



Weaponization of Grain Trade (cont'd)

War Impacts on Ukraine's Production and Market Shares

- Part I The supply of Ukrainian grain is at risk
- Part II Current effects of the war. Agriculture, economy, ecology

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 101000751



Part I

The supply of Ukrainian grain is at risk



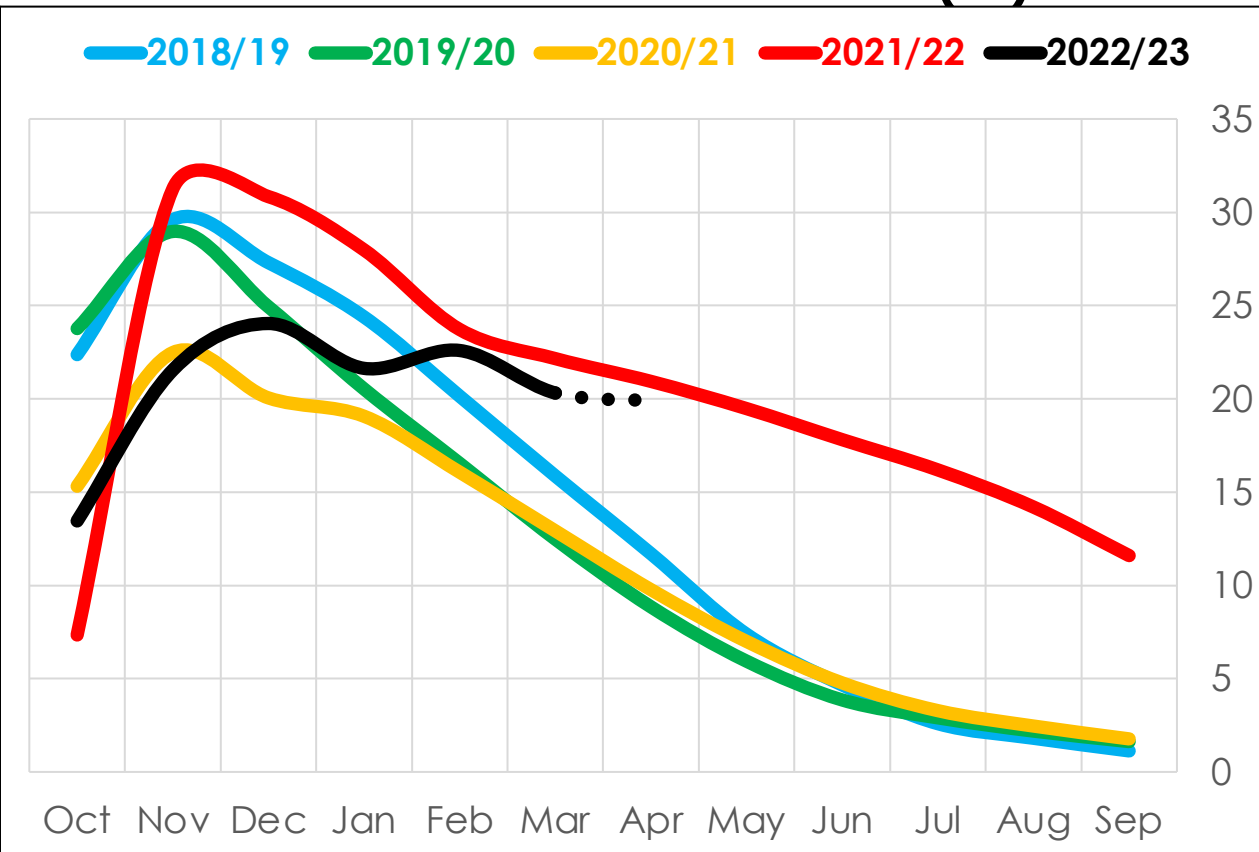
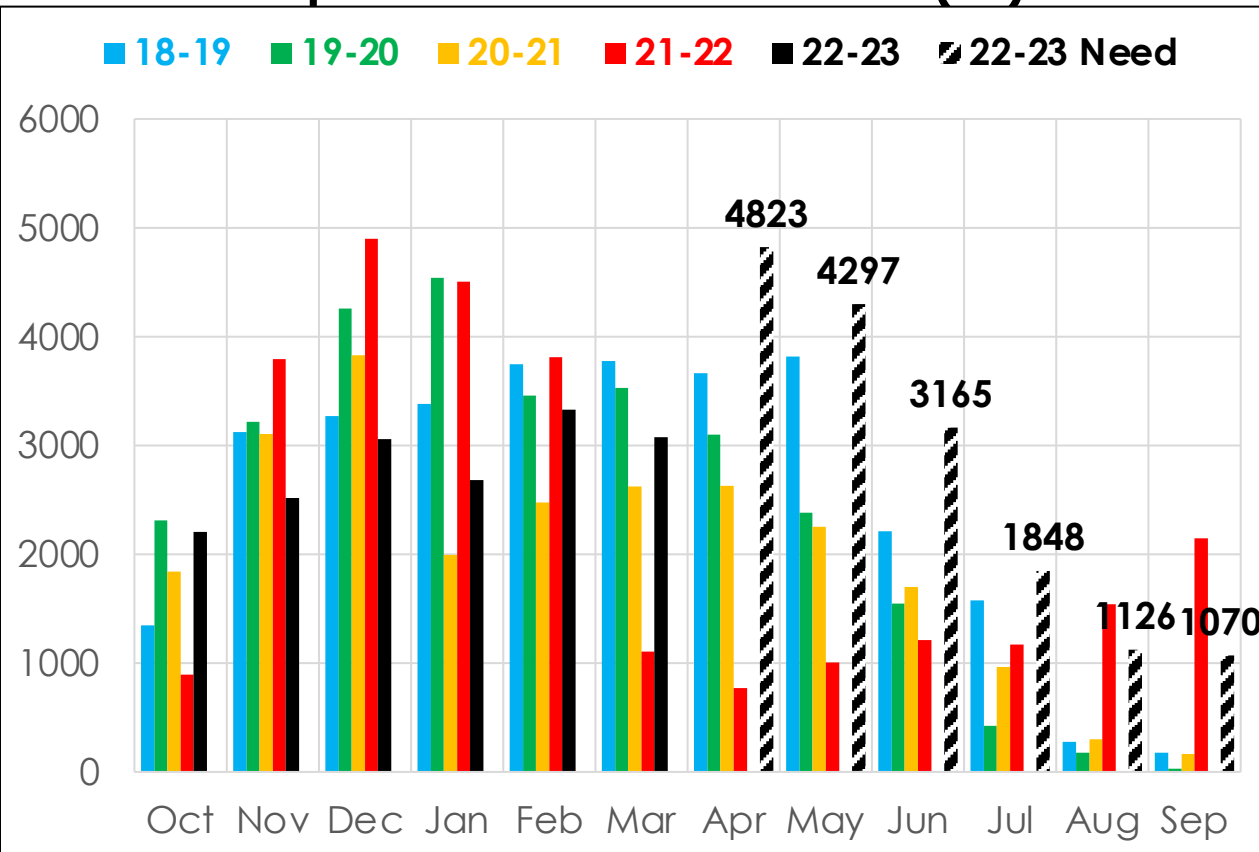
In Egyptian Arabic, the word for "**bread**" is the same as the word for "**life**"

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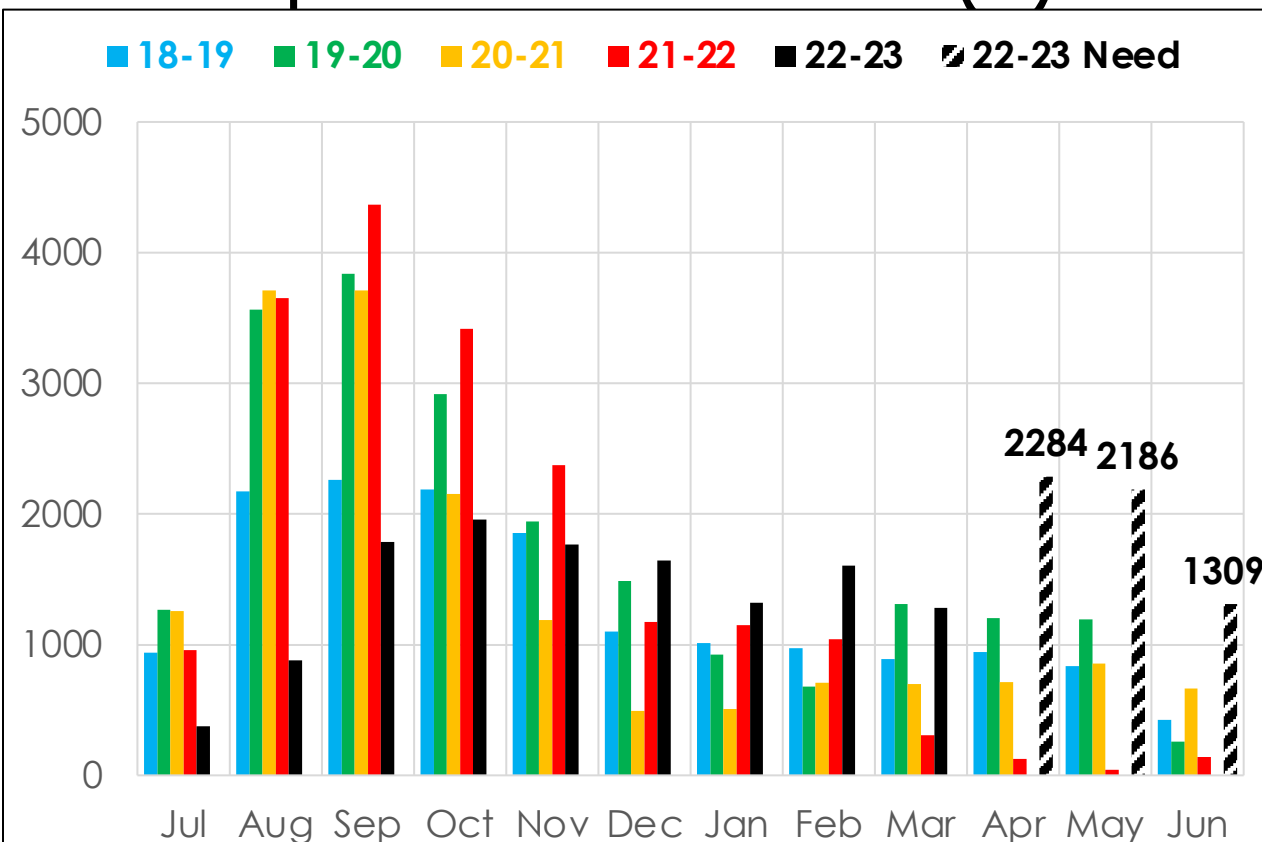
Export of Ukrainian corn (kt)

