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MANAGEMENT OF FOOD SECURITY AND TRANSPORT SERVICES OF AGRICULTURAL ENTERPRISES OF THE GRAIN MARKET

Viktor Koval, Kateryna Kozak, Ihor Savenko, Valeriia Drozdova, Natalia Asaulenko, Iryna Honcharova. «Management of Food Security and Transport Services of Agricultural Enterprises of the Grain Market». *The article presents the results of a study of the state of transport support for agricultural producers as a basis for ensuring food security both within the country and in the international arena. The main types of transport involved in organizing transport services for various groups of agricultural products are described. The main directions for ensuring the high-quality and timely export of finished products from the places of their production are considered, especially grain crops and milling products, which play an important role in fulfilling the guarantees provided by Ukraine in the global food security mechanism. The methodology of statistical research is used as a tool for assessing the effectiveness of the analysis since the demand for transport services depends on the efficiency of agricultural enterprises, which, in turn, are very sensitive to natural and climatic influences. According to the results of the study, only 4% of the total number of road transports was carried out on orders from livestock producers, which means not only a low level of development of the transport service system for this group of agricultural producers, but may also be a consequence of imbalances in the development of this sector of agricultural production. The results obtained can be used to identify internal reserves for increasing the coverage of agricultural producers with transport services to meet domestic demand for food and reduce food imports due to the inability to provide domestic producers with reliable logistics services. Ensuring food security is a complex process that requires high-quality interaction between many industries and effective management by state authorities. Transport services for agricultural producers should become an effective tool for ensuring food security both in the domestic market of Ukraine and in fulfilling Ukraine's international obligations.*

Keywords*:* management, food security, grain market, transport services, transportation of grain and milled products, transportation of agricultural products of plant and animal origin

Віктор Коваль, Катерина Козак, Ігор Савенко, Валерія Дроздова, Наталя Асауленко, Ірина Гончарова «Управління продовольчою безпекою та транспортним обслуговуванням аграрних підприємств зернового ринку». *У статті наведено результати дослідження стану транспортного забезпечення сільськогосподарських товаровиробників як основи забезпечення продовольчої безпеки як усередині країни, так і на міжнародній арені. Охарактеризовано основні види транспорту, задіяні в організації транспортного обслуговування різних груп сільськогосподарської продукції. Розглянуто основні напрями забезпечення якісного та своєчасного вивезення готової продукції з місць її виробництва, особливо зернових культур та продуктів їх перемолу, які відіграють важливу роль у виконанні гарантій, які надає Україна в глобальному механізмі продовольчої безпеки. Як інструмент оцінки ефективності аналізу використовується методологія статистичних*

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досліджень, оскільки попит на транспортні послуги залежить від ефективності роботи сільськогосподарських підприємств, які, у свою чергу, є дуже чутливими до природно-кліматичних впливів. За підсумками дослідження, лише 4% від загальної кількості перевезень автомобільним трнаспортом було здійснено за замовленнями виробників тваринництва, що означає не тільки низький рівень розвику системи транспортного обслуговування цієї групи виробникев сільськогосподарської продукції, але й може бути наслідком диспропорцій у розвитку цієї галузі сільськогосподарського виробництва. Отримані результати можуть бути використані для виявлення внутрішніх резервів збільшення охоплення сільгоспвиробників транспортними послугами з метою забезпечення внутрішнього попиту на продовольство та зменшення імпорту продовольства через неможливість забезпечити вітчизняних товаровиробників надійними логістичними послугами. Забезпечення продовольчої безпеки - складний процес, що потребує якісної взаємодії багатьої галузей та ефективного керування з боку державних органів. Транспортне обслуговування виробників сільськогосподарської продукції має стати ефективним інструментом забезпечення продовольчої безпеки як на внутрішньому ринку України, так й при виконанні міжнародних зобовязань України.

Ключові слова: управління, продовольча безпека, зерновий ринок, транспортне обслуговування, перевезення зерна та продуктів перемолу, перевезення сільськогосподарської продукції рослинного та тваринного походження

Introduction. In the context of international specialization in agricultural production, the distribution of products across different countries is uneven. To ensure the direct consumption of agricultural goods, they must be transported over considerable distances. The management of transport services for agricultural enterprises addresses two key challenges: the efficient sale of agricultural products and the assurance of food security.

