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EXPORT LOGISTICS OF AGRICULTURAL PRODUCTS OF UKRAINE IN THE CONTEXT OF ENSURING FOOD SECURITY DURING MARTIAL LAW

Abstract

The study determined the dynamics of growing grain crops in Ukraine and the geography of their export. The problems of ensuring export logistics as a result of military aggression by Russia in the context of ensuring food security are pointed out. The main directions of export logistics of grain crops from Ukraine and the peculiarities of transportation by railway, river and road transport were studied. The directions of diversification of export logistics of grain crops from Ukraine during martial law in the context of ensuring food security have been determined. Further ways of ensuring the development of the export of grain crops from Ukraine and improving the logistics infrastructure are substantiated. A description of the directions of cooperation between Ukraine and the European Union countries regarding the promotion and support of export logistics to the main countries of importers of agricultural products to ensure food security is provided. Ways of post-war restoration of the logistics of export of agricultural products from Ukraine and ensuring the sustainability of agricultural producers are considered.

Keywords: *agricultural products, grain, logistics, export, food security, infrastructure, transport, war, Ukraine.*

Introduction

As a result of the full-scale aggression of Russia and the blocking of regions and ports of Ukraine, agricultural enterprises faced problems of exporting products, which threatens the food security of the world. The logistics of exporting agricultural products is forced to look for new ways of transportation outside the country. There was a need at the state level to seek help and support from the international community and the possibilities of European logistics. In the pre-war period, there was a sharp dissonance between the productivity of crop production, grain logistics and the need to fulfill export agreements for the supply of various types of products to foreign buyers.

The geography of supply of agrarian products of agriculture of Ukraine is quite wide and involves cooperation with partners from more than 180 countries of the world. And distant China and India, Egypt, Saudi Arabia, and Iran are in the first places in terms of grain exports. Turkey and the countries of the European Union hold a significant share of exports.

The logistics infrastructure of the export of agricultural products in Ukraine faced the problems of providing these countries, first of all, with grain crops. Currently, the largest channel for exporting agricultural products from Ukraine is border crossings with the European Union countries. Shipment of agricultural products is carried out mainly through land railway crossings on the border of Ukraine with Poland, Romania, Slovakia and Baltic countries.

Materials and Methods

The research used data from the State Statistics Service of Ukraine on the economic results of agricultural enterprises and USDA – export data. The research period covers 5 years (2018-2022). The research used methods of economic analysis.

Results and Discussion

Assessment the volume activity of agricultural enterprises of Ukraine and the geography of exports

Traditionally, in Ukraine, the lion's share of the gross harvest of

grain was exported, and on average over the last three seasons, it fluctuated between 70-73%, while the share of the harvest needed for domestic needs did not exceed 30%. A significant advantage of export over domestic demand is characteristic of the main cereals, wheat and corn, while the reverse trend is observed for niche crops, and in the barley segment, the share of export slightly exceeds its domestic consumption.

It should be noted that before the military invasion of Russia in Ukraine, the export potential of barley was realized by 95% (estimated at 6.0 million tons in February 2022), wheat by 81% (22.5 million tons), and corn by 60% (30.0 million tons).

With the beginning of the war, the Government of Ukraine imposed a ban on the export of certain grain crops, such as oats, millet, buckwheat and rye, to ensure food security in the country during martial law, and also introduced mandatory export licensing of wheat and corn. Subsequently, for corn, this procedure was canceled at the request of market participants due to the significant excess of the grain harvest over its internal need and the expectation of record high transitional crop residues at the end of 2021/2022 against the background of the limited possibility of further realization of its export potential.

Cultivation and export of wheat

Ukraine is among the top-5 main exporters of wheat. According to the USDA, its share in the world market for the last three seasons averaged 9%. From 2018/19 to 2020/21, the ratio of grain shipped to the foreign market to its production in the country fluctuated between 63-73% (Figure 4.1).

The 2021/2022 season was marked by a new maximum in the gross crop harvest (32.2 million tons, +29% to the 2020/2021 harvest), and a new record level of grain exports was also expected. As a result of the impossibility of operation of the ports in the waters of the Azov and Black seas, the shipment of wheat to the foreign market has practically stopped, because the main buyers of grain are the countries of North Africa, Southeast and South Asia, and the Middle East, to which grain is delivered by sea transport. Thus, in 2021/2022 wheat exports from Ukraine are expected at the level of 18.6 million tons (+12% to the 2020/2021 season).

