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**ANALYSIS OF THE GRAIN MARKET IN UKRAINE
AND THE DIRECTIONS OF THE DEVELOPMENT OF
GRAIN CARGO TRANSPORTATION LOGISTICS**

УДК 656.02

Шраменко Н.Ю., Музыльов Д.О., Манукян А.В. «Аналіз ринку зерна в Україні та напрямки розвитку логістики перевезень зернових вантажів»

Зернова логістика в Україні активно розвивається, а тому потребує дослідження проблем зернової інфраструктури та транспортно-логістичного забезпечення в ланцюгах постачання. Проведений аналіз динаміки обсягів виробництва зернових вантажів свідчить про їхнє поступове зростання протягом 2010-2019 рр. Аналіз динаміки обсягів перевезень зерна і продуктів перемолю залізничним транспортом свідчить про тенденцію динамічного збільшення обсягів перевезення впродовж 2010-2019 років. Однак суттєвим темпам зросту обсягів виробництва зернових, а отже, зросту обсягів їхнього перевезення з подальшою перевалкою в морських портах, не відповідає рівень ефективності логістики. Наслідком цього є висока собівартість українського зерна, а, отже, зниження його конкурентоздатності на зовнішньому ринку.

Виявлені недоліки процесу організації перевезень зернових вантажів залізничним транспортом в порти та запропоновані рекомендації щодо підвищення ефективності організації постачання зернових вантажів від постачальника до споживача.

Ключові слова: зернові вантажі, залізничні перевезення, ланцюги постачання, транспортно-логістичне забезпечення, зернова логістика, морські порти, елеватори, зернові термінали, залізничні станції, логістична інфраструктура.

Шраменко Н.Ю., Музылев Д.А., Манукян А.В. «Анализ рынка зерна в Украине и направления развития логистики перевозок зерновых грузов»

Зерновая логистика в Украине активно развивается, а поэтому нуждается в исследовании проблем зерновой инфраструктуры и транспортно-логистического обеспечения в цепях поставок. Проведенный анализ динамики объемов производства зерновых грузов свидетельствует об их увеличении в течение 2010-2019 гг. Анализ динамики объемов перевозок зерна и продуктов перемола железнодорожным транспортом свидетельствует о тенденции динамического увеличения объемов перевозок в 2010-2019 годах. Однако существенным темпам роста объемов производства зерновых, а следовательно, роста объемов их перевозки с последующей перевалкой в портах не соответствует уровень эффективности логистики. Следствием этого является высокая себестоимость украинского зерна, а, следовательно, снижение его конкурентоспособности на внешнем рынке.

Вявлены недостатки процесса организации перевозок зерновых грузов железнодорожным транспортом в порты и предложены рекомендации по повышению эффективности организации поставок зерновых грузов от поставщика к потребителю.

Ключевые слова: зерновые грузы, железнодорожные перевозки, цепи поставки, транспортно-логистическое обеспечение, зерновая логистика, морские порты, элеваторы, зерновые терминалы, железнодорожные станции, логистическая инфраструктура.

Shramenko N., Muzylyov D., Manukian A. “Analysis of the grain market in Ukraine and directions for the development of logistics for the transportation of grain cargo”

Grain logistics in Ukraine is actively developing, and therefore needs to study the problems of grain infrastructure and transport and logistics in supply chains. The analysis of the dynamics of grain production volumes indicates their increase during 2010-2019. An analysis of the dynamics of the volume of transportation of grain and grinding products by rail indicates a trend towards a dynamic increase in transportation volumes in 2010-2019. However, the level of logistics efficiency does not correspond to a significant growth rate of grain production volumes, and consequently, an increase in their transportation volumes with subsequent transshipment in ports. The consequence of this is the high cost of Ukrainian grain, and, consequently, a decrease in its competitiveness in the foreign market.

Deficiencies in the process of organizing the transportation of grain cargoes by rail to ports were identified and recommendations were made on improving the efficiency of organizing the supply of grain goods from supplier to consumer.

Keywords: grain cargoes, rail transportation, supply chains, transport and logistics support, grain logistics, seaports, elevators, grain terminals, railway stations, logistics infrastructure.

Introduction

Ukraine is one of the leading grain exporting countries in the world market. Agrarians apply a set of measures to increase grain yields, resulting in a record volume of grain production and legumes. However, the significant growth rate of grain production, and consequently the increase in their volume of transport with subsequent transshipment in seaports, does not correspond to the level of logistics efficiency. The result is a high cost of Ukrainian grain and, consequently, a decrease in its competitiveness on the foreign market. Therefore, the issue of increasing the efficiency of the formation of grain supply chains in the logistics system of distribution of cargo flows is urgent. The article analyzes the tendencies of development of the market of production of grain and leguminous crops for 2010-2019 in Ukraine and defines the directions of development of logistics of grain transportation.