Stocks of Ukrainian corn (kt)

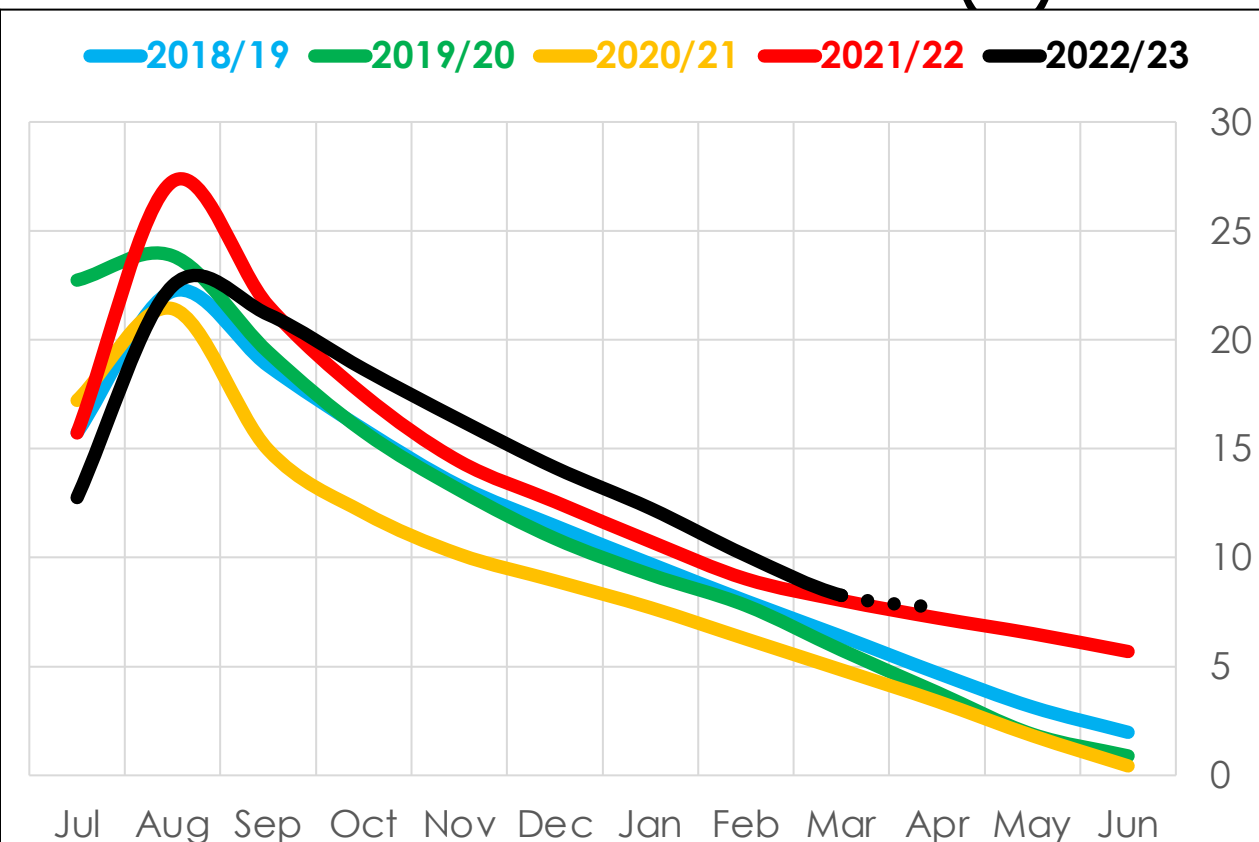


The sixth month of the corn season is coming to an end — during this time, 16.9 mln t of grain were cleared for export. There is still half a year of the 22-23 season ahead, during which the same amount (16.3 mln t) needs to be exported. But unlike the active autumn-winter period, in spring, and even more so in summer, the activity of our traditional importers decreases seasonally. This is logical - they want to buy while there is plenty of grain in the Northern Hemisphere, and exporters compete with each other. The fact that Ukraine and the USA currently have large unsold stocks leads some importers to delay buying. With arrival of the Brazilian crop in June, Ukraine needs trade security to maintain exports.

Export of Ukrainian wheat (kt)



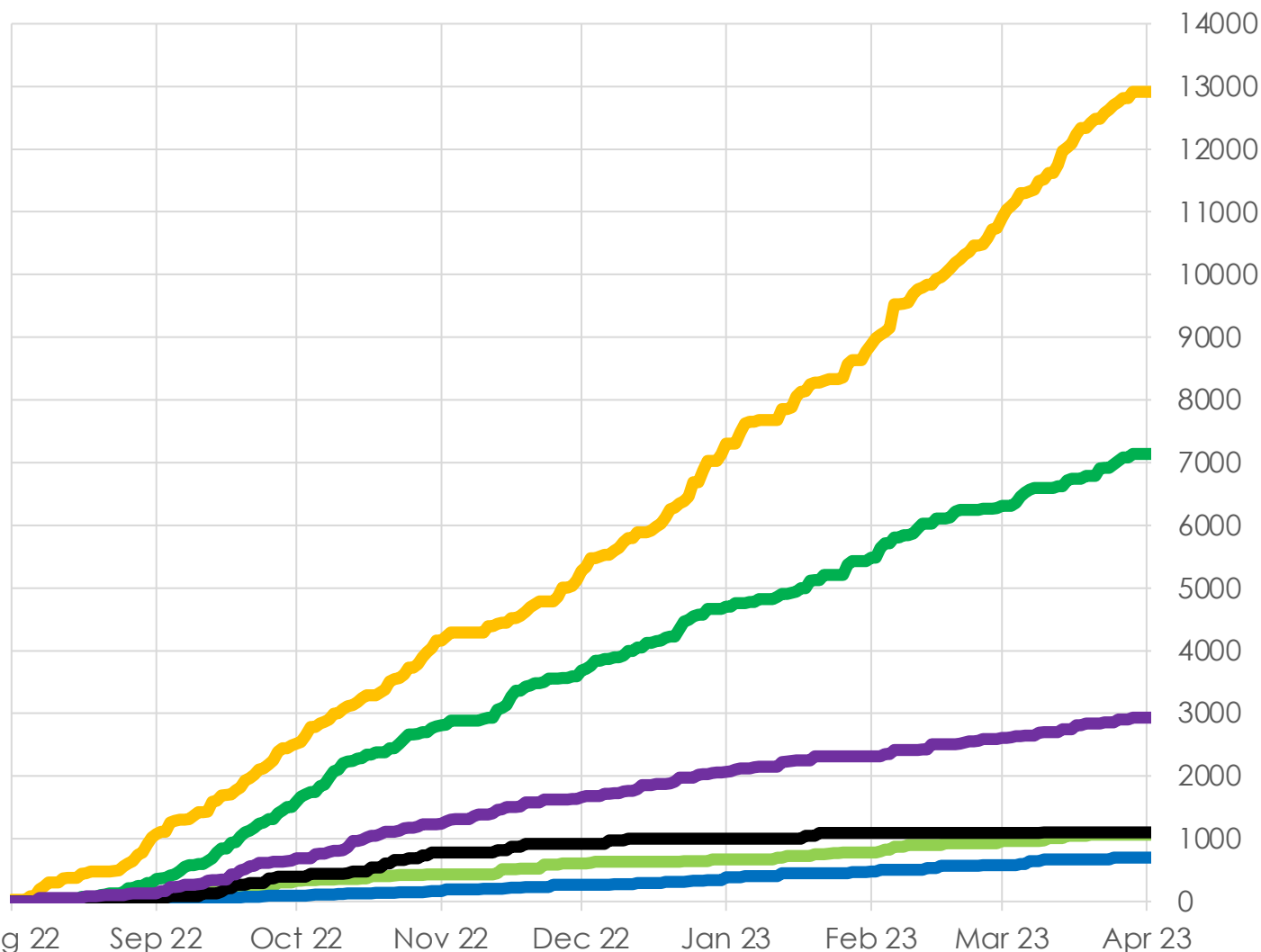
Stocks of Ukrainian wheat (kt)



3 months left before the end of the season (Jul-Jun), during which about 5.8 mln t of wheat needs to be exported. During the 3-months (Sep-Nov) record pace of the season 22/23 took place, the export amounted to 5.5 mln t. This was achieved during an active demand period, while Grain Initiative let Ukrainian wheat to find a way abroad, so importers were eager to buy. Now, in the end of season, importers are waiting for the next crop and will soon harvest some of their own. Even though some importers still need wheat, It's hard to expect that Ukraine will be able to find and fulfil enough demand under conditions, in which exports currently exist (with Bosphorus inspections sabotage, a 60/120-day corridor issue, etc.). Export forecast — 14.8 mln t, ending stocks — 4.4 mln t.