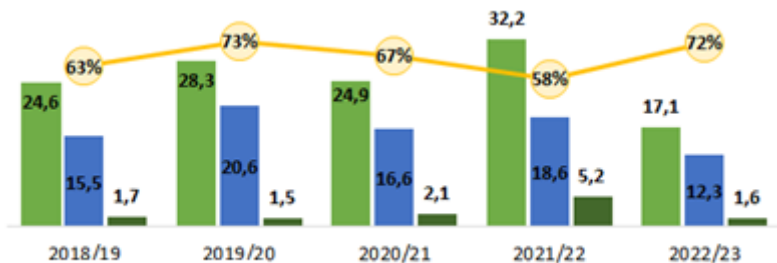


Figure 4.1 Dynamics of wheat cultivation and export, million tons

Notes:



Source: created by authors' based on State Statistics Service of Ukraine

Egypt and Indonesia remain the main importers of wheat from Ukraine for more than one season, their share in the total volume of grain logistics to the foreign market is about 15-16% (Figure 4.2).

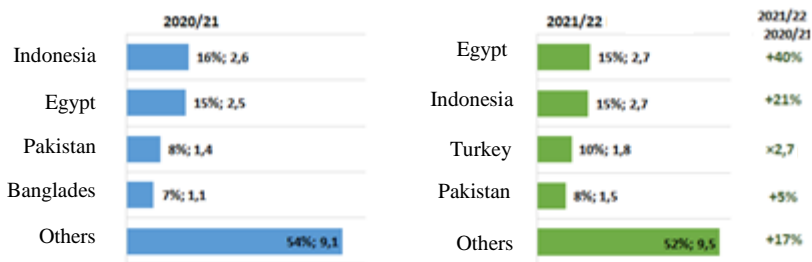


Figure 4.2 Geography of wheat exports from Ukraine, million tons, July-February

Source: created by authors' based on USDA

Indonesia covered 24-27% of its import needs at the expense of Ukrainian grain crops over the past three seasons. Since the peak of grain purchases by Indonesia from our country falls in August-November, for 8 months of 2021/2022, Ukraine has already provided 24% of the expected import demand in this direction, which,

according to USDA experts, is expected at the level of 11.0 million tons. The Indonesian market in the wheat segment is quite diversified, the need for grain crops is also covered by supplies from Canada, Argentina, the USA and Australia, therefore, if the war in Ukraine drags on, the presence of these countries in the specified market may increase significantly.

The share of Ukraine's presence in the Egyptian grain market from 2018/2019 to 2020/2021 averaged 22% and reached a maximum of 29% in the 2019/2020 season. During the 8 months of the current season, Ukraine managed to export 2.7 million tons of grain crops to Egypt, which is 23% of the expected import (12.0 million tons according to the USDA forecast).

Since August 2020, Pakistan also actively began to buy Ukrainian grain crops (in 2020/2021, the government of this country allowed private businesses to import wheat to stabilize domestic prices and build reserves to ensure food security due to the coronavirus pandemic in the world), and, according to the results of 2020/2021, its share in the total export of Ukrainian grains was 8% (1.4 million tons), while the presence of Ukraine in the Pakistani wheat market was 39%. In the 2021/2022 season, Pakistan managed to import 1.5 million tons of grain crops from our country (+5% compared to the same indicator in 2020/2021), which corresponds to 77% of its expected import (1.9 million tons according to USDA forecasts). In connection with the blockade of Ukrainian seaports, this country may switch to the purchase of wheat, for example, from India, Australia or European Union countries.

As for Bangladesh, the volumes of wheat exports from Ukraine in the specified direction gradually decrease with each season, and if according to the results of 2020/2021, this country occupied the fourth position in the ranking of the main importers, then according to the results of 8 months of the current season, it dropped to the seventh place.

