process the prerequisites for the finished products quality are laid. The critical control points in the production are also the milk bottling stages, direct process of dairy products creation, finished products cooling and their shipment.

The milk processing enterprises products features, which affect the approaches to their operational, engineering and logistics management, in addition to the continuity of the production cycle, are also the following:

- inefficiency of the narrow products range manufacturing. A raw milk characteristic quality feature is the presence of fatty and non-fatty components. Therefore, products technology by milk processing enterprises is accompanied by the several types of finished products output at once. For example, when processing milk, it can be obtained cream and butter. Therefore, narrow specialization in the dairy business is less profitable than creating an assortment based on the "turnover" of production.
- short shelf life of dairy products. This limitation necessitates the availability of a large refrigeration and freezing equipment number. It also forces manufacturers to make effective plans of fast delivery and products sale to the end consumer, use modern packaging and storage methods, and apply a loyal customer service system;

- the placement of milk processing enterprises dependence on raw material bases and sales regions. Raw milk, as well as final dairy products, have a short shelf life, and therefore dairy enterprises are concentrated in raw milk and farms zones. Raw materials supply management must be operational, and products from distribution companies must arrive at trucking sites within a day of placing the order (Just-In-Time model);
- optimal distribution channels compulsory presence. Taking into account the storage and transportation of dairy products conditions, the issue of supplying goods in small batches arises, which requires effective cooperation between distributors and trading platforms [13].

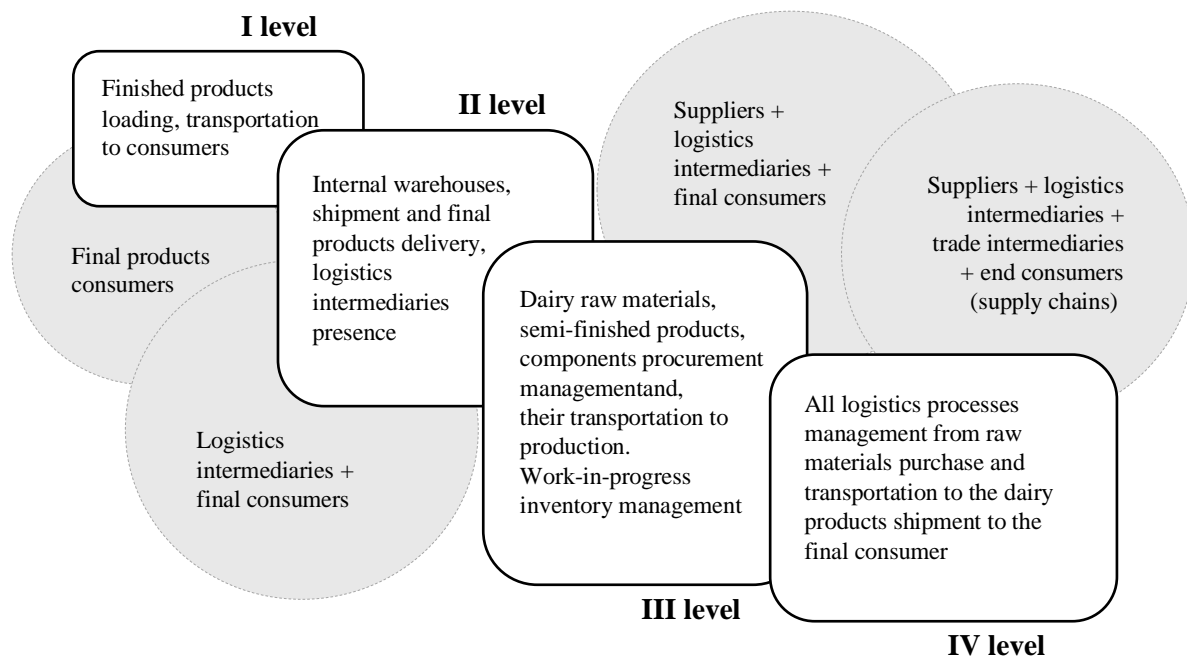


Figure 2. Logistics systems levels of milk processing enterprises

Thus, modern milk processing enterprise engineering management must take into account the listed features and must be built on the functioning of logistics mechanisms basis. Within the scope of controlling planning, automated design (Computer Aided Design) of production, supply and sales management, synchronization of various enterprise divisions work, total quality management (TQM), the engineering management tasks are quite diverse with the involvement of information systems and technologies, software engineering.