Transport services tailored for agricultural producers aim to guarantee seamless support for all stages of production, addressing the time-sensitive demands of the sector. The seasonal variability of agricultural operations necessitates a diverse fleet of transport vehicles and the implementation of an efficiently organized transportation management system (Burak et al., 2019). To foster optimal conditions for agricultural output, careful coordination of product flows is essential, especially in light of possible alterations to the quality or properties of goods during transit (Davydenko, Titenko, Koval, & Skrypnyk, 2024). This underscores the critical importance of bolstering security measures, which form an integral component of the transport management framework for agricultural enterprises.

The development of agricultural markets depends on the methods used to ensure a sufficient supply of goods (Penev, Shyriaieva, Legeza, Merkulov, & Honcharova, 2024). Uneven production capabilities across different regions, climate changes that continuously worsen conditions for growing traditional crops, and the passive approach of some producers in seeking new crops and adapting to evolving agricultural conditions all contribute to the growing importance of transport infrastructure for grain producers in ensuring food security (Koval et al., 2025).

However, established supply chains are not always optimal and may fail to align with shifting production conditions and crop patterns influenced by climate change. Effective management of transport logistics for agricultural producers is, therefore, a key factor in enhancing the efficiency of agricultural production (Honcharova et al., 2024).

In the grain market, an essential component of transport service management is the organization of grain and pre-milled product deliveries to ports. Since most shipments cover long distances, sea transport

plays a crucial role (Honcharova & Metil, Finding areas of innovative activity of the enterprise, 2022). This study aims to analyze how different delivery methods for grain and pre-milled products impact the final cost of goods, which form the foundation of food security.

Literature review. Globalization and local integration create conditions that enhance the ability of agricultural producers to supply their products, which is reflected in the level of profitability of agricultural production. Rau et al. (2023) argue that increasing the mobility of goods is easier in the presence of established transportation channels, but technological barriers may arise in creating new transport links, especially in the process of supporting cross-border trade (Rau, Antoniou, Busch, & Hariharn, 2023). Matyushenko and Redko (2020) point to the need to eliminate Ukraine's transport isolation in the field of rail transport due to differences in rail standards, which confirms the view of Rau et al. on the need to overcome technological discrepancies to ensure international mobility (Matyushenko & Redko, 2020).

The impact of globalization processes on world markets is highlighted by Sabri (2024), paying special attention to the food market as one of the most socially significant in the framework of global cooperation (Sabry, 2024). According to van den Akker et al. (2024), there are currently some problems that can be solved in the process of transporting food supply networks since existing established supply chains do not meet the global demand for food, especially in East African countries (van den Akker, Fabbri, & Slater, 2024). Thow and Nisbett (2019) consider the issues of the stability of food systems depending on the quality of transport service management for agricultural producers, paying attention to the issues of timely adjustment of transport flows to implement qualitative changes in the system of ensuring the stability of food supplies (Thow & Nisbett, 2019, 394(10200)).

Particular attention is paid by various authors to environmental issues, the management of which is a component of transport service management. Gie et al. (2024) consider global trends in changes, including in the field of transport, necessary for the sustainable development of the environment (Gie, McNeill, & Bannerman, 2024). Mia et al. (2022) emphasize the impact of green entrepreneurship on social changes in the world and draw attention to the possibilities of green entrepreneurship in the provision of transport services to agricultural producers, including grain producers (Mia, et al., 2022).

As a solution to the food security problem, Tsai et al. (2020) propose to develop smart and sustainable supply chains in cooperation with logistics, for which it is proposed to digitally reorganize existing supply chains, but this reorganization is largely aimed at tracking the location of food cargo, changing vehicles, but does not consider the issues of providing backup methods of food delivery, which does not contribute to strengthening food security (Tsai, Kosacka-Olejnik, & Golinska-Pawson, 2020). Skyba et al. (2023) consider the possibilities of clusters in the economic development strategy, but do not take into account the need to implement modules for ensuring food security in city clusters (Skyba et al., 2023). Despite the diverse study of the possibilities of improving transport services for agricultural producers, and especially grain crops, which form the basis of food security in various territories, and for which Ukraine is one of the main suppliers of food, transport issues require further study in order to improve the management of both transport services and food security.