Grain Initiative — Cumulative export (kt)

— Corn
 — Wheat
 — Barley
 — Soybeans
 — Rapeseed
 — Sunseed & subproducts



Despite all the logistical problems and uncertainty due to Russia's statements, the Grain Initiative continues and allows Ukraine to continue supplying grain to the world market. Since August 2022, more than 850 ship voyages have been made, during which more than 26 mln t were exported.

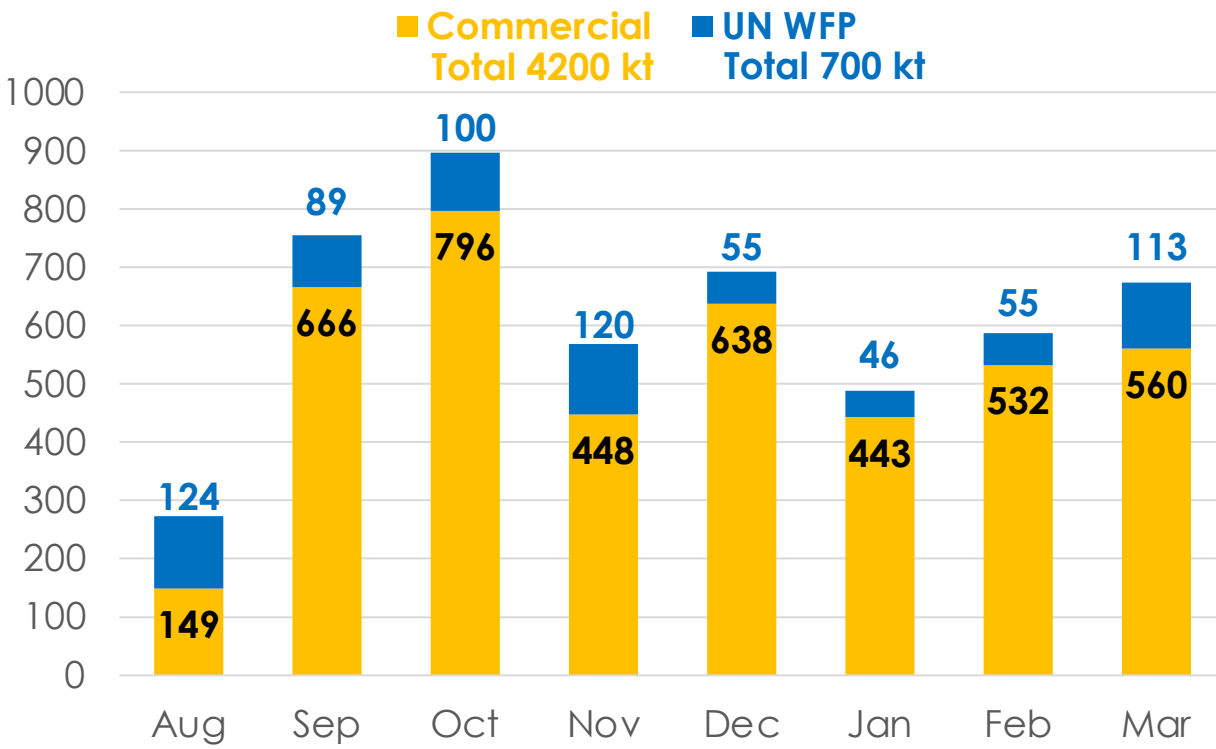
Half of the volume is corn, where Ukraine currently ranks #5 among world exporters.

25% of volume is wheat. Thanks to the arrival of crops in the Northern Hemisphere last summer, world market prices and risks of global hunger in the world have decreased.

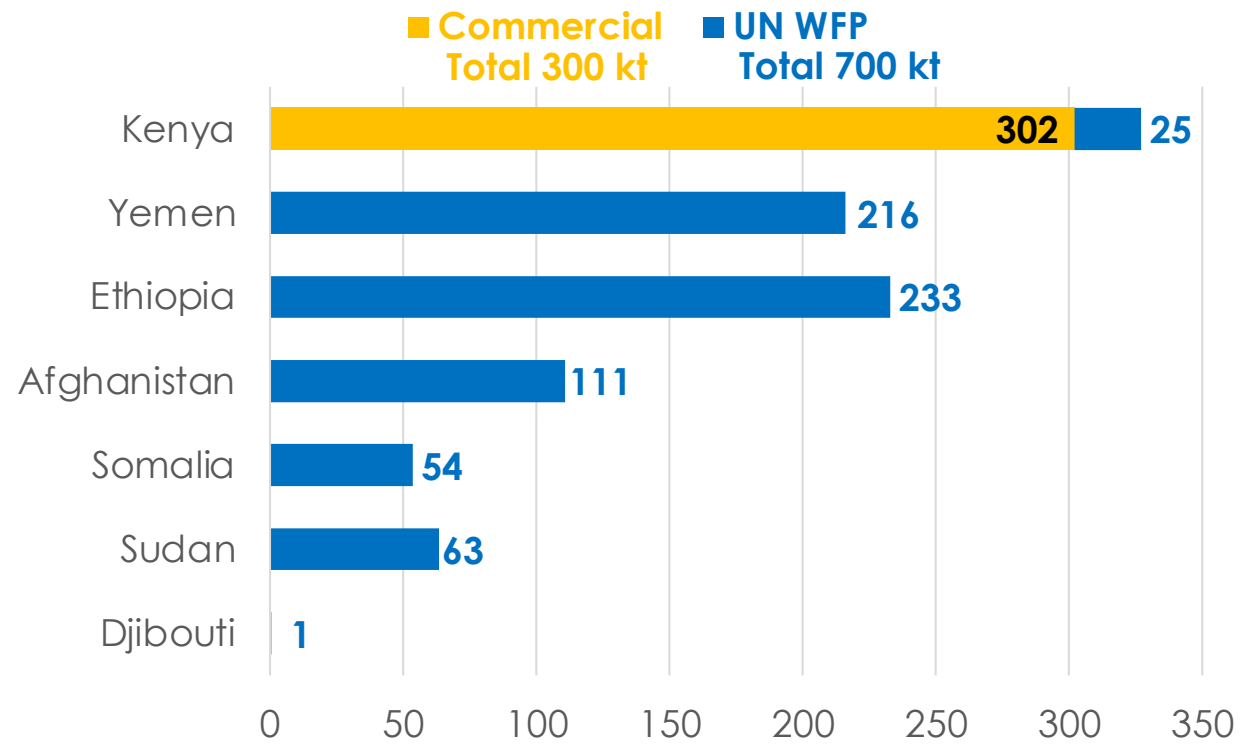
However, considering that Ukraine cannot fulfil the entire export potential of wheat, this means that there is less competition between exporters, so importers still overpay.

The new wheat harvest, which the world expects in the summer of 2023, as well as the continuation of exports by Ukraine (which still maintains the position of the #7 exporter in the world), should further reduce the risks of world hunger. But Russia's statements and actions threaten the world with a new round of the grain crisis.

Exports of Ukrainian wheat to Africa and Asia (kt)



Exports of Ukrainian wheat to most needed countries (kt)



The UN WFP's purchases in Ukraine also depend on the continuation of the Grain Initiative. Ukraine has exported 4.9 mln t of wheat to countries in Africa and Asia (including the Middle East), of which 700 kt (14%) were sent as part of the WFP mission. Most of these 700 kt went to (sometimes war-torn) countries where a large part of the population is below the poverty line: Yemen, Ethiopia, Afghanistan, Somalia, Sudan.