Analysis of recent research and publications

Recently, there is an increasing attention of scientists to the development of the grain market in Ukraine [1-3] and problems of transport and logistics support in the agricultural sector [4-6].

In Ukraine, the logistics component of the cost of grain accounts for about 35% [7]. Therefore, the problem of reducing it is very important for Ukraine [8]. Low level of logistics is noted in farms when organizing the work of transport and harvesting complexes [4], and there are a number of problems in the organization of supply of grain cargo [9].

Experts note that the realization of Ukraine's export potential is significantly hampered by logistical problems, and especially in the field of rail transportation, which is currently the main part for the transportation of grain cargo. In this case, the increase in grain production, which is projected in the future, necessitates the storage and transportation of these cargoes, therefore, the infrastructure of the grain market [10]. However, in the conditions of development of infrastructure of grain terminals [11], as well as the formation of a rational structure of the car fleet [12] and freight wagon fleet [13] it is necessary to analyze and take into account the actual demand for transportation.

Studies [14,15] show that forwarding routing is one of the most important areas for improving the system of organization of carriages. Implementation of routing provides acceleration of delivery of goods to consumers, more efficient use of shunting means, reduction of downtime of wagons at technical stations, during transportation. At the same time, due to the reduction of the cost of transportation, it is advisable to develop a system of discounts for tariffs for transportation of goods by shipment routes [16].

Grain logistics in Ukraine is actively developing, which is why it requires research into the problems of grain infrastructure and transport and logistics support in supply chains.

The purpose and objectives of the study

The purpose of the study is to analyze the market of grain cargo transportation in Ukraine to determine the directions of increasing the efficiency of supply chains.

Research objectives:

- analysis of the dynamics of grain cargo production;
- analysis of the dynamics of transportations of grain cargoes by rail;
- analysis of the dynamics of transshipment of bread cargoes in seaports;
- identification of shortcomings in the process of organizing grain rail transportation to ports;
- development of recommendations for increasing the efficiency of grain freight transportation.

Results

Analysis of the dynamics of production volumes and volumes of grain transportation in Ukraine

The statistics of sowing area of cereals and leguminous crops in Ukraine (excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Sevastopol) for the years 2010-2019 [17] show that after the decrease of the areas since 2013, starting from 2016 in Ukraine there is a gradual increase in acreage, but it is insignificant (Fig. 1).

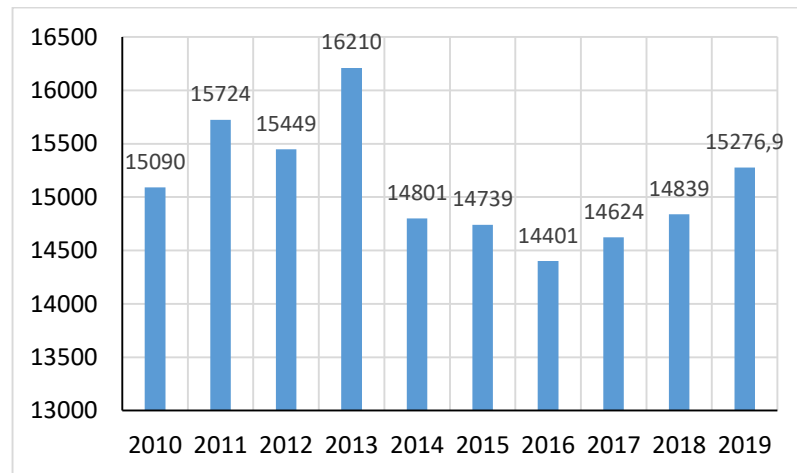


Figure 1. Sown area of cereals and legumes in Ukraine for 2010-2019, thousand hectares

Source: Created by the authors on the basis of [17]

The analysis of the sowing area of cereals and legumes by region in 2019 [17] shows that Kharkiv region ranks third among other regions in Ukraine (Fig. 2).