Logistics system automation through the information technologies and engineering solutions use requires significant capital investments. However, such measures contribute to the operating costs reduction, the enterprise control and analytical operations, quality growth, and the strategies formation. It can singled out the following tasks that are solved by automated systems for debugging logistics chains based on software engineering:

- additional reserves in reducing operating costs identification;
- planning of needs in raw milk and materials;
- managing the raw milk and materials distribution by production divisions;
- commodity stocks distribution managing;
- production capacities loading planning;
- raw materials and final products delivery planning organization, transport costs reduction;
- pricing and document circulation organization;
- exchange and return operations, customer service control [14].

In the martial law conditions, an important aspect that helps milk processing enterprises that are located within the occupied territories, have partially lost production and storage facilities, have been affected by the reduction of production or sales markets, to function despite restrictions or relocate, is the rapid supply chains restructuring, reorientation to new markets sales thanks to investments in logistics automation and analytics [4]. The industrial logistics information systems evolution from the material requirements planning and management system (Material Requirements Planning) to business planning, accounting and bookkeeping automation, payments with buyers and suppliers, financial analytics and planning, external enterprise cooperation management (Customer Synchronized Resources Planning) occurred with the gradual expansion of their functions [11].

The main engineering management element of milk processing enterprises is the engineering and technical service, which functions include science-based planning, operational and planned technical tasks of production and non-production divisions implementation, measures for processes automation and mechanization at the enterprise development. This service also implements the goals of mechanized and automated fixed assets effective use, achieving cost savings on energy, material resources, and maintenance company's fixed assets costs (Fig. 3).