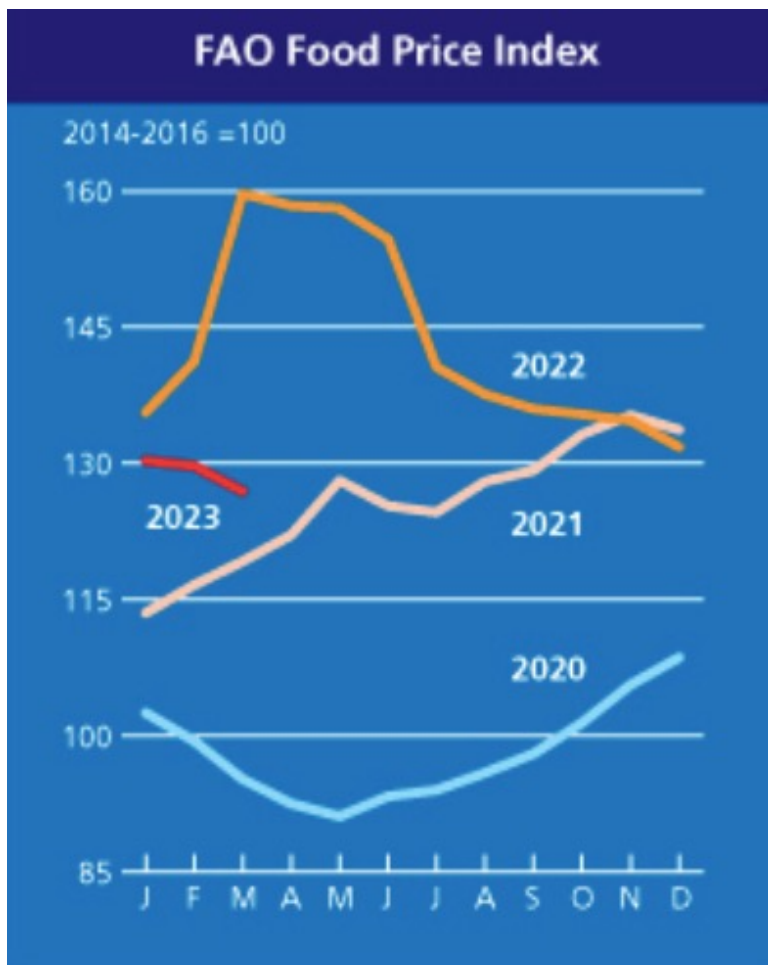
Grain Initiative status



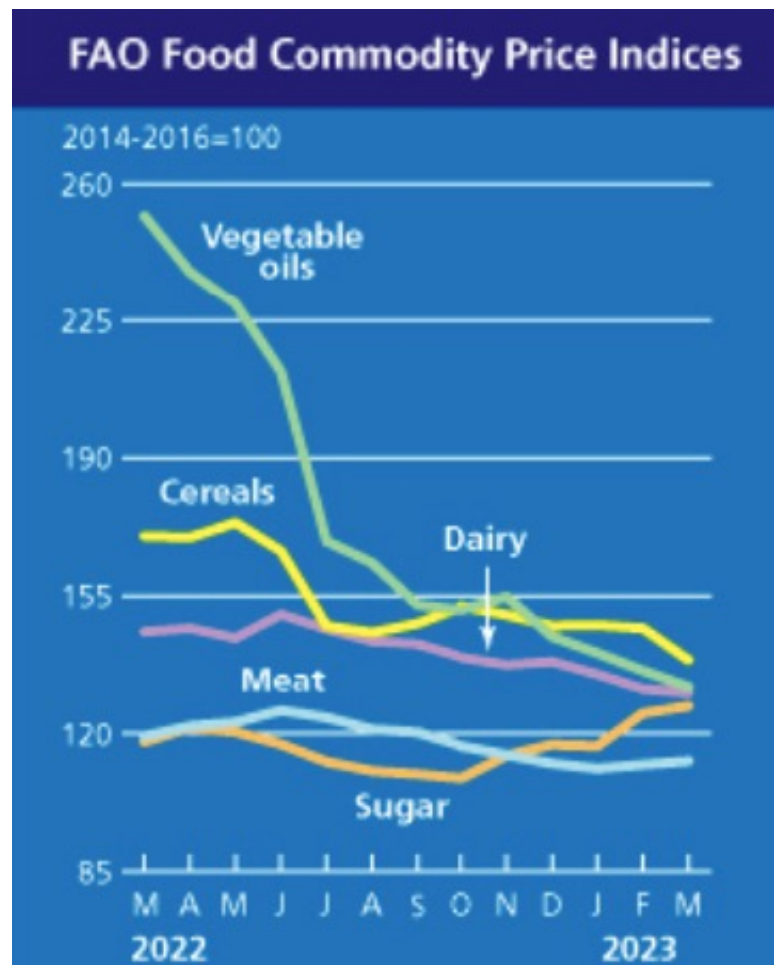
On March 18, UN reported that the Grain Initiative was extended. Even though according to the Agreement, it could be extended only for 120 days, Russia still claiming that the Grain Initiative extended for 60 days, threatening the parties involved with complete termination if its ultimatum demands are not met.

The problem is that without clarification and guarantees from the UN, market participants (mainly importers, insurance companies, shipowners) will consider the **completion of the 60-day period (May 18) as a risky deadline**. Due to the long queues for passing inspections, both previous times demand fell sharply 25-30 days before end of the Agreement terms.

FAO Food Price Index



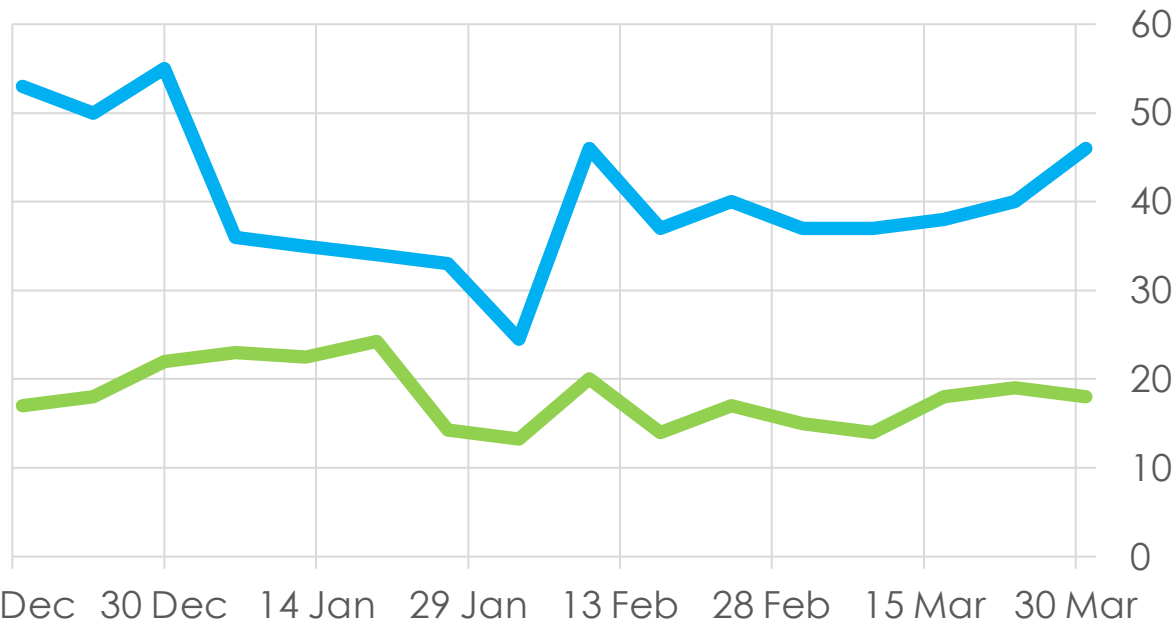
FAO Food Commodity Price Indices



The FAO Food Price Index (FFPI) fell by 2.8 points (2.1%) in March 2023 vs. February, down to 126.9 points, the twelfth consecutive monthly decline since reaching its peak one year ago. The decline was led by drops in the cereal, vegetable oil, and dairy price indices, while those of sugar and meat increased. **The FAO Cereal Price Index fell by 5.6% from February and was 18.6% below its level one year ago, reflecting a fall in international prices of all major cereals.** The FAO Vegetable Oil Price Index fell by 3.0% from February and was 47.7% below its level one year ago, with lower soy, rapeseed, and sunflower oil quotations more than offsetting higher world palm oil prices. The FAO Dairy Price Index fell by 0.8% from February and was 10.7% below its level in the corresponding month a year ago, driven by lower price quotations for cheese and milk powders, while butter prices increased.

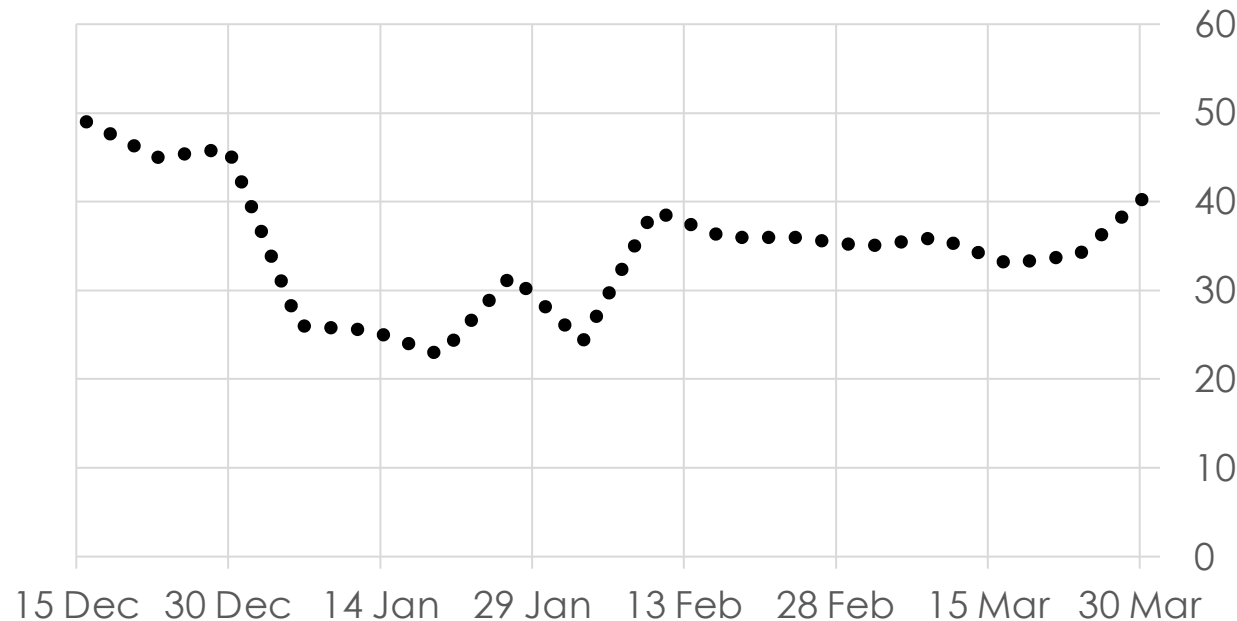
Freight of wheat to Egypt (\$/t)