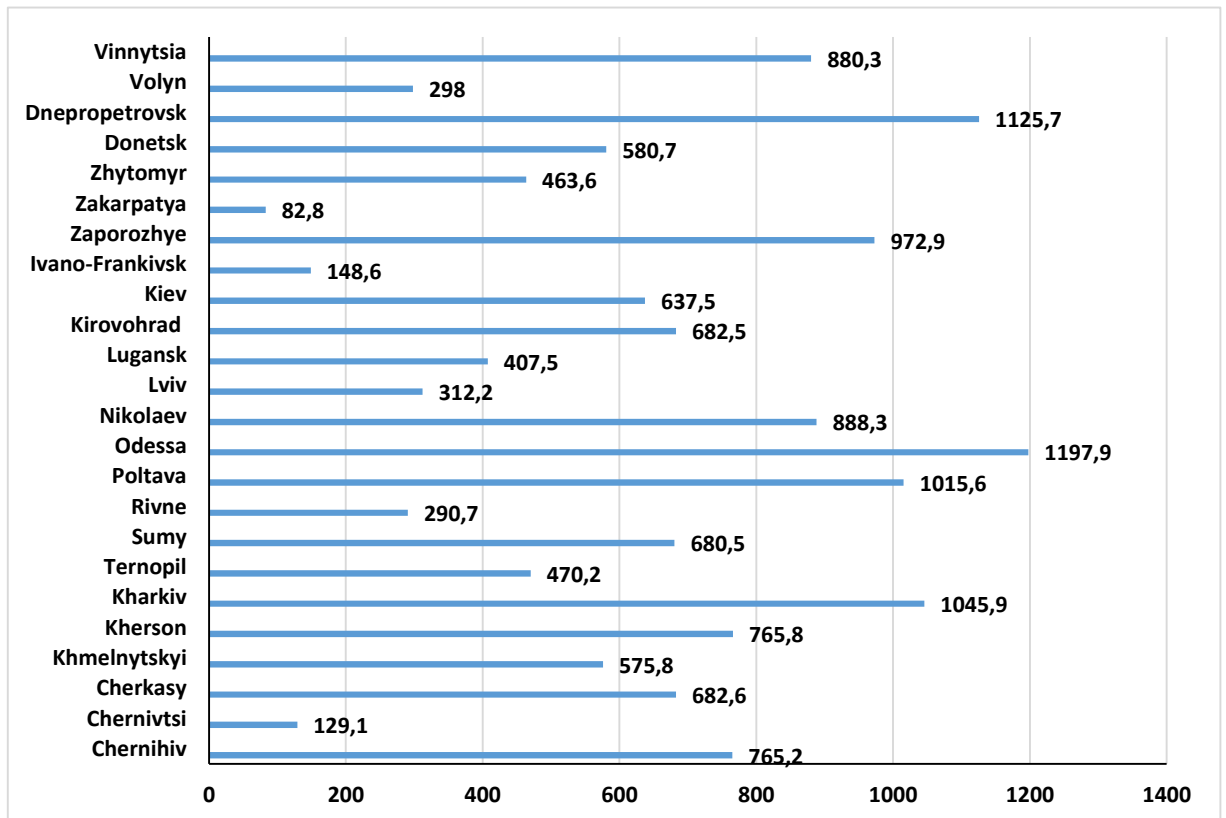


Figure 2. Sowing area of cereals and legumes by region of Ukraine in 2019, thousand hectares

Source: authors-based [17]

The dynamics of production of cereals and leguminous crops in Ukraine (excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Sevastopol) [17] indicates their gradual growth during 2010-2019 (Fig. 3). At the same time, the volume of cereals production in 2019 (75077,82 thousand tonnes) compared to 2010 (37867,1 thousand tonnes) almost twice this figure.

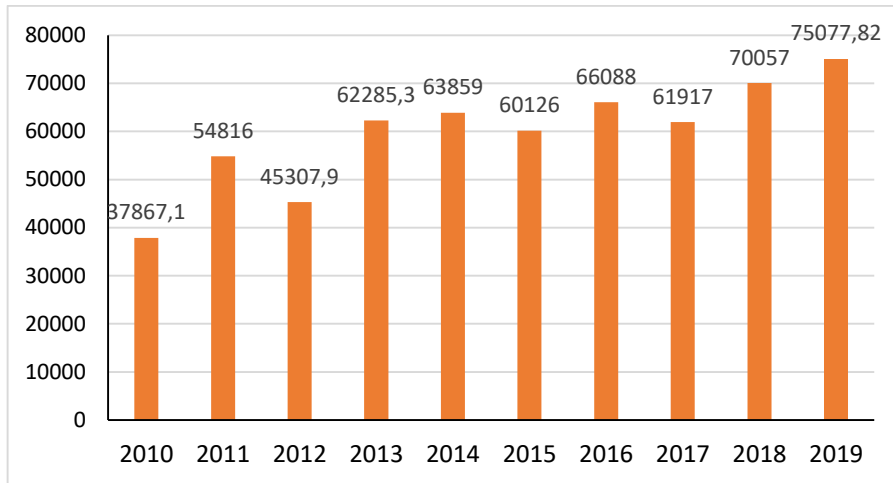


Figure 3. Production (gross harvest) of cereals and legumes in Ukraine for 2010-2019, thousand tons
 Source: authors-based [17]

Analysis of statistics on the volume of production (gross harvest) of crops by regions of Ukraine in 2019 [17] shows that Kharkiv region ranks 6th among other regions in Ukraine (Fig. 4).