Turkey's entry into the top-3 main importers of Ukrainian grain crops in 2021/2022 is of a temporary nature, since the sharp increase in its purchases is associated with a significant decrease in its own wheat production in 2021. Ukraine's presence on the grain market in Turkey, with the exception of 2021/2022, does not exceed 13%.

With regard to 2022/2023, due to a possible reduction in the

cultivation of grain crops in Ukraine in relation to the harvest of the current season by 47%, to 17.1 million tons, their export potential may amount to only 12.3 million tons, which is 34% below the indicator 2021/2022. A reduction in the volume of shipments of Ukrainian grain crops will reduce the presence of our country in the markets of its main importers, and buyers will have to look for alternative logistical ways of suppliers of grain crops to cover the import need.

Corn

According to USDA data, since 2008/2009, Ukraine has been consistently among the top-5 main exporters of corn. In 2018/2019, corn shipments reached an all-time high, amounting to almost 30.0 million tons, which corresponds to 17% of the total global export of the crop. In the 2021/2022 season, a new record was reached for the gross harvest of corn, which, according to the State Statistics Service of Ukraine, amounted to 42.1 million tons (+39% compared to the 2020/2021 harvest), and the export potential of Ukrainian corn was estimated at 30.0 million tons. However, against the backdrop of the blockade of Ukrainian seaports due to the military invasion of Russia, the corn export forecast has been reduced to 20.8 million tons (-13% compared to the 2020/2021 indicator), and the transitional balance at the end of the current season is expected to be at a record high level (12.3 million tons, which is 6.1 times more than the 2020/2021 indicator) (Figure 4.3).

The main importers of Ukrainian corn are traditionally China and the European Union, in 2020/2021 their shares in the total export of corn amounted to 36% and 24%, respectively (Figure 4.4).

From 2018/2019 to 2020/2021, corn exports from Ukraine to China more than doubled, from 3.8 million tons to 8.5 million tons, while, according to the USDA, the Chinese market's need for imported corn increased during the above period 5 times, from 4.5 million tons to 29.5 million tons, which caused a decrease in the share of Ukrainian corn in China's total imports from 85% to 29%. During the 5 months of the current season, Ukraine managed to export 5.5 million tons of corn in this direction, which is 17% more than the same indicator in the previous season and is 24% of the expected import by China (23.0 million tons according to the USDA

forecast). Further export of Ukrainian corn in this direction is currently impossible due to the shutdown of seaports as a result of constant shelling of the territory of Ukraine. Therefore, it is most likely that the presence of American corn will increase on the Chinese market in the current season, and purchases of grain from the European Union and Argentina are also possible.

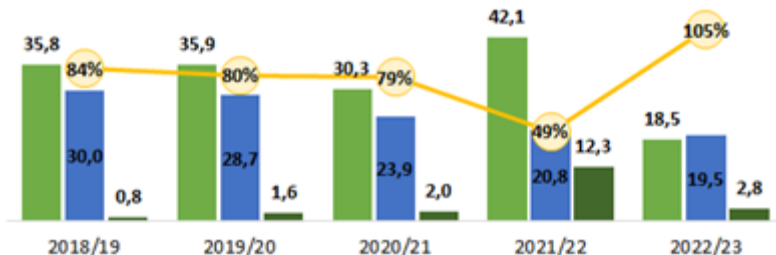


Figure 4.3 Dynamics of cultivation and export of Ukrainian corn, million tons

Notes:



Source: created by authors' based on State Statistics Service of Ukraine

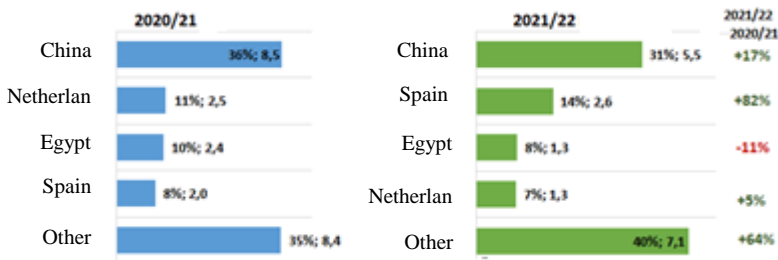


Figure 4.4 Geography of corn exports from Ukraine, million tons, October-February