— Romania — Ukraine



Freight + Transshipping difference (\$/t)

••• Difference = Lost profit



In order to find demand, the price of Ukrainian grain delivered to the importer's port must remain competitive. Until 24.2.22, Ukraine had the same freight cost as in Romania. To compare how the situation has changed for Ukraine, the charts show current situation in the two countries. Ukraine now has a significantly higher cost of freight (which includes "war risks" and long vessel turnover), as well as expensive transshipment in ports due to a lack of loading capacities. As a result, for the same delivery price and higher transportation costs, the Ukrainian farmer receives a price \$30-40 lower than he would have received in the absence of a full-scale invasion and the consequences that Russia has led to.

For the importer, this does not have a direct effect yet, but the longer Ukrainian farmers sell at or below the break-even point, the more they will save on production costs, the smaller the harvest will be in future seasons.

Polish, Romanian PMs Ask EU for Mechanism to Trace Ukraine Grain Exports



Farmers protest against Ukrainian grains:

- Romania and Poland are in talks with the European Commission over export tracing mechanisms for Ukrainian grains to ensure local farmers are not hurt by a flood of cheap imports, the Polish and Romanian prime ministers said on Tuesday.
- In March, Romanian Agriculture Minister Petre Daea said the European Commission has estimated farmers from **Poland, Romania, Hungary, Bulgaria and Slovakia** have lost **\$451.15 mln** overall from the inflows of cheaper Ukrainian grains on their markets.
- **EU agriculture head says he would support limits on trading with Ukraine. He spoke after the European Commission said it had approved a €56 mln (\$61 mln) aid package for farmers in countries bordering Ukraine. Poland will receive €30 mln as part of the package.**



Part II

Current effects of the war

Agriculture, economy, ecology

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Damages in Ukraine due to Russia's war

- Infrastructure **\$36,2 bln**
- Assets of enterprises, industry **\$11,3 bln**
- Agro-industrial complex and land resources **\$8,7 bln**
- Energy sector **\$8,1 bln**
- Forestry fund **\$4,5 bln**
- Transport vehicles **\$3,1 bln**

Total estimate of direct infrastructure damages in monetary terms as of February 2023 - \$144 bln

World Bank Sees Ukraine's Recovery Needs Rising to \$411 bln



Railway infrastructure

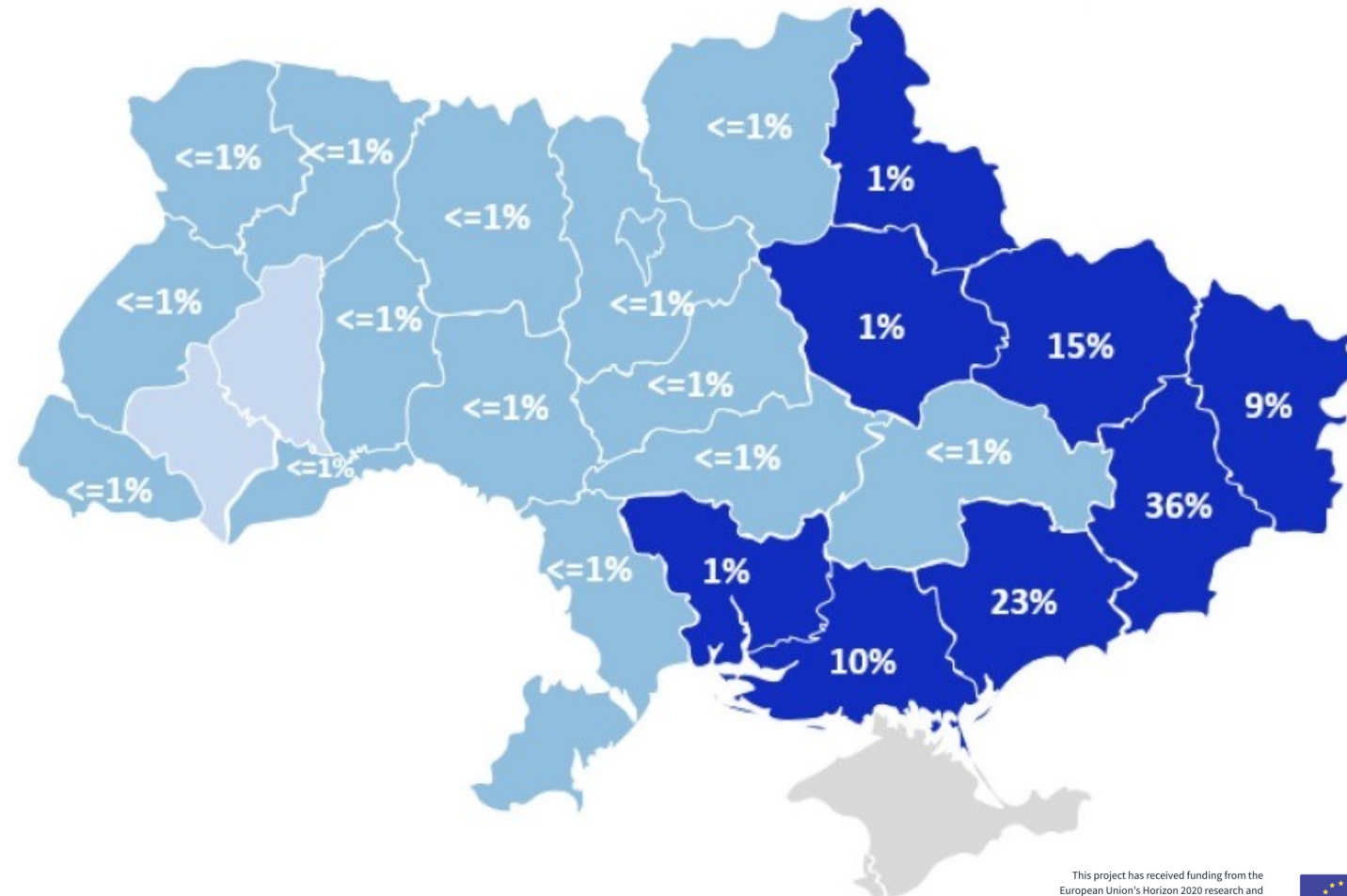
According to preliminary estimates, the total direct damages to the railway are estimated at **\$4.3 bln.**

The length of the damaged railway track is up to 507 km.

The number of damaged railway stations is 126, of which more than 53 were damaged or destroyed in the government-controlled area and the rest in the non-government-controlled areas.

In addition, more than 700 km of railway tracks are located on the temporarily occupied (after 24.02.22) territory.

Distribution of direct monetary damages to the railways by region



Port industry

The total direct damage to port infrastructure and related businesses is estimated at **\$496 mln.**

Moderate port damage is due to two factors.

Firstly, a port is a rather complex and spatially distributed object consisting of many large parts.

Therefore, it is impossible to completely destroy such an object with a few precise missile strikes.

Secondly, **the aggressor captured or used its own and friendly cargo ships to export stocks of grain, ferrous metals, etc., and for this it needed working ports.**

There is still **no traffic on the Dnipro** due to the blockade of the lower part of the river.

UKRAINIAN PORTS DURING THE WAR

TOP LEAD

Almost all Ukrainian ports are closed due to occupation, blockade, mine danger, and the danger of the piracy by Russia.

- 1 Will work as a logistics center
- 3 Entry and exit is not possible
- 3 Don't work
- 5 Occupied since 2014
- 3 Work as usual
- 3 Partially resumed work



Agro-industrial complex and land resources

As of 24 February 2023, the amount of direct damages caused to the Ukrainian agro-industrial complex is **\$8.7 bln.**

The assessment of direct damages to the agro-industrial complex and agricultural infrastructure includes:

- loss of agricultural machinery;
- loss of elevators and other grain storage facilities;
- losses in livestock production from animal deaths and slaughter due to the inability to keep animals;
- losses of perennial crop producers due to damage to plantations;
- losses in beekeeping;
- losses of production inputs and finished goods due to damage and theft.



The infrastructure for storing agricultural products has suffered significant losses.

The total capacity of **the destroyed grain storage facilities reaches 8.2 mln t.**

The capacity **of the damaged grain storage facilities reaches 3.25 mln t.**

The cost of restoring the damaged facilities is estimated at **\$1.33 bln.**

The largest share of losses is due to **the destruction and damage to agricultural machinery**, resulting in estimated losses of **over \$4.65 bln.**

The second largest category is damages due to the destruction and theft of manufactured products.