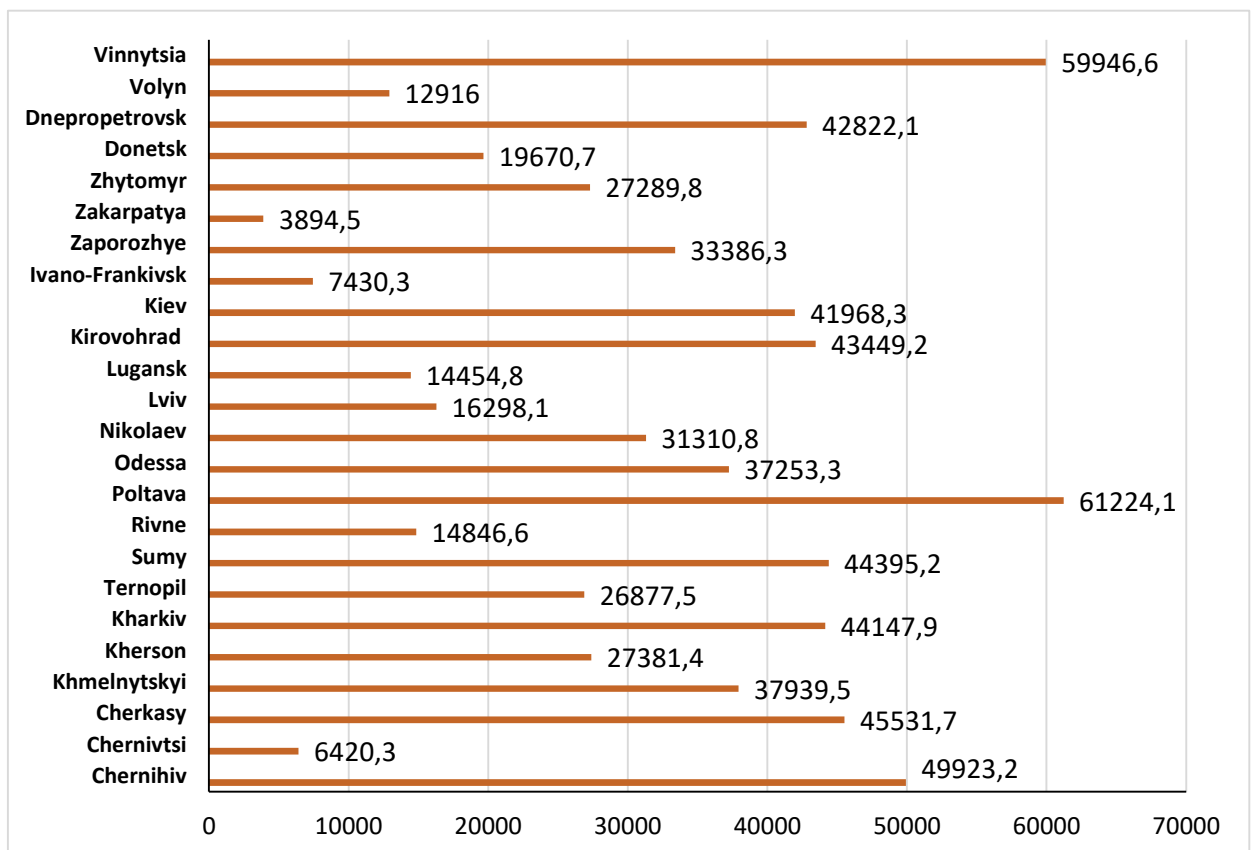


Figure 4. Production (gross collection) of cereals and legumes by region of Ukraine in 2019, thousand tons
 Source: authors-based [17]

Therefore, based on the analysis of statistical data (Fig. 2, Fig. 4), Kharkiv region is a promising region for the cultivation and gross collection of cereals and legumes. This necessitates the further development of transport and grain infrastructure in the region, as well as improving the efficiency of the organization of transport of grain cargoes, especially in the export connection.