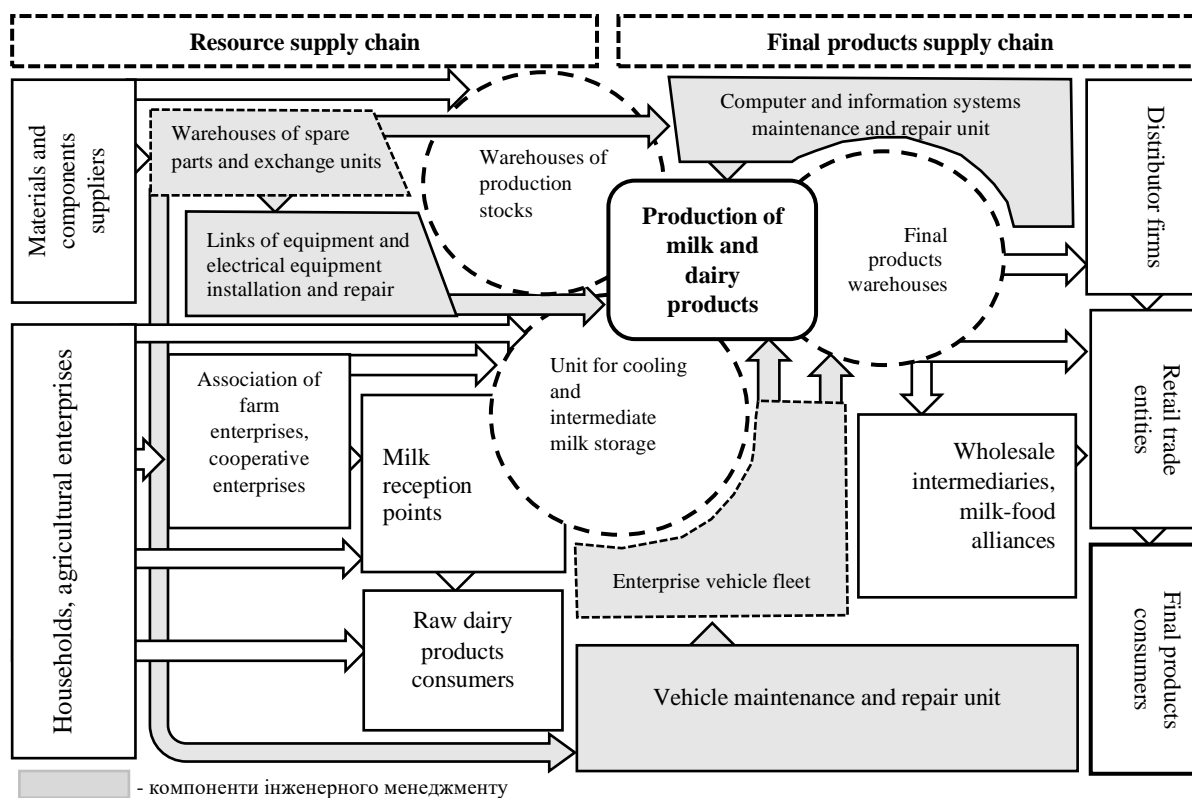


Figure 3. Engineering management components in the milk processing enterprises logistics system [12]

Effective logistics chains use helps enterprises successfully compete in the dairy market. At the same time, opportunities for the output of Ukrainian enterprises to foreign markets are increasing. Business conditions in Ukraine since the the full-scale invasion has begun in 2022 have significantly affected the dairy industry, which has lost many logistical links of raw milk and final products supply. Today, the following are the problems and challenges for milk processing enterprises of Ukraine:

- the reduction of dairy farming and, as a consequence, the decrease of raw milk production in Ukraine in general and especially in the regions affected by the full-scale invasion;
- decrease in demand in some regions of Ukraine due to population migration;

- significant production capacities losses of milk processing enterprises that were directly affected by hostilities;
- decrease in population solvent demand and significant inflationary processes;
- inefficient price policy for raw milk leads to increase in the dairy production cost and expenses;
- obstacles in raw milk and final products logistics and transportation, exports reduction to the markets of some foreign countries;
- high level of competition from imported dairy products;
- a significant working capital deficit in milk processing enterprises due to the reduction of lending and some state loyalty programs curtailment.

The listed threats to the Ukrainian milk processing industry became threats to the functioning of many enterprises, which were forced to curtail their activities. However, under such conditions, flexible management and reorientation to new markets can be a salvation for domestic producers. The forced external and internal population migration due to the conditions of a full-scale invasion caused a change in the regions for the dairy sector products demand concentration. The recorded number of Ukrainian citizens living abroad since February 2022 is 4.67 million people, i.e. more than 11% of the total population (as of June 26, 2023). The largest number of Ukrainian immigrants is observed in Poland (1.58 million people), Germany (1.07 million people), the Czech Republic (0.346 million people), Great Britain (0.20 million people), Spain (0.184 million people) and Italy (0.183 million people) according to the UNHCR data (as of June 2023) [15].

Therefore, some milk producers faced the raw milk excess problem despite of significant decrease in its production (Fig. 4).

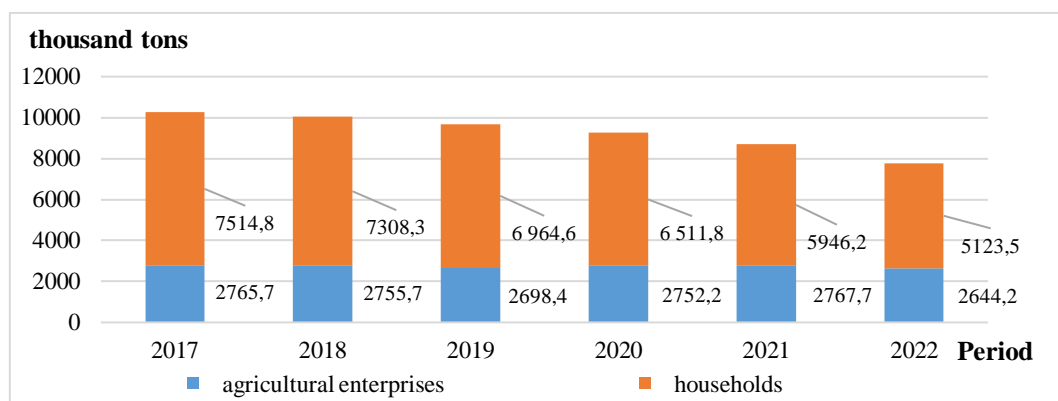


Figure 4. Ukrainian agricultural enterprises and households milk production, 2017-2022, thousand tons [16]