Stolen Grain from Ukraine

The second largest category is damages due to the destruction and theft of manufactured products, with **the total value of destroyed and stolen products estimated at \$1.87 bln.**

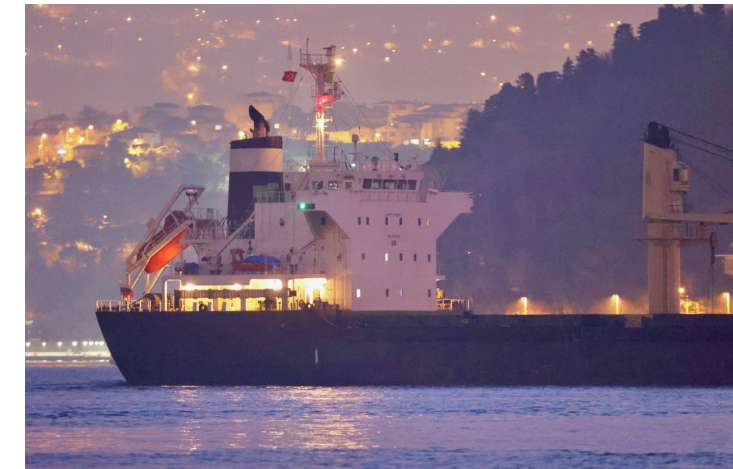
The true figure is likely to be higher. These are only confirmed facts.

The ports of Mariupol, Berdyansk and Skadovsk are still occupied. While the port of Kherson can be considered unblocked after the de-occupation of Kherson, it is still not operational, as is the port of Mykolaiv and the port of Olvia.

In the occupied territories of Ukraine, **Russia collected wheat worth at least \$1 bln.** The **occupiers claim that they collected 3.5 mln t** of grain in the Zaporizhzhia region last year. Currently, grain is bought there in 14 branches of the "State Grain Operator". Farmers had to cooperate with this "enterprise", and the purchase prices of the occupiers were lower than the market prices.

In turn, **as for grain, 400-500 kt** (also worth hundreds of millions of dollars) **were reported stolen from the four occupied southern regions**, which is more than a third of local stocks. For example, the Metinvest Group reported that the occupiers planned to export 200 kt of products worth \$170 mln from Mariupol's factories. The occupiers have already planned to export 1 mln t of grain of **the new crop** through the port of Berdyansk and by rail.

The USA imposed sanctions on a Russian company that steals grain from Ukraine.

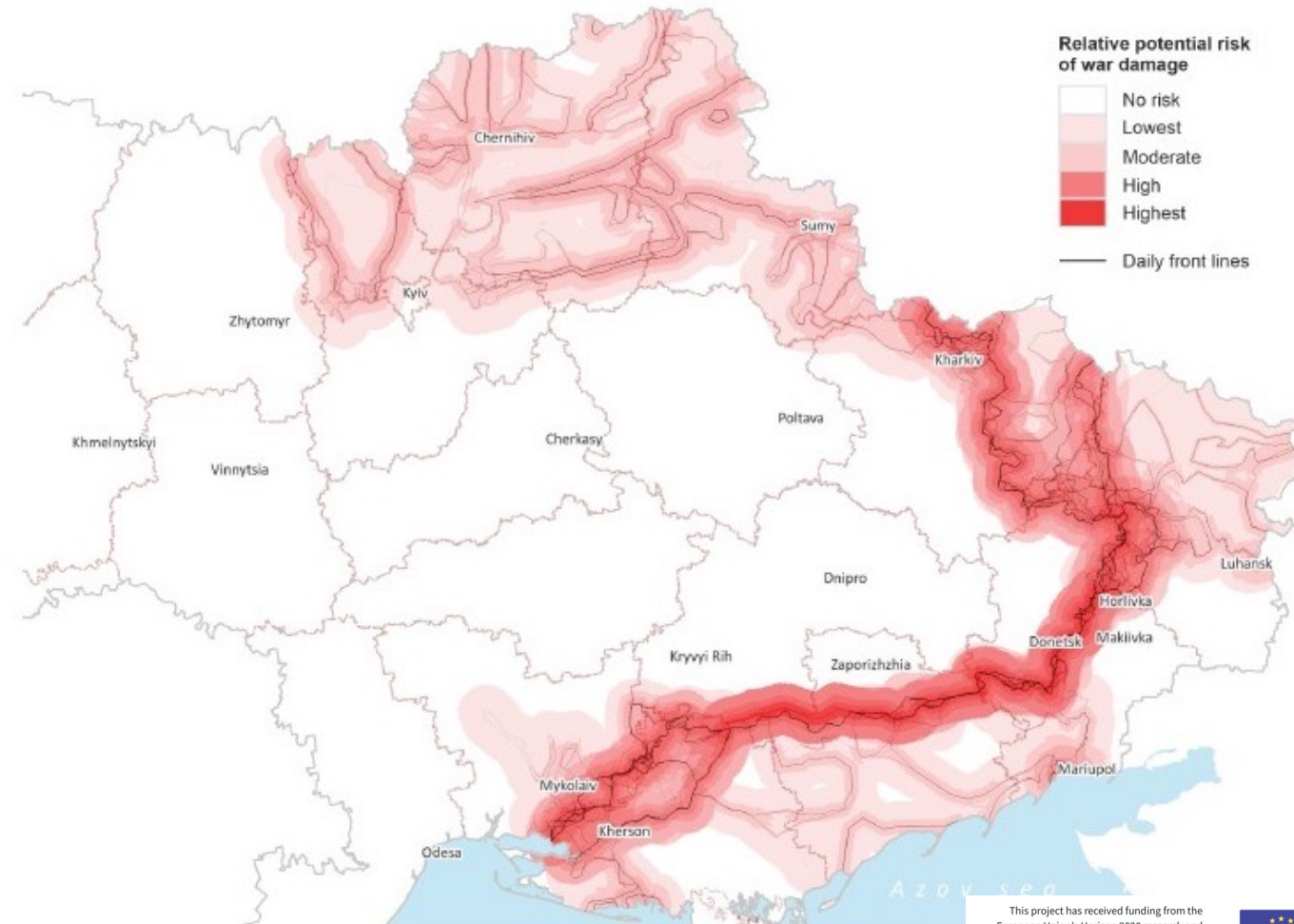


Russia continues to export stolen Ukrainian grain to Syria

(March 20, 2023) A company from the RF sent another batch of grain stolen from Ukraine from Sevastopol. A ship loaded with 27 kt wheat is bound for Syria.

Environment

Risks of soil damage in combat zones



Russia's military aggression has led to a number of dangerous impacts on all environmental components – air, soil and landscapes, surface and groundwater, vegetation, and wildlife.

188K km² of soil are at risk of damage and contamination. A high risk of damage and contamination is found on 105k km² of soil located up to 5 km from the front lines.

The use of land damaged by the hostilities will be complicated by the need for recultivation, demining and the disposal of unexploded ammunition.

298k ha of forest and **1,438k ha of grass fires** were recorded in the combat zone, which, together with the burning of oil and oil products, caused significant air pollution.

5.5 mln t of pollutant emissions have been released into the air due to the hostilities in Ukraine.

Forest fires

Damages to the forest fund as a result of forest fires are estimated at more than 82.9 mln m³ of timber with an estimated value of \$4.5 bln.

The total area of forest fires in the areas where active hostilities took place is **almost 298k ha.**

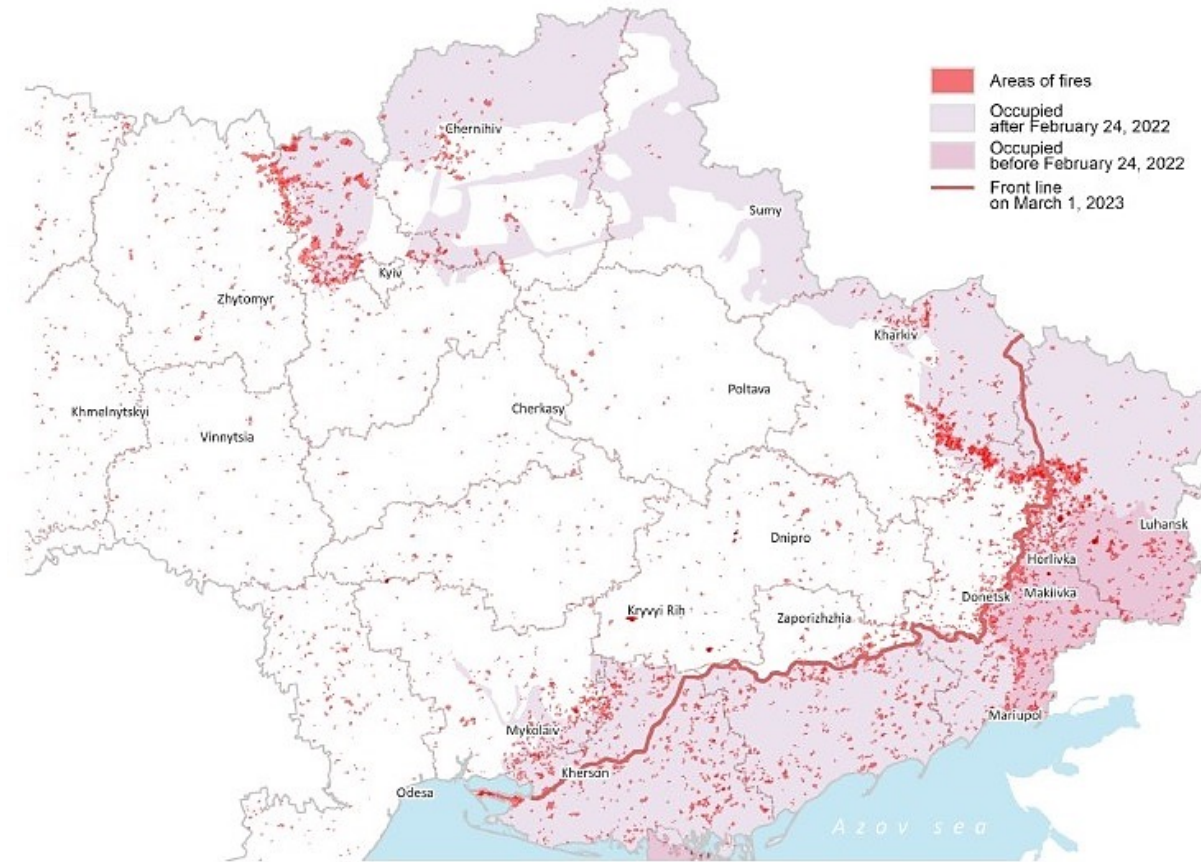
This area of forest fires in 2023 exceeds the average annual area of forest resources destroyed by fires throughout Ukraine **by more than 50 times.**