The dynamics of grain and leguminous crops yield changes in Ukraine is analyzed (data are given without taking into account the temporarily occupied territories of the Autonomous Republic of Crimea, Sevastopol and parts of temporarily occupied territories in Donetsk and Luhansk regions.) For 2010-2019 [17] and identified in 2019 (Fig. 5), this figure has a maximum value of 49, 1 q per 1 ha of harvested area.

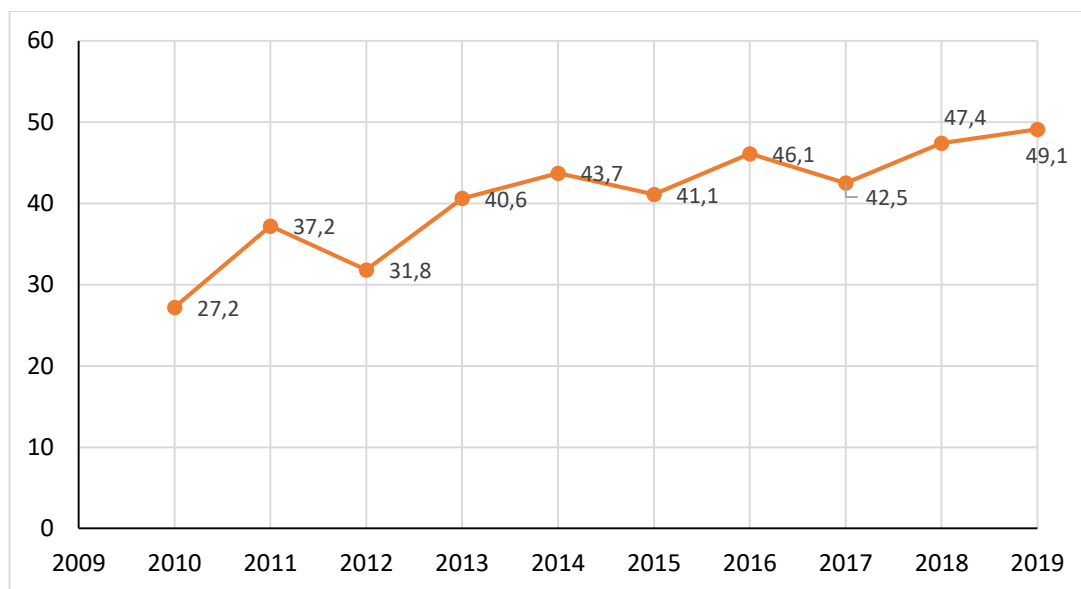


Fig. 5. Yields of cereals and legumes in Ukraine for the years 2010-2019, c per 1 ha of harvested area

Source: authors-based [17]

Analysis of the statistics (Fig. 5) shows that the yield of cereals in 2019 (49.1 cc per 1 ha of harvested area) compared to 2010 (27.2 cc per 1 ha of harvested area) has almost doubled. Taking into account the fact that the sowing area of cereals in 2019 almost did not change in comparison with 2010 (Fig. 1), it can be concluded that the significant increase in the yield of cereals and legumes in Ukraine during 2010-2019 is due to the following factors:

- favorable weather and climatic conditions (soil quality and composition, terrain, terrain temperature, groundwater level, rainfall, etc.);
- use of modern technologies of grain cultivation (qualitative preparation of seeds, fertilizers of soil, performance of field works in a short time, etc.);
- the use of modern harvesting equipment and equipment that is more economical and less costly in harvesting.

However, it should be noted that not all farms are equipped with new harvesting equipment and are still using outdated equipment.

The overwhelming proportion of grain cargoes [10] that are sent to the foreign market are transported through ports and delivered to terminals by rail.

In 2019, the maximum figures for the volume of grain cargo processing in the seaports of Ukraine were recorded. According to reporting statistics [18-23] dynamics of volumes of processing of bread cargoes for 2014-2019 was constructed (Fig. 6). At the same time, grain cargoes occupy the first place in the volume of processing [23] in seaports (34.13%) among the whole nomenclature of cargoes (Fig. 7). In this regard, the development of measures to increase the efficiency of the process of supplying grain cargo to seaports with a view to further exporting this cargo becomes relevant.