Description of the research object. One of the priority areas of economic development in Ukraine is the development of agricultural production since there are production resources available and there is significant potential for increasing the efficiency of agricultural production. Over the past 35 years, there has been a varying

percentage of value added to Ukraine's gross domestic product generated in the fields of agriculture, forestry, and fisheries (Figure 1).

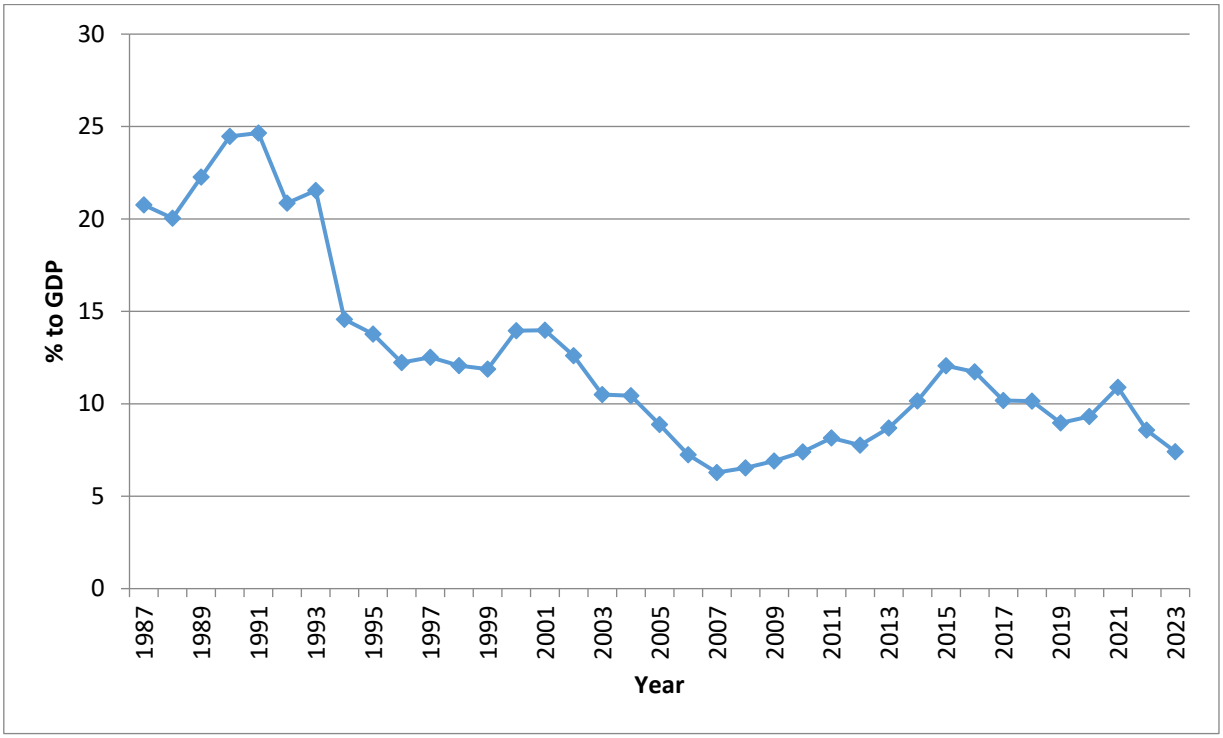

Figure 1. Percentage of value added in Ukraine's GDP generated in agriculture, forestry, and fishing.
Source: Compiled based on (World Bank, 2024).

Significant fluctuations in the percentage of added value (maximum 24.65% in 1993, minimum 6.28% in 2007) are explained by different levels of added value creation in the field of industrial production. However, for Ukraine, the percentage of added value from gross domestic product significantly exceeds the world average, which indicates significant volumes of agricultural production and the constant demand for transport services for agricultural producers.

Since different territories are differently provided with transport infrastructure, there are imbalances in the transport services for agricultural producers.