The average annual area of forest plantations destroyed by forest fires is **5,270 hectares.**

During the 11 years of observations of the extent of forest resources lost due to fires (2010-2020), **the highest value was recorded in 2020.** At that time, the area of affected forest plantations **reached 28k ha.**

One of the key factors behind this volume of forest fires is the difficulty of extinguishing forest fires in areas where active hostilities are or have been taking place. Even in the liberated territories, fighting forest fires is significantly complicated by the threat of mine contamination.

Estimation of forest and grass fires in the combat zone



Since firefighting and forestry activities along the front lines are dangerous until the combat operations are fully stopped and the forests are demined, the decline in forest cover in Ukraine remains a serious problem.

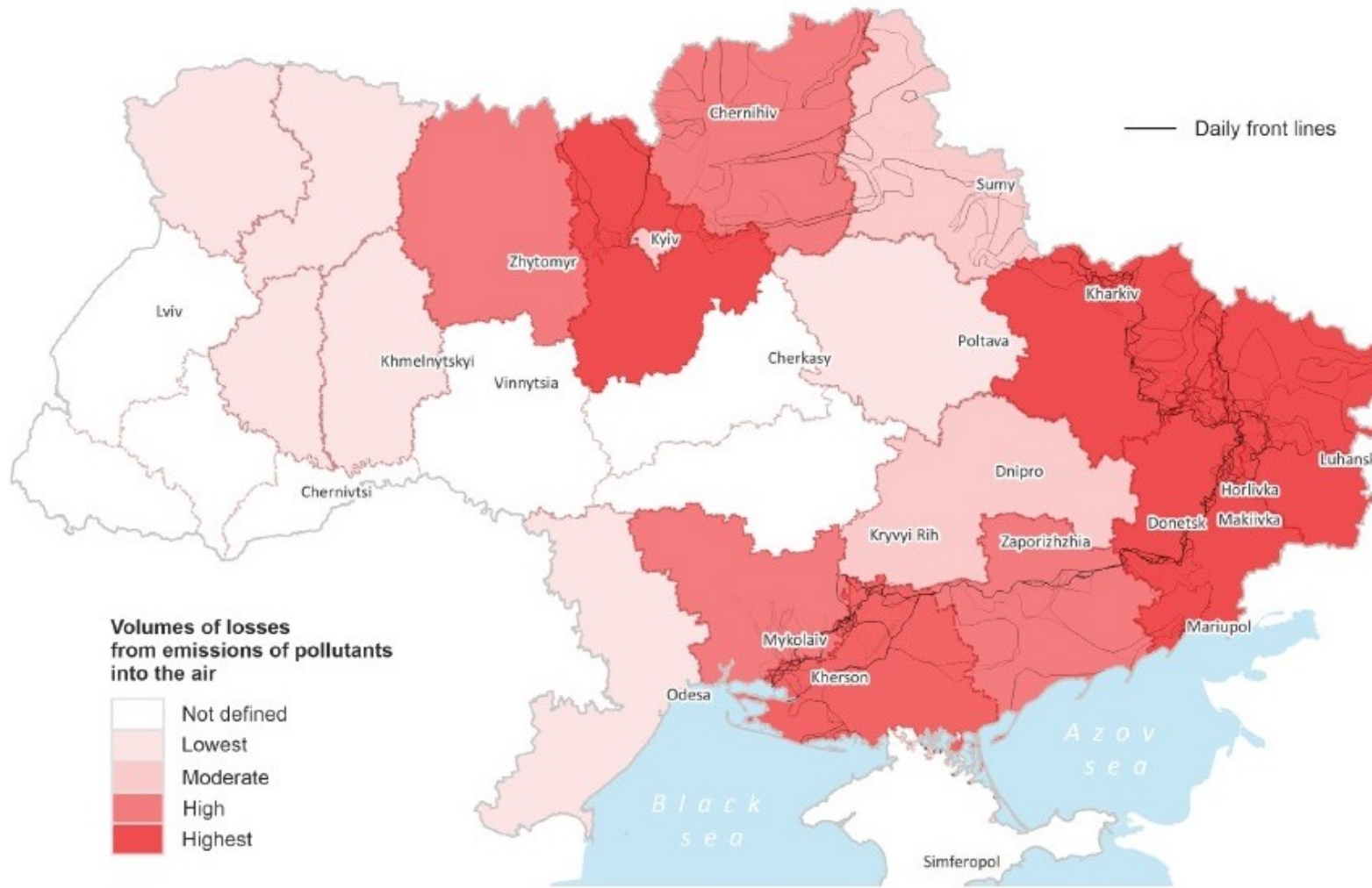
Air

The amount of damage from pollutant emissions into the air, caused by military operations

The damage from air pollutant emissions is almost \$25.8 bln, of which \$15 bln is damage from forest fires, \$10 bln is damage from grass fires, and \$752 mln is damage from the burning of oil and oil products.

To restore the damaged objects (incl. transport infrastructure) additional emissions of pollutants into the air will be required in the amount of \$1.1 bln.

Damage from air emissions should be compensated in amounts that will allow for equivalent environmental clean-up measures, as well as measures to prevent and adapt to climate change, which is especially important for agricultural production.



The negative environmental impact

Since 24 February 2022, there were numerous cases of infrastructure damage and power outages at coal mining enterprises. This resulted in the shutdown of mine water drainage systems and, in some cases, complete flooding of mines, **which inevitably led to surface water pollution, flooding and contamination of surrounding areas and subsidence of the surface.**

During the war, there have been repeated disruptions in the operation of hydraulic structures, water supply and sewage systems and facilities, including those **accompanied by accidental discharges of pollutants into water bodies.**

As a result of military maneuvers, construction of fortifications, explosions and burning of ammunition, **the surface layer of soil is disturbed.**

The hostilities on the territory of Ukraine have led to significant **land pollution and damage to the landscapes of the nature reserve fund.**

The disruption of nature reserves also occurs due to the lack of protection and the cessation of funding, which leads to an increase in illegal logging, extraction of minerals, forest and grass fires.

As a result of the hostilities, forests and forest protection plantations have suffered significant damage. **The greatest risks to forest plantations are associated with forest fires caused by ammunition explosions or deliberate arson related to the tactics of warfare.** In addition, significant forest areas have suffered from mechanical damage caused by military maneuvers and ammunition explosions, which leads to the weakening or death of forest plantations.

To reduce the negative environmental impact

The outbreak of the war has virtually paralyzed many aspects of environmental protection activities.

The destruction of the environmental protection system in the combat zones has led to the loss of information on the state of the environment, and in some areas, there is no environmental monitoring, no provision of ecosystem services and no measures to improve the environment, reduce greenhouse gas emissions and adapt to climate change.

In order to reduce the negative environmental impact of hostilities, immediate measures should be taken to protect and restore ecosystems in the affected areas.

Such measures may include:

- ✓ **land recultivation,**
- ✓ **reforestation,**
- ✓ **water purification,**
- ✓ **ammunition and mine clearance,**
- ✓ **and measures to prevent further pollution.**

It is important to maintain the attention of the international community and society to the problem of the environmental consequences of the war in Ukraine and to take all possible efforts to eliminate them.

Demining

About 270k km² of Ukraine's territory has been affected by the war, either through direct hostilities, mining of combat areas, or as a result of artillery shelling, strategic aviation, etc. The mines, other explosive ordnance (EO), and their remnants pose a direct threat to the lives and health of Ukrainian citizens and impede normal economic activity in the affected areas.

Around 185k km², or approximately 30% of Ukraine's territory, could potentially be contaminated with EOs and needs to be surveyed for mines and cleared. Since the beginning of the war, the SES has surveyed and cleared 704 km², mostly in Kyiv and Chernihiv oblasts, which have been de-occupied since April 2022, and has cleared around 200,000 EOs. Based on the current results of mine action, the density of cleared EOs is 284 explosive hazards per 1 km² of cleared territory, and may be significantly higher in areas of prolonged and active hostilities.



The problem of demining the fields will be relevant for the next 10 years and will cost Ukraine billions of dollars!