According to Figure 4, it can be observed that the raw milk production by agricultural enterprises during 2017-2022 had stable dynamics and almost did not change. However, every year in the overall milk production structure in Ukraine, the production share falling on households is more than 65% (in 2022). Although, in recent years, we can observe a slight increase in the milk production share falling on agricultural enterprises. This happened due to the fact that the volume of households milk production in 2022, compared to 2017, decreased by 31.8%, and the total volume of production decreased by 24.4%. The biggest decline in household milk production was last year, in 2022, when the reduction occurred by 13.8%. At the same time, the processed milk volume also decreased by 14% and amounted to 2.74 million tons [16].

The new quality and safety standards for the raw milk production, which contain European norms, were designed to unify the requirements and indicators of the EU and Ukraine in this area. Since the start of such requirements in 2019, the production of non-grade milk that was produced by households has significantly decreased. A transition period until January 2022 was applied for market entities that

are not focused on the raw milk and dairy products export, in order to reorient themselves to the implemented rules. The specified changes in standards affected the milk production volume by households, reducing the II grade and lower grades milk production share [9].

Small households are also more sensitive to political and economic factors and market changes than agricultural enterprises, and the deterioration of logistics due to hostilities and the impossibility of relocation caused a reduction in production. The milk processing enterprises number on the territory of Ukraine has decreased since the beginning of the full-scale invasion. Statistics show that 58 such business entities ceased their activities during martial law.

Demographic factors also have a significant impact on the industry. Dairy products consumption per capita (for people who do not have problems with lactose tolerance) is recommended at the level of 380 kg per year. Annual food consumption balances calculated for Ukraine show that Ukrainians consume milk and dairy products below the recommended norm, about 200 kg per year (Fig. 5) [17].

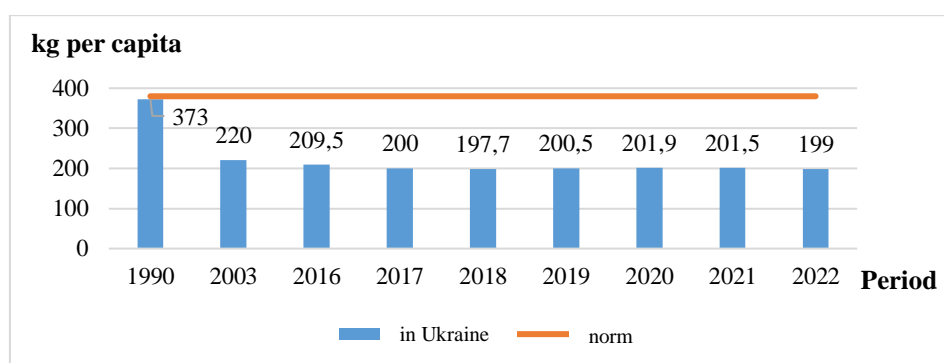


Figure 5. Annual milk and dairy products consumption per capita in Ukraine, kg (in terms of milk) [17]

During the period of 2019- 2021, the milk and dairy products consumption was stable in Ukraine, and the dairy products import by European suppliers was also increasing. In particular, in 2021, the largest share of 72% in the value of all imported dairy products was cheeses and sour milk cheese supply. The factor that stimulated the increase in imports was the high cost of domestic dairy products compared to European suppliers, which was caused not only by modern production technologies, but also by lower prices for dairy raw milk. In 2022, all dairy products categories import decreased significantly, generally by 50% in value terms compared to 2021. Milk products consumption, despite the calculated balances, also decreased.