Source: created by authors' based on USDA

European Union countries covered an average of 60% of their import needs over the past three seasons at the expense of Ukrainian

corn. Of this volume, about 59% of the corn in total went to the key buyers of Spain and the Netherlands. In 5 months of 2021/2022, these countries managed to import from Ukraine 2.6 million tons and 1.3 million tons of corn, respectively, which is 82% and 5% higher than the same indicator a season earlier. At the same time, the total volume of Ukrainian corn logistics to the European Union from October to February of the current season amounted to 7.4 million tons, exceeding the 2020/2021 indicator by 69%. At present, the European Union countries are the only available destination for the export of corn from Ukraine.

Egypt also occupies a significant place in the ranking of key importers of corn from Ukraine, but the volume of its purchases gradually decreases with each season. If according to the results of 2018/2019, the share of Ukrainian corn in the total import of Egypt was 32%, then in 2020/2021 it decreased to 24%. Egyptian corn imports are quite diversified, in addition to Ukrainian corn, the country buys Argentinian, Brazilian and Romanian corn in significant volumes.

As for the forecasts for 2022/2023, with the expected reduction of corn cultivation in relation to the harvest of the current season by 56%, to 18.5 million tons, and due to the record transitional crop residues at the end of 2021/2022 at the level of 12.3 million tons, its export potential may amount to 19.5 million tons, which is 6% lower than the 2021/2022 indicator.

Types and ways of export logistics of grain in Ukraine

Currently, three types of grain logistics are common in Ukraine – rail, water and motor transport. Their choice depends on the distance and final point of transportation. The leading position is occupied by railway transport, but in recent years, we have observed a reorientation towards road transport. The river method has the smallest share in the overall structure of the logistics of grain crops.

Export logistics of grain by rail transport

In the field of railway transportation of grain, there is a stable shortage of special grain wagons, especially during the harvesting season of certain crops. Periodically, “Ukrzaliznytsia” declares its ability to transport up to 47 million tons.

This applies both to its delivery to sea and river ports, and to transportation to neighboring countries. During martial law, the need for rail transportation increased. There is a high traffic load and a shortage of wagons, which is why many agricultural producers and grain traders faced problems during the export logistics of grain to the European Union countries.

Thus, there are six railway border crossings for the land export of grain from Ukraine to the European Union countries: on the border with Poland, they are Izov – Hrubeshiv, Mostyska – Medyka and Yagodyn – Dorogusk; with Romania – Vadul-Siret – Dornesti, with Slovakia – Chop – Chierna nad Tisou, with Hungary – Chop – Zahony. Their total throughput per day is 534 grain wagons.

In the current conditions, the load on the railway logistics of Ukraine has increased many times, and the throughput capacity of railway border crossings is significantly inferior to the indicators of the port infrastructure, so the railway system of Ukraine and the railways of neighboring countries need time to adapt to a sharp increase in the volume of Ukrainian cargo transportation.

There are a number of technical difficulties for the development of alternative routes. For example, a double change of trolleys on wagons during delivery to the Baltic ports, dimensional restrictions when moving through the territory of the European Union, which do not allow the use of Ukrainian wagons in certain sections, the overloading of the railway infrastructure of the European Union with its own cargo.

It is worth noting that, according to experts, only 55-60% of the available cargo transportation potential through western border crossings is used, which is due to a number of factors, such as: uneven use of border crossings by market participants, lack of rolling stock of foreign carriers, limited capacity of individual sites, the need to build new logistics chains on the territory of neighboring countries, bureaucratic delays in customs, phytosanitary, veterinary registration, etc.

Nevertheless, according to railway statistics, in March-April 2022, 921.6 thousand tons of corn, 7.0 thousand tons of wheat and 4.9 thousand tons of barley were loaded for export through land border crossings.

A significant part of the fleet of domestic grain wagons is

outdated and needs either capital repair or total write-off. In recent years, more and more market participants are trying to overcome the problem in a radical way, creating their own fleet of grain wagons and ordering dozens of them. This approach is quite promising, but it also has a number of problems. First, purchasing hoppers is a rather expensive investment. At the same time, it should be taken into account that the capacities of domestic enterprises for the production of grain wagons are not unlimited. It takes a long time to process an order and receive it. Secondly, the issues of independent transportation of private wagons with grain from elevators to railway lines remain not fully agreed upon.