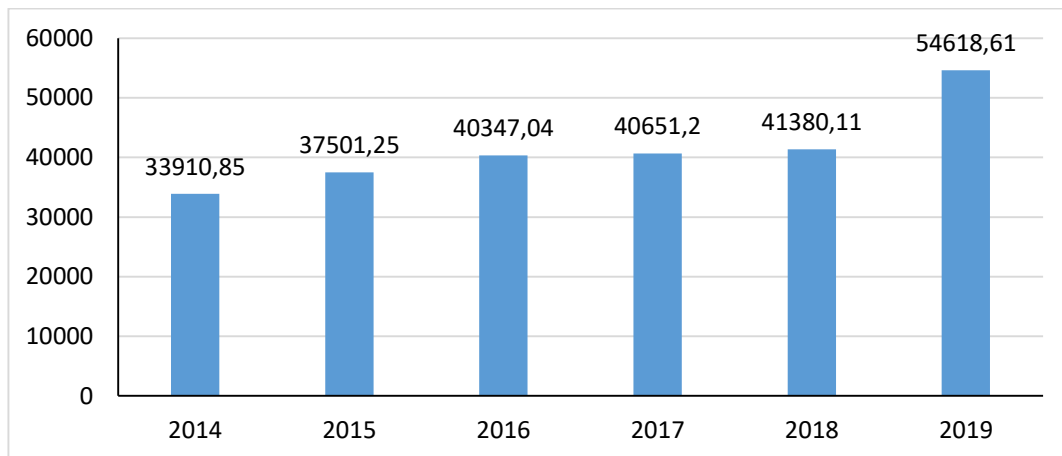


Fig. 6. Volumes of transshipment of grain cargoes in seaports of Ukraine, thousand tons

Source: authors-based [18-23]

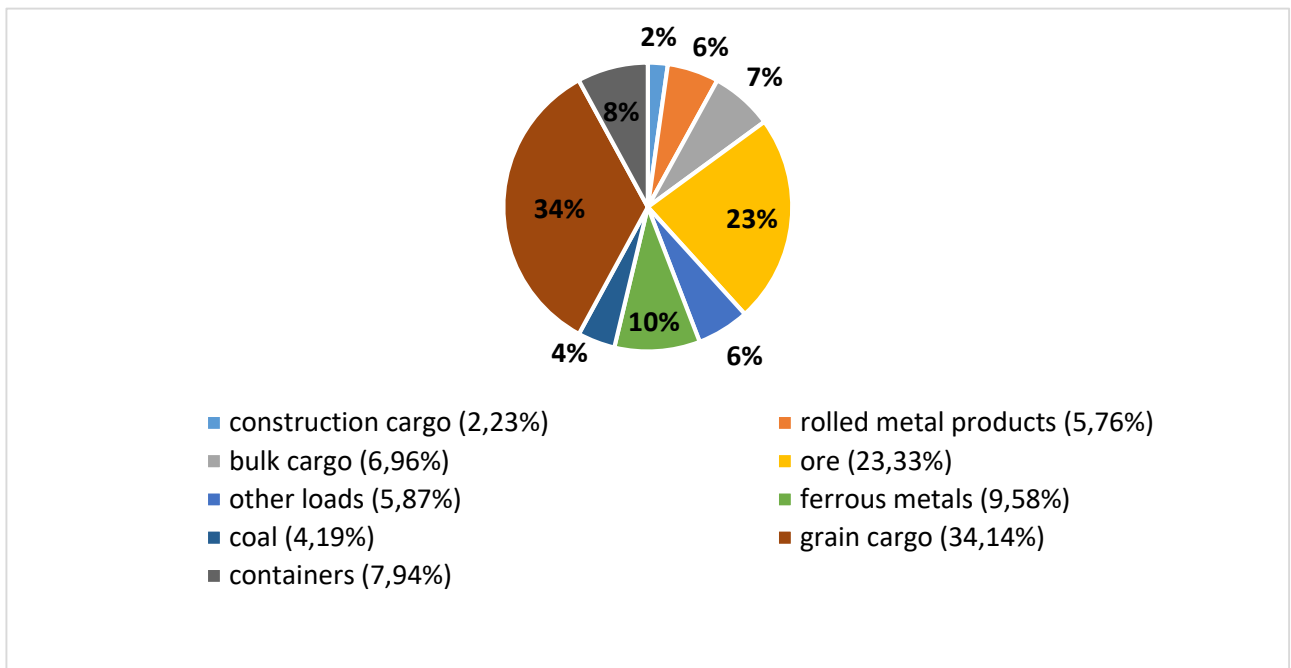


Figure 7. Structure of volumes of transshipment of cargoes in seaports of Ukraine by type of cargo in 2019, %

Source: authors-based [23]

The leaders in the processing of grain cargo among the seaports of Ukraine in 2019 [23] are 4 ports (Fig. 8): the Nikolaev seaport (29.76%), the Black Sea port (23.19%), the seaport "South" (20.14%), Odessa seaport (16.28%).