Against the reduction in the dairy milk production background, a decrease in the demand for dairy products by 27% was observed due to the processes of population migration abroad [18]. In connection with the military actions, the product supply logistics changed significantly, and the enterprises production capacities began to be affected by the internal population migration (Fig. 6). At the beginning of 2023, the internally displaced population number was 928,000 people in the central and 604,000 people in the northern regions of Ukraine (including Kyiv), where the largest milk processing enterprises are mostly concentrated (Vinnytsia, Poltava, Cherkasy, Kyiv, Zhytomyr regions) [15]. Thus, the factors of the war and the decrease in population in Ukraine due to migration affected the dairy market, offsetting the loss of production, which under normal conditions would have turned out to be a significant shortfall, and may increase the import expansion.

Despite the trade suspension with the Russian Federation, Belarus and some other CIS countries, Ukrainian dairy producers have started looking for export opportunities in order to maintain their stability and save jobs due to the duration of the port blockade. Exports stimulation occurs thanks to the grant support program, E-export schools, which are aimed at scaling up small and medium-sized businesses of Ukraine through online trading platforms [19]. During 2022 by many large milk processing enterprises, such as Lusdorf LLC, Organic Milk LLC, TERRAFOOD LLC, MC Halychyna

LLC, Ternopil Dairy PJSC, Radylyivmoloko LLC, Bilotserkivska Agro-Industrial Group LLC, Lubensky Dairy Plant LLC, PJSC Ichnyansky Dairy Canning Plant were granted permission to export during martial law.

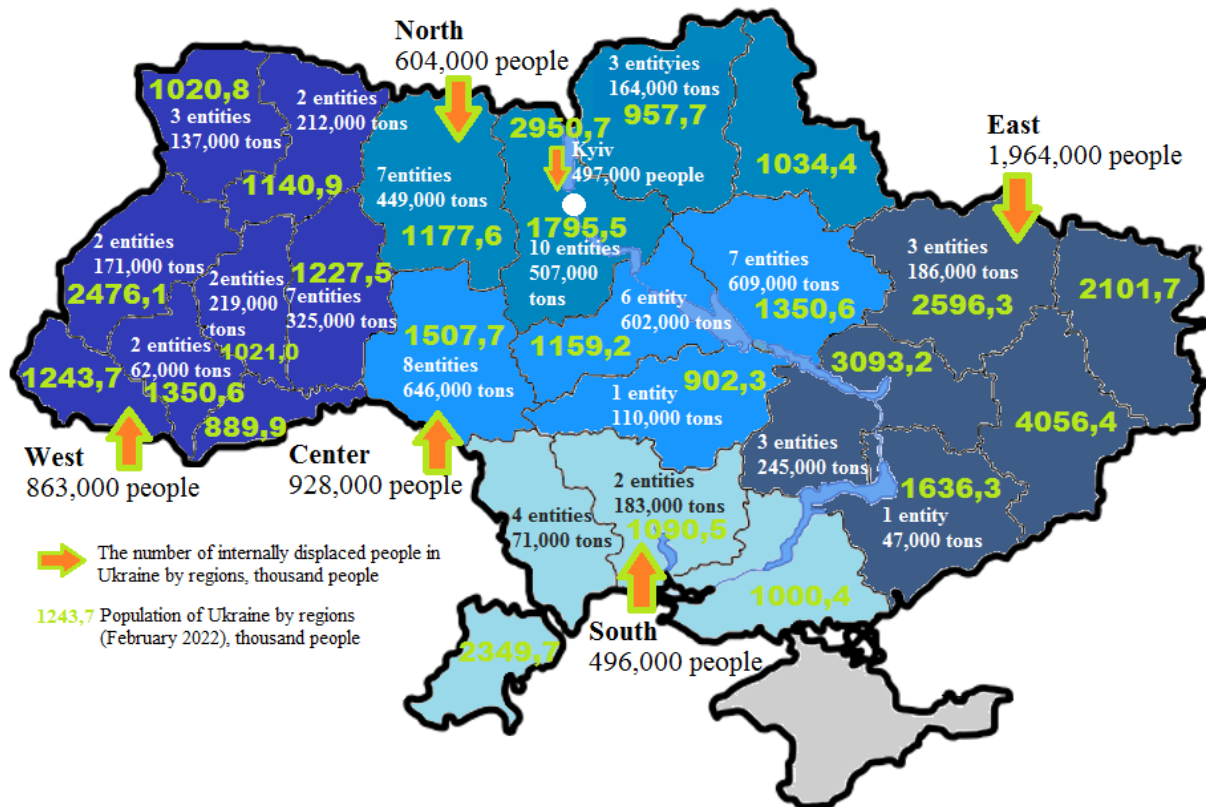


Figure 6. Map of the milk processing enterprises production capacities (thousand tons) and the population in Ukraine by regions (thousands of people) comparison, 2022 [19]