The role of road transport in providing agricultural producers. In Ukraine, the most developed system of automobile support in the field of transport services is the system of automobile support. Therefore, the vast majority of agricultural products are transported by road. According to the results of the observation conducted by the State Statistics Service of Ukraine for the period from 2017 to 2021, the vast majority of agricultural products transported by road are grain products (78-80%), and among other types of plant products, potatoes (0.4%), sugar beets (3%), other fresh vegetables and fruits (3.4%), live plants and flowers (0.1%) and other plant products (10.1%).

Among animal products, live animals account for 0.2% of the total volume of cargo transported by road for the period from 2017 to 2021, milk accounts for 2.1%, and other raw materials of animal origin account for 0.4% (Figure 2).

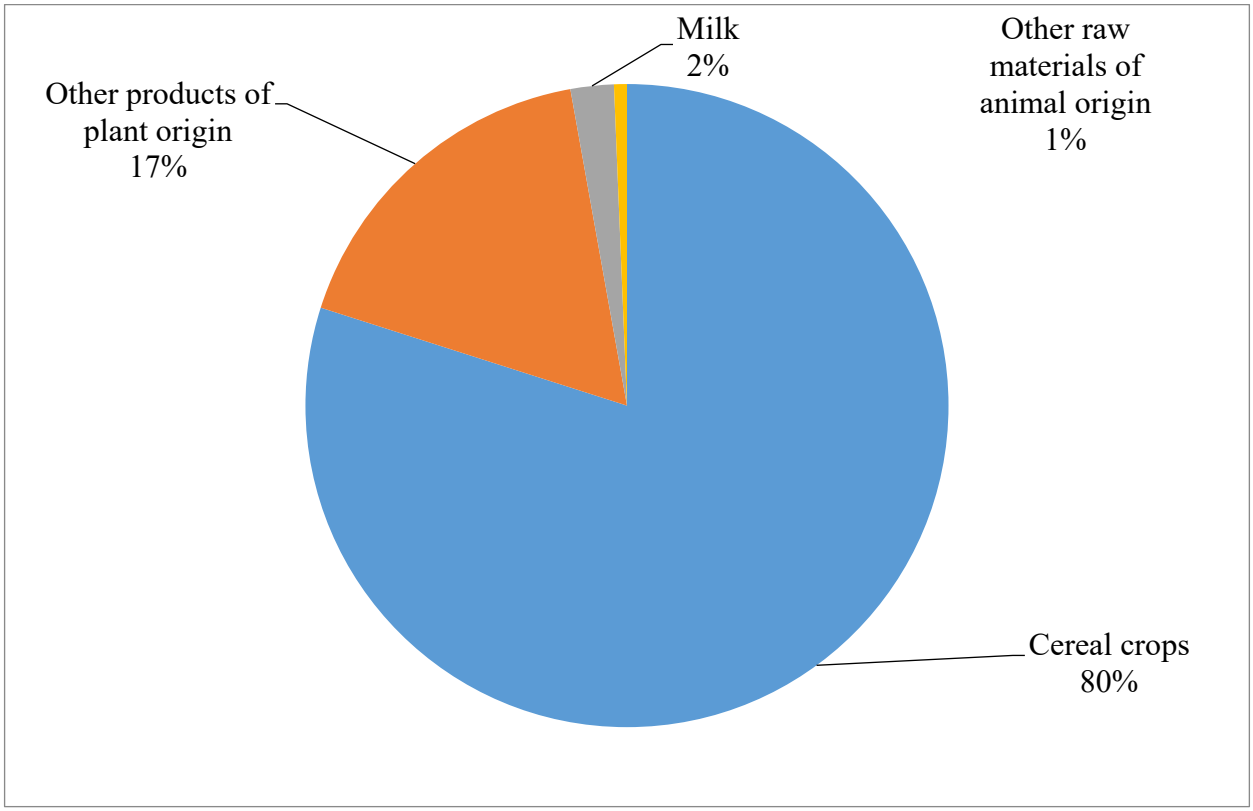

Figure 2. Transportation of agricultural products by road.
Source: Compiled based on State Statistics Service of Ukraine (2024).