Demining of agricultural land

In the liberated areas there are about **2 mln ha of mined fields**. Each year of idleness of these lands will cost the country's economy up to \$800 mln. There are **6 mln ha under temporary occupation, which will also require inspection after release**.

Demining does not guarantee that farmers will return to work on these lands. The surface still needs to be leveled and recultivated, that is, to restore soil fertility. **In June the total cost of such works was estimated at \$40 mln.**

The Association of Ukraine's Sappers says that **demining a square meter of land can cost \$3-4**. No farmer can afford to finance such works.

The Military Feudal Project, which aggregates information for humanitarian demining, estimated **total humanitarian demining at \$5 bln in the summer of 2022. This amount is higher now.**



Complete humanitarian demining will require a lot of equipment and specialists. The Association of Ukraine's Sappers believes that complete demining of Ukraine may take tens of years. However, the experience of other countries, particularly Croatia, and new technologies can accelerate this process.

Currently, in Ukraine, demining of agricultural land is prioritized.

The procedure for reserving* employees

Business asks to speed up the procedure for reserving employees in order not to disrupt the sowing season

In March, the sowing campaign starts in Ukraine, and this year is no exception, despite the difficulties faced by farmers: reduced area suitable for sowing, higher prices for inputs, logistics, etc. At the same time, the biggest risk that farmers currently see is the slowdown in the mechanism for reserving workers.



Business certainly understands the importance of Ukraine's military front. Meanwhile, the sowing season, its quality and timeliness are crucial for food security, not only for Ukraine but also for the world.

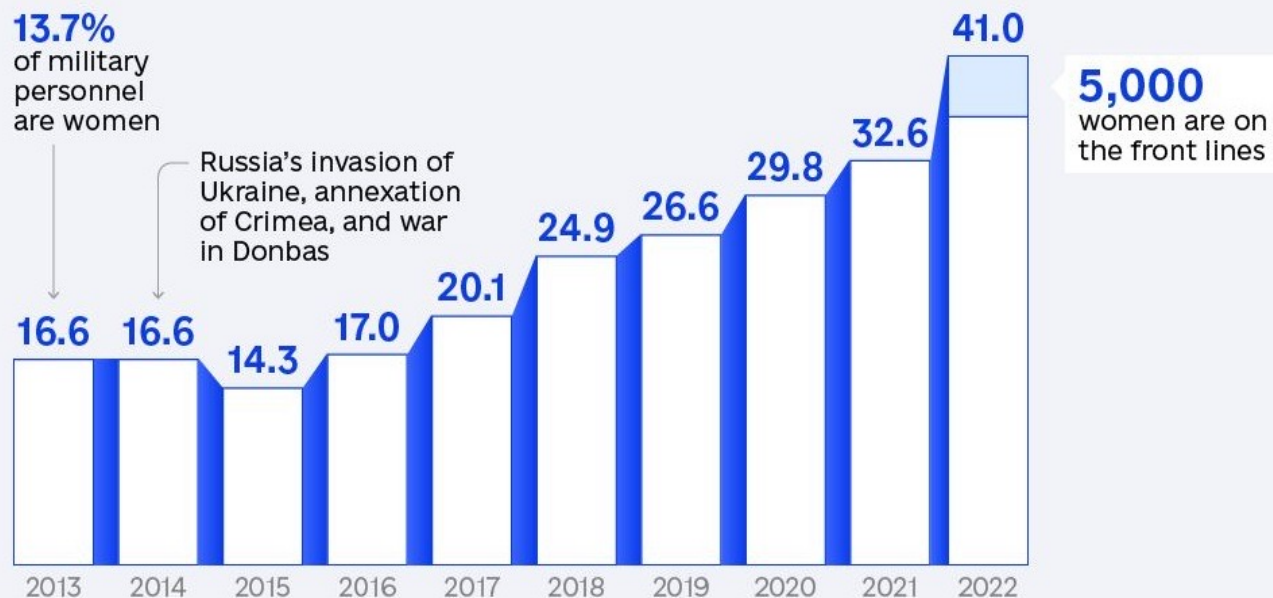
Moreover, the agricultural sector is Ukraine's largest export industry, accounting for more than half of all exports in 2022, sending more than \$23 bln worth of products abroad, which supports the stability of the hryvnia and the NBU's reserves.

At the same time, the sowing season will also affect the future for Ukraine and for the world.

*** A procedure during martial law that allows a company to guarantee that certain people critical to running business will not be drafted into the Armed Forces of Ukraine.**

Women in the Ukrainian Military

The number of women in Ukraine's Armed Forces (in thousands)



The percentage of women in the Armed Forces of selected countries*



A question may be asked
“What about women having to take over from absent men?” And “who remains to work on the farms”?

As of 2022, 41,000 women are part of Ukraine's Armed Forces, with 5,000 serving, voluntarily, on the front lines.

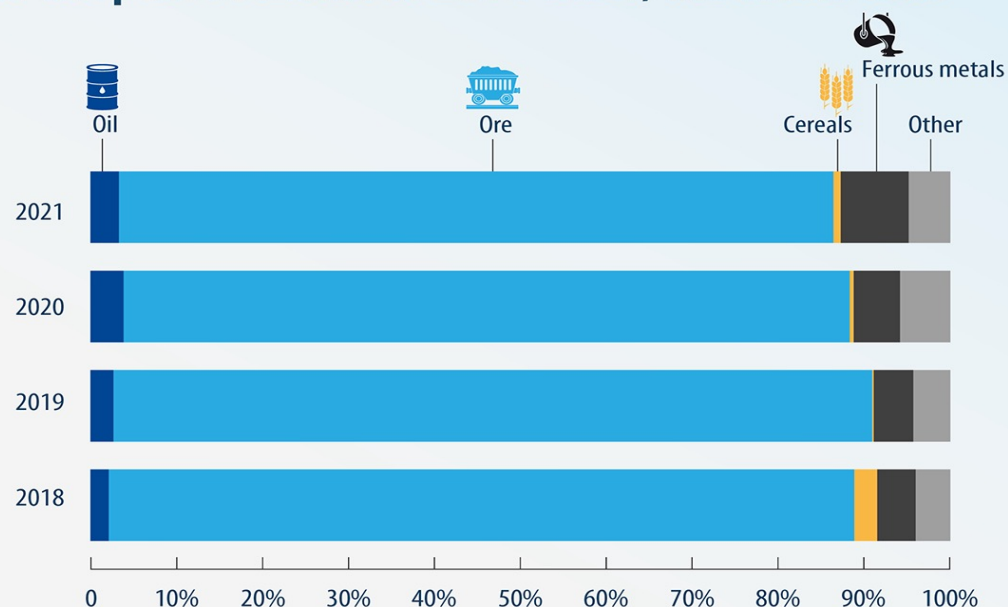
While women have played an important role in Ukraine's Armed Forces in past years, **the percentage of women in the Ukrainian Military has increased to 15% since Russia launched its war against Ukraine in 2014.**

Ukrainian Danube ports

Before the war, in 2018-2021 share of Danube ports in total Ukraine's cargo shipment **was 2.5-4.2%**. They did not cover any significant share of the total Ukraine's port cargo turnover, especially for grain cargo.

The Ministry of Infrastructure estimated the potential of transshipment increase up to 1 mln t per month.

Volume and structure of export cargo handling by types in the port of Izmil in 2018-2021, thousand tons



Source: USPA GMK CENTER

After the Russian blockade on Ukraine's Black Sea ports, the country's neighbors such as Romania scrambled to offer their own ports to export grain. Grain has been transported from the Ukrainian Danube ports of Reni and Izmil to Romania.

Under these conditions, the Ministry of Infrastructure **plans:**

- ✓ **to increase the throughput of Ukrainian Danube ports by 1.7 times, up to 25 mln t per year**
- ✓ **to modernize Danube ports, build new terminals and hubs**
- ✓ **to connect the ports of Reni and Izmil with rail**
- ✓ **to attract private investment for the construction of terminals.**

The plan for development of Danube ports include:

- ✓ dredging;
- ✓ further implementation of the "Danube – Black Sea" deep-sea navigation project;
- ✓ construction of the inland navigation fleet;
- ✓ repair and modernization of the existing park;
- ✓ attraction of a used fleet for the fastest possible effect;
- ✓ construction and modernization of access railway tracks;
- ✓ direct railway connection;
- ✓ unconstrained road traffic conditions.

The planned investment in the project implementation is about \$200 mln.

Not only Ukraine is dredging the Danube



Wreckage of a World War Two German warship is seen in the Danube in Prahovo, **Serbia**



The Danube in the **Bulgarian** course has become shallow to dangerous levels



The water level of the River Danube has continued to drop from a recent record low, dipping to 43-44cm at **Budapest, Hungary**



- Due to the drought in some parts of the Danube, the water level has dropped to dangerously low levels in July-August, 2022
- Shipping and agriculture suffer as drought causes dramatic fall in Danube. Grain supplies at risk
- **In August 2022, Bulgaria, Romania and Serbia began to deepen the bottom of the Danube.** So Ukraine is not the only one dredging the Danube.

The development of the transport potential of the Danube



Ukraine and Romania agreed (March 9, 2023):

- ✓ to jointly develop the Danube ports
- ✓ to improve pilotage of vessels in common section of river Danube



The development of the international project DIONYSUS has been completed (March 17, 2023).

26 countries have joined the initiative. As part of the program, USPA representatives analyzed the development of transport corridors and inland waterways in the Ukrainian part of the Danube region.