According to statistical data, despite restrictions and military actions, in 2022 the export of dairy products increased significantly in all product groups (except sour-milk cheeses and whey). In value terms, there is an increase in exports by 17.9% compared to 2021. The reason for this were the following changes:

- support for the stock dairy products (such as butter, skimmed milk powder, whole milk powder, casein, cheeses) export;
- agreements on preferential export to EU countries without customs duties;
- simplified conditions for the dairy products transit through Europe;
- an increase in the milk processing enterprises number that have received the right to supply products to the EU and Great Britain;
- establishment of logistics relations with the the Middle East, North Africa and Asian countries;
- the presence of raw milk surplus that needed to be sold on foreign markets [3].

The new Ukraine's exports geography began to take shape even before the full-scale invasion since 2014, when trade with Russia was reduced, and delivery to the CIS countries was limited due to the transit transportation through the Russian Federation impossibility. However, the dairy products trade share of with post-Soviet countries remained at the level about 90% of the total the dairy industry exports volume. Until 2021, the exports share to the CIS countries (except the Baltic countries) still remained at the level of 50% (Fig. 7), although exports to the EU doubled and there was a slight increase in supplies to the countries of the Middle East and North Africa [19].

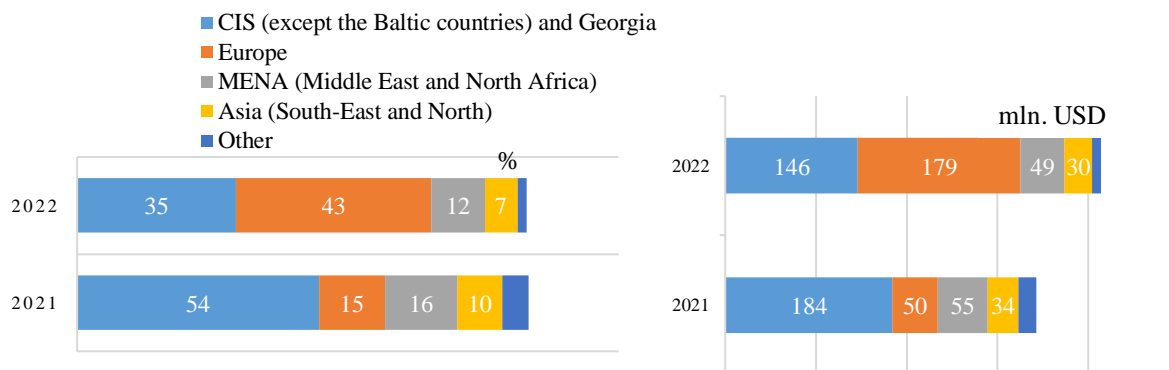


Figure 7. The dairy products export from Ukraine geography in percentage and value terms comparison, 2021-2022 [1]

In 2022, a radical change in the Ukrainian exports logistics orientation took place (Fig. 7). The loss of the ability to transport goods through Ukrainian seaports forced exporters to use land delivery methods and turn to European partners. Therefore, the share of exports to EU countries in 2022 increased 3.6 times compared to 2021. The supply to the CIS countries (except the Baltic countries) decreased by 20.6%, to the MENA countries by 10.9% and to the countries of Southeast and North Asia by 13% [1].

As for the dairy products range exported from Ukraine, it is worth noting that the largest exports share in 2022 is occupied by butter – 20%, casein – 19%, and skimmed milk powder – 17%, the supply of which has increased significantly (Fig. 8). Also, starting from 2022, Ukrainian cheeses, which faced significant competition from Polish producers, began to be exported to Europe. The dairy products were exported in the total amount of 210.1 million USD, and imported in 186.0 million USD, compared to 2021, when exports amounted to 178.2 million USD and import to 372.8 million USD [20].