To provide road transport services for the transportation of plant products, it is necessary to take into account the specifics of the goods, the transportation of which was ordered by agricultural producers. For the transportation of vegetables and fruits, which are transferred by the customer of transport services in specialized containers, it is necessary to provide for the reverse circulation of the container, the transportation of which should be carried out in the most compact form to save transport resources. Also, when transporting fruits and vegetables, depending on the density of the fruits, commodity volumes should be provided, taking into account natural waste due to possible errors in sorting products.

When transporting small-scale crop products, such as dill, green onions, it is necessary to take into account temperature regimes and air humidity levels (Shmygol, Luczka, Harbar, Koval, & Cioca, 2024, No 1, Vol.72). When transporting flowers, seedlings and seedlings, there are also features that must be taken into account when planning transport services for agricultural producers.

Road transport is actively used in the transportation of agricultural products in international traffic. Figure 3 presents general information on the transportation of agricultural products by road in international traffic for the period from 2017 to 2021.

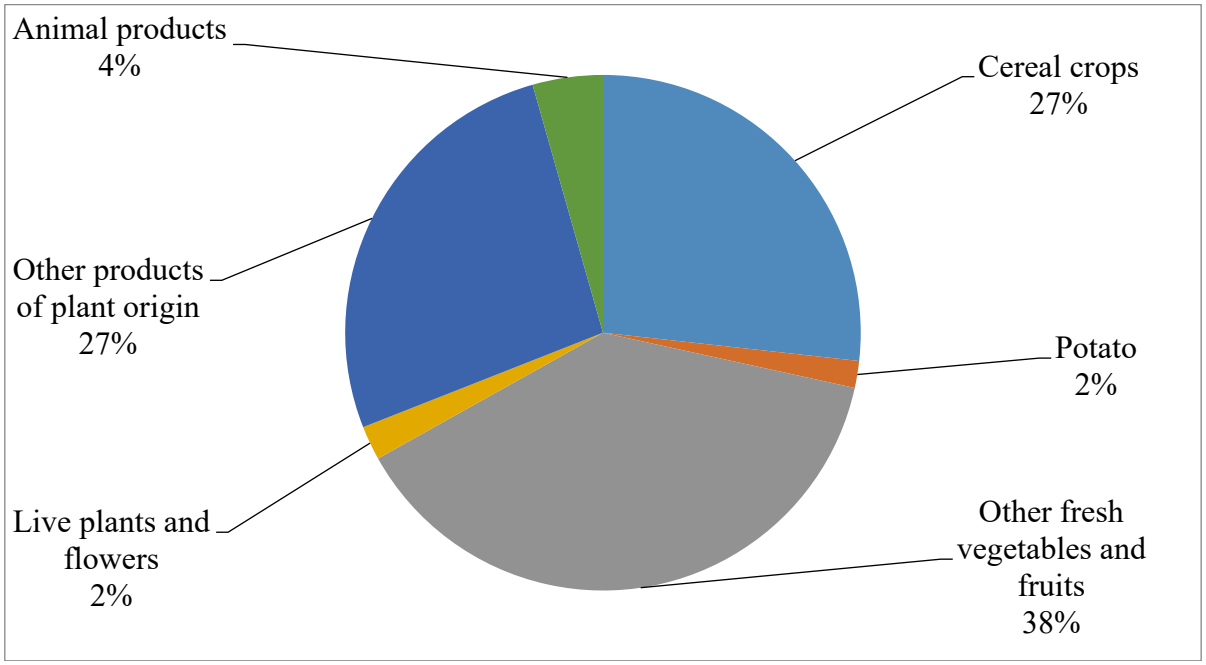

Figure 3. Transportation of agricultural products by road in international traffic.
Source: Compiled based on State Statistics Service of Ukraine (2024).

In international traffic, the vast majority of products transported within the framework of transport services for agricultural producers are fresh vegetables and fruits (38%). This is due to the high mobility of road transport, the convenience of loading and unloading operations, and the high density of roads in areas where these types of agricultural products are actively produced. Under these conditions, it is observed that other plant products account for 27% of the total volume of transportation within the framework of transport services for agricultural producers by road in international traffic. In general, crop products account for 96% of the total volume of transportation by road in international traffic, which is explained by the significant mobility of crop producers, unlike livestock producers (State Statistics Service of Ukraine. Agriculture, forestry and fisheries).