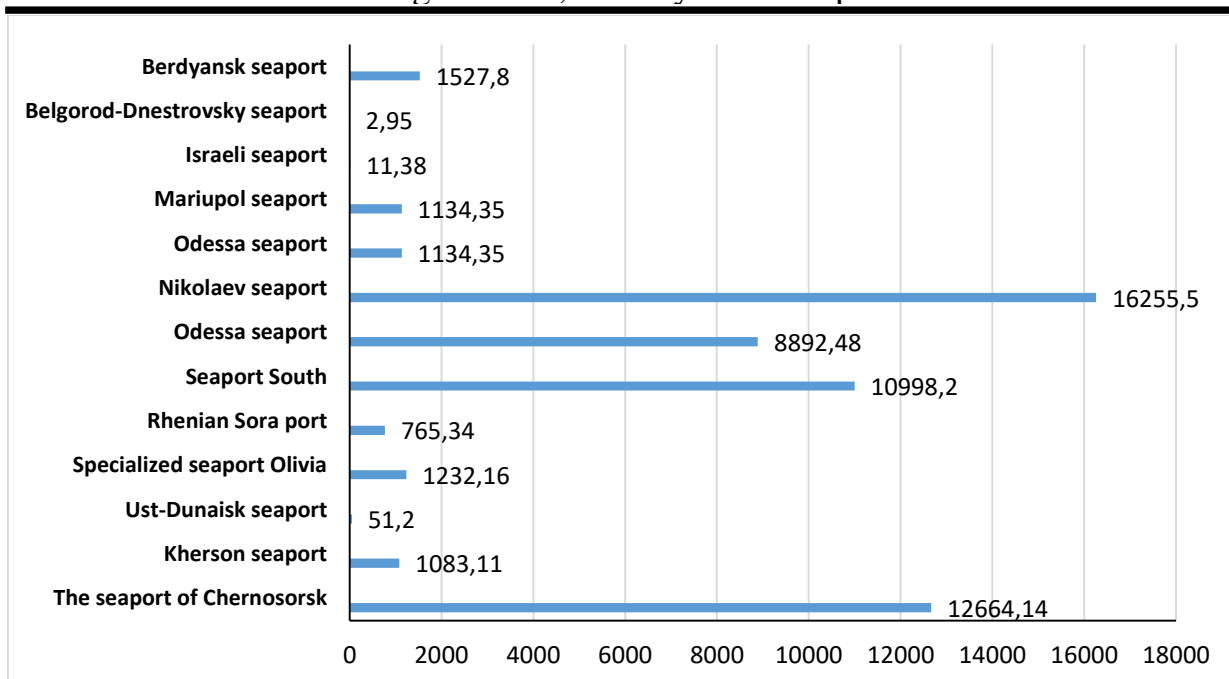


Figure 8 - Volume of processing of grain cargo in the seaports of Ukraine in 2019, thousand tons
 Source: authors-based [23]

The dynamics of the volume of transportation of grain and products of grinding by rail [17] shows that there is a tendency of a constant increase in the volume of transportation during 2010-2019 (Fig. 8). At the same time, in 2019 (39.8 million tonnes), as compared to 2010 (12.2 million tonnes), the volume of transportations of grain cargoes by rail increased more than three times.

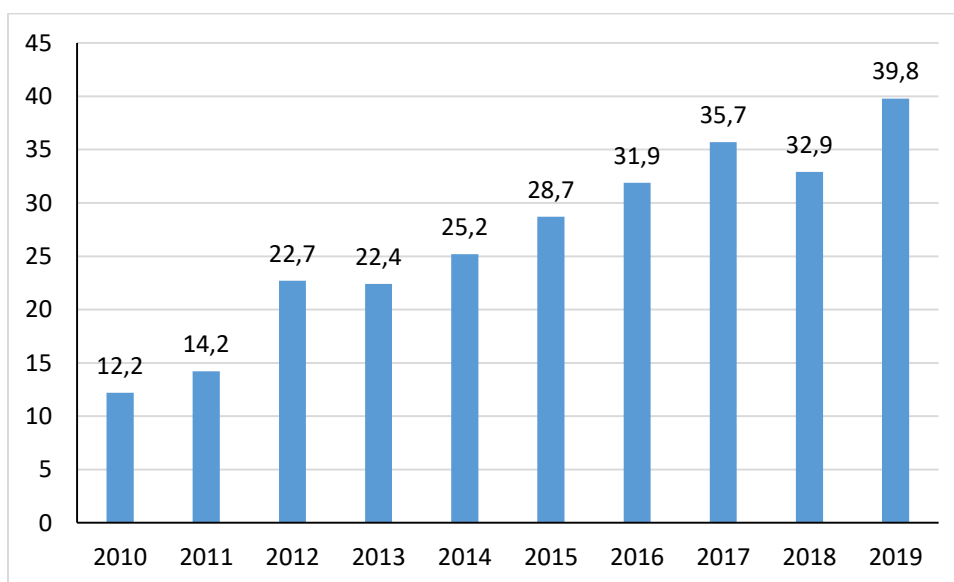


Fig. 8 - Volume of transportation of grain and products of grinding by rail, mln. Tons
 Source: authors-based [17]