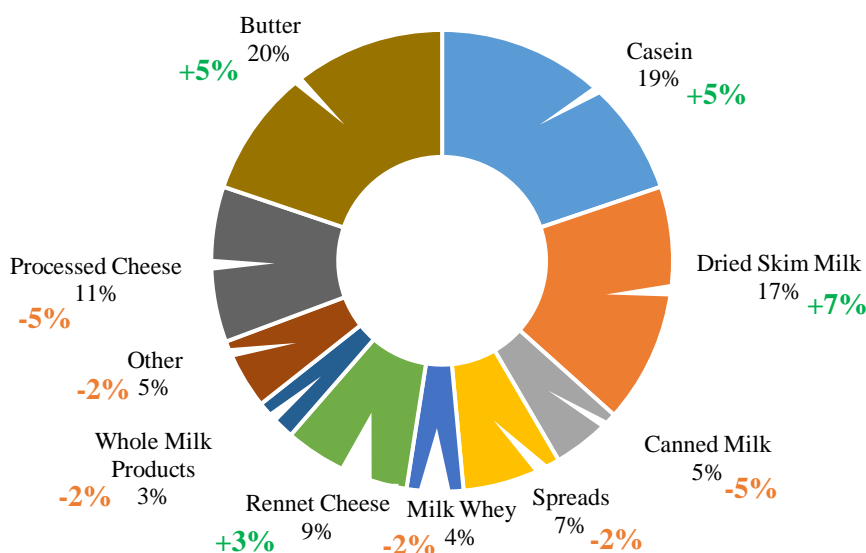


Figure 8. The Ukrainian dairy products export structure in 2022 and its growth rates from 2021 [2]

Therefore, the dairy production in Ukraine and its export should be accompanied by the appropriate level of raw milk and final products quality. This should be facilitated by an active government policy in the dairy cattle breeding field promotion and support, the basis for productions creation that will meet international and European standards for targeting foreign sales markets. Opportunities to enter European markets allow Ukrainian producers to avoid problems with logistics and expensive

transportation to MENA countries, and therefore milk processing enterprises should effectively choose export product portfolios, taking into account the situation and demand in foreign markets.

4. Conclusions

Thus, the situation that has developed in the dairy industry in connection with the destructive full-scale invasion impact requires complex and effective actions in the field of state stimulation and support, changes in the quality raw milk and products characteristics, adaptation to modern production safety standards, effective costs production control, modernization of technologies and equipment for complex milk processing and resources secondary use, increase in energy efficiency, the engineering management system implementation. All of the listed measures will contribute to strengthening the Ukrainian producers competitive positions and will be able to increase opportunities for the dairy product exports growth not only to the EU countries, but also to partner countries from the CIS, MENA and Southeast and North Asia countries [6].

The considered modern aspects of milk processing enterprises activity make it possible to draw conclusions that the effective logistics chains construction plays a significant role in ensuring the dairy industry sustainability, especially in the conditions of a decrease in the enterprises production capacity in the occupied regions of Ukraine and in combat zones. The exports over imports predominance in 2022 and ensuring a sufficient level of dairy products consumption were achieved thanks to the rapid reorientation to European markets, export quotas, export permits granting to enterprises, and the state grant programs launch.

Since Ukraine is at the stage of restructuring the milk production standards and bringing them closer to the European ones, an effective form of the milk producers activities implementation should be the cooperation of small farms that produced mostly second-grade milk and the logistics distribution concentration. Thus, the problems of logistics chains for small milk producers will be solved through joint efforts to implement storage equipment, organization of shipment, control of milk transportation, as well as veterinary and sanitary control. This will make it possible to support domestic milk producers, reducing the risks of low-quality supply and lack of raw milk.

Export-oriented dairy products pass special inspection, in particular, in terms of requirements for milking equipment and farm hygiene, and also collection, transportation, processing, milk heat treatment, milk and dairy products packaging requirements. Such a quality policy in the Ukrainian dairy industry was introduced even before martial law, and integrate international and EU requirements for milk grades and dairy products characteristics to prepare for entering foreign markets. In addition to quality standards, it is also necessary to take into account the export potential of the importing countries and the capacity of overland routes for the transportation of goods abroad, since there are problems with the documentary exports support, the lack of vehicles and containers for transit through the EU. Under these conditions, the best options for exporting products remain the European Union neighboring countries the by road and railway.