In recent years, the practice of loading grain into railway platforms by container method is becoming more and more widespread. That is, the logistics of grain in special, most often, 20-ton containers. This approach also has a number of both advantages and disadvantages. On the one hand, the transportation of grain in containers to foreign buyers guarantees the quality of the products, provides convenience in handling them, and makes it possible to clearly separate different batches of products. The use of containers for grain makes it possible to partially eliminate the shortage of hopper wagons and the huge problem of transporting crops by highways. On the other hand, not all elevators have the technical possibility of loading grain into containers. According to official statistics, containers with agricultural products destined for export contain only 20% of grain.

In order to increase the efficiency of the use of railway transport during martial law and ensure the export logistics of grain, the Prime Ministers of Ukraine and Poland signed a Memorandum on strengthening cooperation in the railway sector. It provides for the creation of a joint logistics enterprise of the two countries. The effective mechanism of cooperation between PKP and “Ukrzaliznytsia” will allow to increase the volume of rail transportation of Ukrainian exports to the European Union and to world markets through the Polish ports of Gdynia and Gdansk. But for this, it is necessary to define a list of infrastructure investments and look for sources of financing in the European Union (in the form of grants and financial assistance from the European Commission) for cross-border infrastructure projects.

Export logistics of grain by river transport

During martial law, a significant volume of grain was transported by river transport as an alternative to sea transport. Potentially, this is the cheapest method of cargo logistics, which is more profitable, compared to rail. The potential of river transportation of grain in Ukraine exceeds the indicator of more than 15 million tons, but in fact, it is much smaller. The reason for the incomplete realization of the potential of this logistics direction is the need to carry out large-scale dredging of rivers, first of all the Dnieper, the lack of cargo ships and the need to develop the river port infrastructure as a whole.

In the current conditions, market participants together with the Ukrainian authorities continue to search for opportunities to redirect export supplies to the European Union by alternative routes – by river transport along the Danube River to Romania. The possibility of Ukraine transporting grain to importers through Lithuanian and Latvian ports is being considered, and a ship with 71,000 tons of Ukrainian corn has already left the Romanian port of Constanta.

European ports are able to handle about 1.5 million tons of Ukrainian grain and about 250,000 tons of oil every month.

Export logistics of grain by road transport

The issue of automobile transportation of grain crops remains the most problematic. The condition of domestic highways, especially in the central and southern regions of Ukraine, has turned into a problem of national importance. Ukraine is suffering huge losses due to the poor condition of the roads. One of the reasons for this is non-observance by agricultural producers of the rules of grain transportation by motor vehicles regarding the limitation of loads. Due to efforts to reduce the cost of transportation and the difficulty of overcoming routes with broken roads, many agricultural producers deliberately violate the rules of transportation of grain crops – they overload transport with grain. Some of them go to the elevators, but many go directly to the ports. The share of the latter is constantly growing due to the fact that more and more owners of medium-sized and even small agricultural farms prefer to export grain on their own. Accordingly, they are forced to take care of its supply to ports or large hub elevators.

More and more owners of agricultural enterprises have realized that having their own fleet of grain trucks significantly expands their

capabilities, reducing dependence on third-party companies and making the transportation of grain by motor vehicles cheaper.

The most effective way to ensure the optimal logistics of grain crops to transshipment complexes is considered to be the establishment of mutually beneficial partnership relations with those companies whose capabilities make it possible to guarantee the fulfillment of their obligations. These are companies that have been working on the market for a long time, have their own elevator and transshipment facilities, as well as a transport fleet for the timely transportation of grain across Ukraine in the required volumes.

It should be noted that the European Commission canceled tariffs and quotas on Ukrainian exports for a year, which will contribute to the growth of supplies to the European market. With the efforts of representatives of the railways of Ukraine and European countries, plans are being actively developed and implemented to increase the capacity of border stations and optimize transportation through the European Union. However, in the near future, it is unlikely to realize the remaining export potential of the current season only at the expense of European Union demand and delivery through the European Union infrastructure to third countries. In addition, not all grain crops are in significant demand in European countries, and for some, Ukraine and the EU are competitors on the world market. Therefore, it is likely that in the near future the structure of trade, as well as the structure of production in the grain segment, will undergo significant changes.