Analysis of the process of supplying grain freight by rail and recommendations

The increase in the volume of transportation of grain cargoes and products of grinding by rail is caused by the following factors:

- a significant increase in grain production (Fig. 3);

- renovation and enlargement of the rolling stock fleet, namely grain trucks, mainly since 2009 [24];
- increasing the efficiency of the organization of transportation by forming mainly route trains on the threads of the schedule (about 180 railway stations were re-oriented to the formation of route departures, with the freight train departing clearly on schedule [1]). In addition, Ukrzaliznytsya distributes the maximum number of routes through the Prozorro system, which gives equal access to all participants [1].

At the same time, the analysis of practical experience revealed the shortcomings of the process of supplying grain cargoes by rail to ports:

- the infrastructure of grain terminals needs to be further developed, as well as the capacity to store grain at route stations and the capacity of grain handling equipment in seaports to be increased;
- insufficient number of rolling stock, including grain trucks [10,25];
- insufficient quantity and significant wear (90-95%) of the fleet of locomotives, which leads to a fall in the turnover of cars [10];
- low capacity of port railway stations. As a result, there is an imbalance between the capacity of port railway stations and the terminals that use their services [10];
- unsatisfactory condition and deterioration of some sections of the network of railways and highways, which leads to a decrease in the total capacity of the railway;
- the formation of departure routes does not determine the optimal number of cars in the train and does not determine the optimal interval of grain supply from the elevators to the ports;
- the actions of all participants of the grain delivery process in the supply chain (agricultural suppliers, elevators, carriers, terminals, ports) [1] are not mutually consistent, which leads to irrational use of transport and transport and warehouse resources and leads to an increase in the cost of grain cargo.

In order to increase the efficiency of grain transportation from supplier to consumer, including in mixed traffic, it is recommended that:

- apply modern technologies of loading and unloading works on elevators and ports to reduce the idle time of vehicles under cargo operations and, consequently, to accelerate their rotation;
- apply optimization methods in planning and organization of grain transportation in the presence of technological restrictions on the network of railways and highways;
- to make the choice of rational technological parameters in the organization of wagon flows by technological routes in the logistics chain of supply of grain cargo;
- to coordinate technological processes in supply chains and junction modules of different modes of transport in order to prevent inter-operative and non-standard downtime of vehicles and transport and storage resources;
- coordinate the activities of agro suppliers, elevators, carriers, terminals, ports and other market participants in order to achieve synergistic effects throughout the logistics system of grain supply.

Therefore, special attention needs to be given to the efficient organization of wagon traffic when delivering grain cargoes from elevators to ports based on logistical principles. First of all, it concerns the organization of technological routes.

Conclusions

Based on the analysis of statistics for the years 2010-2019, it is determined that in Ukraine there is a tendency of gradual increase of production volumes and yields of cereals and legumes. At the same time, there is a tendency of dynamic increase of volumes of grain transportation and products of grinding by rail transport and a considerable increase of volumes of processing of grain cargo in seaports (to 54618,61 thousand tons in 2019). Therefore, Ukraine has significant export potential for the supply of grain cargo. This necessitates the further development of transport and

grain infrastructure in the country, as well as improving the efficiency of the organization of supply of grain cargo, especially in the export connection, which will allow to reduce the cost of grain and, consequently, to increase its competitiveness in the world market.

The shortcomings of the process of organizing the transportation of grain cargo by rail to ports were identified, among which: insufficient coordination and mutual coordination of the actions and interests of all participants of the grain delivery process in the supply chain (agricultural suppliers, elevators, carriers, terminals, ports) interval of grain supply from elevators to ports.

Recommendations for increasing the efficiency of the organization of supply of grain cargoes from the supplier to the consumer, which include, first of all, the following are proposed: to choose rational technological parameters for the organization of freight flows by technological routes in the logistics chain of supply of grain cargoes; to coordinate technological processes in supply chains and junction modules of different modes of transport; coordinate the activities of agricultural suppliers, elevators, carriers, terminals, ports and other market participants.

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