However, milk processing enterprises managed to cover a large part of the losses in production capacity only due to the significant migration of Ukrainians abroad, and the increase in the share of exports to the European market may be short-lived in case of relevant benefits cancellation. Therefore, in order not to lose the obtained opportunities and increase the development potential it is worth keeping exports at a high level, maintaining trade relations, controlling the manufactured products quality, applying lending tools, grant programs in order to create appropriate conditions for the recovery of dairy farming and the milk processing industry as a whole.

References

- [1] The dairy industry during the war. Infagro Media Project: website. URL: <https://media.infagro.com.ua/> (access date: 23.07.2023).
- [2] Milk export as a powerful support for the dairy industry. Agribusiness-Ukraine Portal: website. URL: <https://agrobusiness.com.ua/molochnyi-eksport> (access date: 10.08.2023).

- [3] How war changes the milk market in Ukraine in 2022. Association of milk producers: website. URL: <http://milkua.info/uk> (access date: 24.07.2023).
- [4] Ukrainian dairy industry in war conditions. MilkUa Portal: website. URL: <http://milkua.info/uk> (access date: 03.09.2023).
- [5] Komarynytskyi I 2010 Mechanism formation of the dairy processing enterprises oriented on export organizational and economic support. *Marketing and innovation management*. J 2 155-159
- [6] Moshkovska O 2022 Dairy industry of Ukraine in martial law. *Goods and markets*. J 2 4-12
- [7] Rossokha V 2019 Forecasting trends and investments for the dairy industry and ensuring rational consumption of milk and dairy products by the population. *Economy of agro-industrial complex*. J 12 16-27
- [8] Ippolitova I 2016 Analysis of factors for ensuring competitive advantages of the Ukrainian dairy industry enterprises. *Economy and society*. J 6 160-166
- [9] Rutkevich T 2015 Adaptation of milk enterprises to european quality standards. *Scientific Bulletin of Kherson State University*. J 14 (3) 31-34
- [10] Zhalinska I 2017 Directions of quality management systems development in operational activities of dairy enterprises in Ukraine. *Economics and business management*. J 4 51-56
- [11] Melnyk L 2018 Ways of cost optimization for sales channels of milk-processing enterprises in Ukraine. *Pryazovsky Economic Bulletin*. J 6 (11) 137-240
- [12] Sharay S 2013 Logistics supply of milk products. *Management of projects, system analysis and logistics*. J 12 43-49
- [13] Zhurska O 2013 Logistic aspects of providing of competitiveness of agroindustrial enterprises are on processing of milk of Ukraine. *Efficient economy*. Available at: <http://www.economy.nayka.com.ua/?op=1&z=2461>
- [14] Nikolaiev V Information systems in logistics management. Kharkiv National University of Economics. 2018. B 231
- [15] Refugees from Ukraine situation. Operational Data Portal: website. URL: <https://data2.unhcr.org/en/situations/ukraine> (access date: 03.09.2023).
- [16] Production of livestock products by species. State Statistics Service of Ukraine: website. URL: https://ukrstat.gov.ua/operativ/operativ2022/sg/vpt/arh_vpt2022_u.html (access date: 15.08.2023).
- [17] Balances and consumption of the main food products by population of Ukraine. Statistical report. State Statistics Service of Ukraine. 2020. B 59
- [18] Changes in the dairy industry during the war in Ukraine. Diya Business Portal: website. URL: <https://export.gov.ua/news/> (access date: 15.08.2023).
- [19] Population of Ukraine by regions. MinfinMedia. Ukrainian portal about finances and investments: website. URL: <https://index.minfin.com.ua/ua/reference/people/> (access date: 03.09.2023).
- [20] 180-degree turn: how war changed the dairy industry and export markets. Access to the Truth: website. URL: <https://www.epravda.com.ua/columns/2022/07/4/688831/> (access date: 15.08.2023).