In contrast to the total volume of road transport, grain has a much smaller share in international transport (27% versus 80%), which is due to the use of other types of transport for grain producers to provide transport services in the implementation of international agreements. A significant part of the transportation of grain and milling products is carried out by rail and water transport. In general, rail and water transport for the period from 2016 to 2020 transported mainly grain and milling products from the variety of agricultural products (Figure 4).

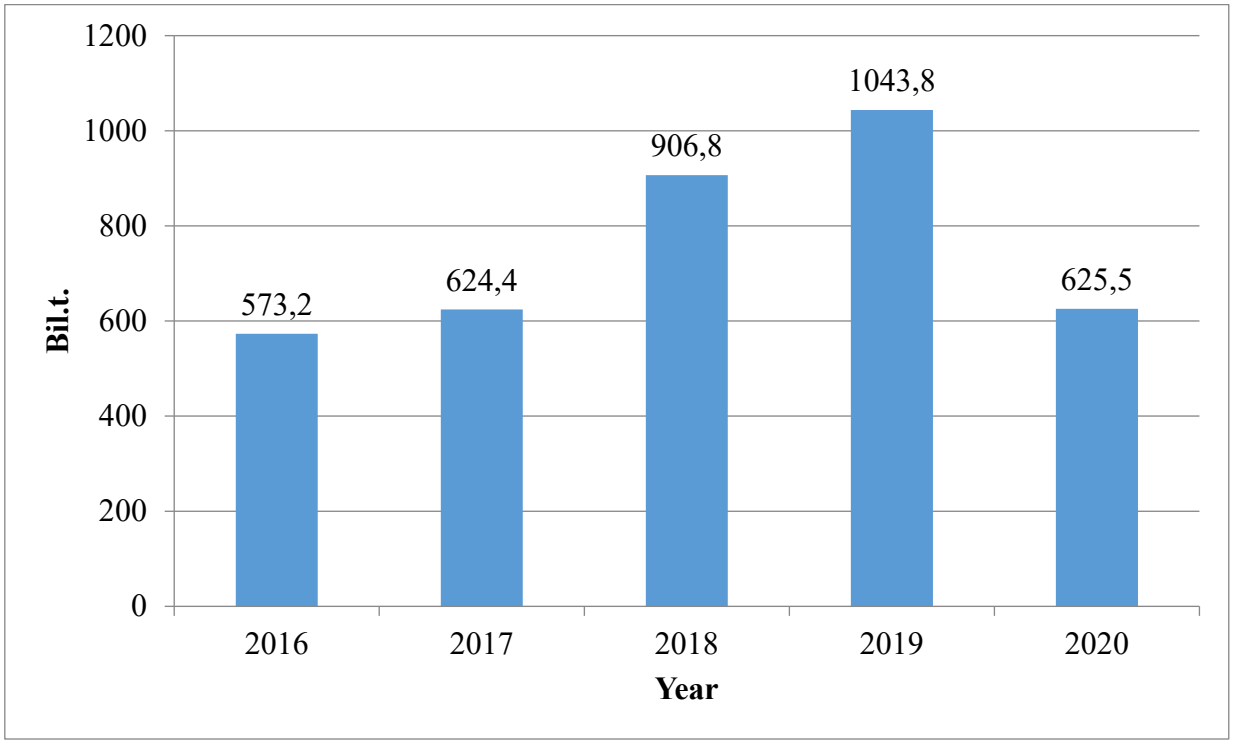

Figure 4. Transportation of grain and milling products by rail and water transport.
Source: Compiled based on State Statistics Service of Ukraine (2024).