Risks and support directions of export logistics of agricultural products of Ukraine

The suspension of foreign trade has an extremely negative impact on the country's economy due to the lack of foreign currency earnings and directly reflected on Ukrainian farmers, who have concentrated significant reserves of raw materials and most of whom remained in a very difficult situation before sowing.

We have identified internal negative factors that have impact on export logistics of grain and the activities of agricultural producers:

- rising prices and fuel shortages;
- significant increase in prices for transshipment of agricultural products;
- bureaucratic delays in customs, phytosanitary, veterinary

registration of products;

- difficulties of obtaining licenses by motor carriers for the ability to carry out transportation in the European Union countries;
- uneven use of border crossings by market participants, load on the western transitions when exporting products;
- significant queues at railway crossings.

That is why, from the very beginning of the war, the search and establishment of new ways of exporting Ukrainian products, as well as the modernization of existing logistics facilities on the western border of the country, were important both for the Ukrainian side and for the main importers. Since, Ukraine is territorially bordered by the European Union countries, it is quite logical that the main flow of exports is currently directed in this direction, but logistics remains a weak point in the almost established sales chain.

It is quite clear that it will not be possible to reach the pre-war export volumes through the western border, but it will be possible to unload the internal infrastructure in a few months and free the warehouses before the start of the new harvest, at least partially.

In addition, it is very important that the European Union and Great Britain canceled all tariff quotas and import duties for Ukrainian products for one year.

In the medium- and long-term perspectives, the European Commission will work on increasing the infrastructure potential of new export corridors and establishing new infrastructure ties within the framework of the reconstruction of Ukraine. The next round of applications for funding from the Connecting Europe Facility (CEF) fund will support projects that improve transport links with Ukraine, including for railway connections and railway terminals. Therefore, on 12 May 2022, the European Commission adopted a Decision regarding the signing of a high-level Memorandum of Understanding between the European Union and Ukraine regarding indicative maps of the Trans-European Transport Network (TEN-T) in Ukraine. In the high-level Agreement signed with the European Commission, the logistics corridors of Ukraine (railways, roads, waterways) were included in the TEN-T maps.

The development of export logistics of grain crops will be possible in case:

- unblocking and development of sea ports, creation of alternative

export routes;

- transformation and full provision of the environment for sustainable economic viability of all entities of the agro-industrial sector;

- rapid recovery, formation of new economic chains and support of competitive functioning of the processing industry;

- restoration of safe physical and ecological condition of lands;

- achieving the optimal level of physical and economic food security;

- timely fulfillment of Ukraine’s obligations to harmonize national legislation with EU legislation within the framework of the Association Agreement.

Conclusions

Ukraine is one of the key exporters to the foreign market of grain crops, their domestic production significantly exceeds domestic consumption. However, due to the full-scale military invasion of russia on the territory of Ukraine, it led not only to disruptions in the supply chains of agricultural products in the domestic market and destroyed export logistics. Accordingly, Ukrainian agricultural products cannot be delivered on time to their destination, which threatens global food security.

The Ukrainian agricultural sector is looking for ways to optimize export logistics of grain through alternative directions and solutions to the challenges it faces. The main ones include: low capacity of railway stations on the border with European countries; bureaucratic state obstacles in European countries regarding import and certification of grain; limitation of freight transportation by land routes; lack of a sufficient number of European wagons for grain transportation; limiting the capacity of European logistics centers; lack of drivers for international road transportation, etc.

The main obstacle during martial law is the lack of stable logistics chains that can ensure the necessary volumes of export of grain.

However, the Government of Ukraine and the international community are implementing various programs to support and stabilize export logistics of grain through cooperation in the field of rail and road transportation, using the capabilities of small rivers, and delivering products to the seaports of the European Union countries.

All these steps are able to save Ukrainian exports of grain, and, accordingly, to preserve the financial stability of agricultural producers and the country, which is extremely important for defeating the aggressor and ensuring food security in the world.

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