The role of railway transport in ensuring the export of agricultural products. Railway transport provides transport services to grain producers only within the territory of Ukraine, which is explained by the difference in tracks between Ukraine and the EU countries and other European countries. The exception is the railway tracks in Moldova, which have the same standard as the tracks in Ukraine. However, due to the lack of demand for grain from Moldova, these tracks are used only for transit transportation of grain to the seaport of Reni, which provides transport services for the functions of a river and seaport at the same time. The port, which is located in the South-Western part of Ukraine, at the junction of the Ukrainian, Romanian and Moldovan borders, and the intersection of four transport corridors (Cretan No. 7 and No. 9, Eurasian and Black Sea), has great potential, especially in the field of international trade, however, deliveries to this port can only be carried out either by road or by rail in transit through the territory of Moldova.

The role of water transport in ensuring the export of agricultural products. Since there are certain specifics in the transport service of grain and milled products producers, such as large batches of products, the threat of fires during transportation, complex loading and unloading processes that require stationary specialized equipment, transport service by water transport is in the greatest demand among grain and milled products producers operating in the international food security system. Figure 5 presents the total volumes of grain and milled products transported by water from 2016 to 2020.

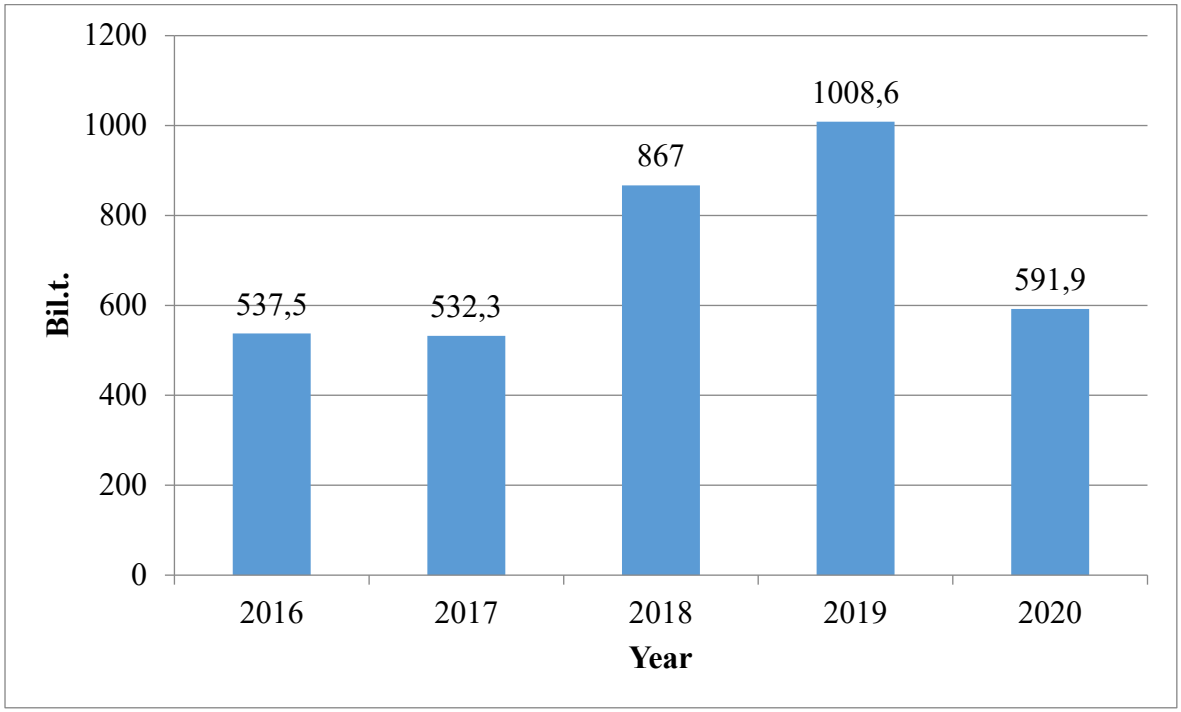

Figure 5. Transportation of grain and milling products by water in 2016-2020.
Source: Compiled based on State Statistics Service of Ukraine (2024).

The production of grain and milled products significantly exceeds Ukraine's domestic needs for these types of agricultural products, therefore, a significant part of the transportation is provided by transport service providers that carry out transportation by water modes to grain and milled products producers when carrying out international transportation (Figure 6).

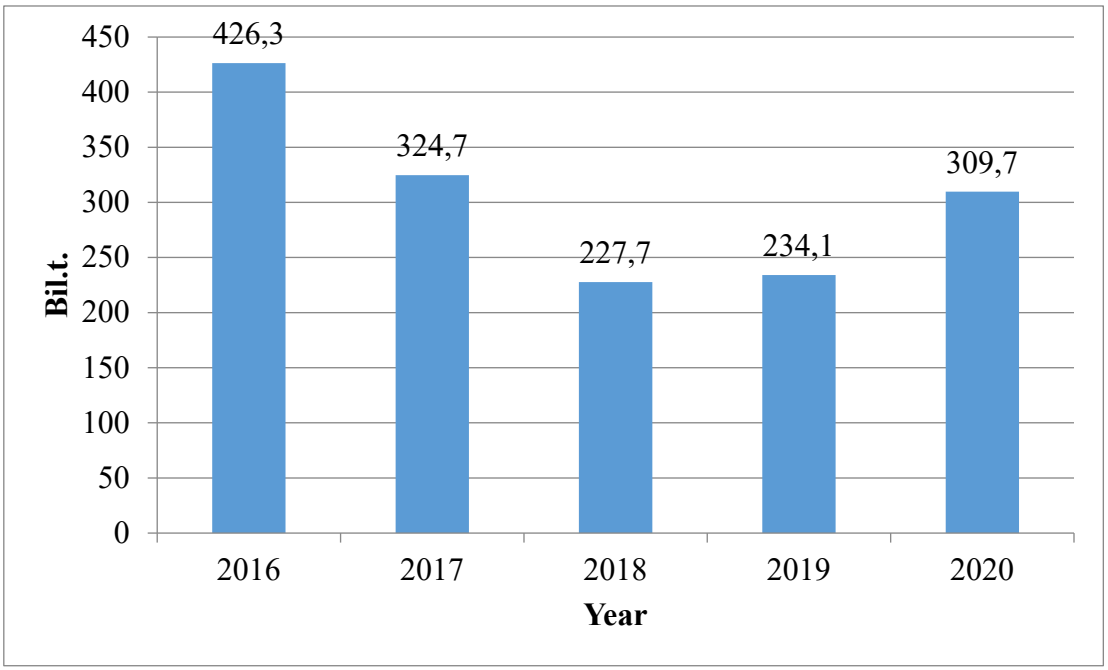

Figure 6. Transportation of grain and milling products by water transport in international traffic.
Source: Compiled based on State Statistics Service of Ukraine (2024).

Ukraine's priority in the production of grain and milled products, formed in the process of international specialization, plays an important role in creating a system of international food security and shapes the volumes of gross domestic product and exports, which affects Ukraine's position at the international level.

Conclusions. The study of the transport support system of agricultural producers showed that the main commodity flow both in the domestic and foreign markets is grain milled products. When transported by road, grain and milled products make up 80% of the total volume of transportation, which indicates the stability of demand for services for the transportation of this type of agricultural product, especially within the domestic market, since in foreign trade operations, grain transportation makes up only 27% of the total volume of goods transported. Consequently, road transport plays a more significant role in ensuring food security within the country.

Rail transport is also actively involved in the transportation of grain and milled products, however, it should be considered to a greater extent as an intermediate link in the implementation of international contracts for the supply of grain and milled products as part of ensuring global food security. On average, 750 million tons of grain and milled products are transported per year, which is about 30% of annual world consumption. However, due to technical limitations, it is not possible to use rail transport for mass grain exports.

Water transport is actively used to provide transport support for international grain supply contracts, transporting on average more than 300 million tons of grain and milled products per year, which is 14% of global grain consumption. However, to expand the possibilities of providing grain producers with water transport services, infrastructure solutions are needed that will facilitate access to port infrastructure facilities for transport companies engaged in intermediate grain transportation.

In general, taking into account the volumes of grain and milled products, the transportation of which is carried out within the framework of transport services for agricultural producers, the implementation of agreements on ensuring food security both within Ukraine and within the framework of international cooperation is carried out. This study did not contain an examination of the quality and level of development of digital components of the grain producers' transport system, which may serve as subjects for further research.

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