Blaming his decision on nonexistent export restrictions that were allegedly imposed by the West, Vladimir Putin has backed out of a trade deal brokered by the United Nations and Turkey that permitted Ukrainian grain to be exported from ports on the Black Sea to world markets. Putin is now trying to diminish Ukraine’s ability to export grain, even though he has devastated Ukraine’s 2023 harvest, reducing it by one-third. The Black Sea is now part of the war zone. This threatens the viability of all Black Sea grain exports, including grain sourced from Russia, with severe implications for global food security.

The Russia-Ukraine War has spooked world corn and wheat markets. Russia is the world’s largest exporter of wheat, the most widely cultivated food crop. Wheat is used mainly in foodstuffs, including bread, pasta, biscuits, and cakes. Russia accounts for about 18% of global wheat exports, but unlike in the case of wheat, Russia is not a major player in the world corn market, supplying less than 2% of global corn exports.

Alternatively, Ukraine is not one of the top players in the wheat market. Ukraine provides 9% of the world’s wheat exports and 14% of its corn exports and ranks as the fourth largest corn exporter, behind the United States, Brazil, and Argentina. Why are these trade statistics vital? The simple answer is that Russia’s aggression in the Black Sea region increases the risk of the world grain market losing the number four corn exporter and the number one wheat exporter if grain vessels on the Black Sea become targets of drone strikes. In the worst-case scenario, grain exports shipped across the Black Sea and through the Bosphorus Strait (connecting the Mediterranean Sea and the Black Sea) could be halted, cutting off 27% (17%) of global wheat (corn) exports from Russia and Ukraine combined.

Figure 1 summarizes shifting volumes of Ukrainian and Russian grain exports to the world market.

![Figure 1. Russian Grain Export Fortunes Are Ukraine’s Misfortunes](https://apps.fas.usda.gov/psdonline/app/index.html#/app/home)


Note: Grain exports, in million metric tons (mmt), include corn and wheat. Pre-war is the average for marketing years 2018/19 to 2020/21. The marketing year 2023/24* exports are projected. The corn marketing year is September to August, and for wheat it is July to June.
95% of Russia’s grain exports are via the eastern portion of the Black Sea, and the largest ports are Novorossiysk and Taman. Ports in the Sea of Azov also export considerable amounts of grain through the Kerch Strait and then into the Black Sea. The war has periodically halted shipments through the Kerch Strait.

A second war-related price spike in corn and wheat occurred in July 2023 when Russia backed out of the Black Sea Grain Initiative (BSGI) and, at the same time, stepped up attacks on Ukraine’s export infrastructure with the bombing of Odesa and Danube River ports. The BSGI, brokered by the United Nations and Turkey, allowed Ukraine to export grain through the Black Sea ports. In Figure 2, we see from the lack of ships in the northwest portion of the Black Sea that the Odesa grain ports stopped operating after the BSGI was terminated. Instead, bulk carriers are bunched up at the mouth of the Danube River, picking up grain at the inland Danube ports (e.g., Izmail and Reni), across the river from Romania (a NATO member), and then sailing back out to the south-western Black Sea.

After the July 2023 BSGI shock, wheat prices increased by 15% and corn prices increased by 10%, although prices reversed in less than two weeks. Besides looking at futures prices, it is also informative to consider how the market priced in the added uncertainty brought on by the war. We can use something called implied volatility to measure the war premium. Implied volatility can be measured in the corn and wheat options markets.

The Chicago corn and wheat markets are the world’s central grain markets, trading futures and options. The futures contracts are obligations to buy or sell a specific quantity and quality of wheat or corn at a certain price on a specified future date, such as December. Alternatively, options give the buyer the right to buy or sell a futures

**Figure 2. Black Sea Grain Export Routes and Volume**

![Diagram of Black Sea Grain Export Routes and Volume]

Source: The export shares for Ukraine were calculated based on data from the Ukrainian Grain Association (July 2022 to June 2023), while those for Russia are from the Foreign Agricultural Service (July 2022 to April 2023). The green cargo ship data are from MarineTraffic. We show ship positions and movements as of August 5, 2023.

wrote, “An unprecedented food crisis is engulfing the world—supercharged by the war in Ukraine. It has brought rising food prices, malnutrition, and the potential for much worse.” The *Wall Street Journal* and the World Bank echoed this narrative.

On the Chicago grain futures market, wheat prices rose by 30% in March 2022, an extraordinary price jump in one month when there were no other unusual news events. At the same time, corn prices went up by 13%. Interestingly, wheat prices responded more than corn prices, even though Ukraine is relatively more important in the corn trade than in the wheat trade. However, almost all grain exports from Ukraine and Russia are loaded on vessels that cross the Black Sea and sail through Turkey’s Bosphorus Strait to world markets (see the bottom left-hand corner of Figure 2).

If the war were to jeopardize all the grain shipments on the Black Sea, the wheat market would be hit harder than the corn market because the volume of wheat shipments on the Black Sea was about 1.7 times the corn shipments. Figure 2 shows that over

Russian Aggression Caused Grain Price Spikes and Raised Market Volatility

The Russian invasion of Ukraine in February 2022 caused the commodity futures markets to explode, with significant jumps in the prices and volatilities of energy and grains. The war also stoked the most sizeable food security concerns since the 2007/08 commodity price boom. After the war in Ukraine broke out, the *Economist*...
contract, but unlike futures, there is no obligation.

Implied volatility is a term used in the context of options trading, referring to the market’s expectation of the future price volatility of the underlying asset, such as corn or wheat. One can think of implied volatility as the market’s measure of expected risk (or expected volatility) of price changes embedded in options prices. Implied volatility is reported on a one-standard deviation annualized basis. This means that if the implied volatility is 50%, then the options market implicitly estimates that a one standard deviation change in the underlying price over the next year could lead to a ±50% change in the current price. When implied volatility is high, the market participants expect significant price swings in the underlying commodity.

The time paths of nearby call options implied volatilities for the Chicago corn and wheat markets are shown in Figure 3. When Russia first invaded, the wheat implied volatility jumped from around 40% to over 160%. During the same period, the implied volatility for corn increased from about 25% to close to 60%. Then, over a year later, when Russia backed out of the BSGI, wheat volatility rose from 40% to 50%, and corn volatility went from 30% to close to 40%. Once again, the wheat market priced in a higher war premium than the corn market.

**Black Sea Grain Initiative and Solidarity Lanes Lowered Grain Prices**

After the February 2022 invasion, the so-called Solidarity Lanes were established on the border between Ukraine and the European Union (EU) and allowed for Ukraine grain exports via road, rail, and the Danube River ports. The Solidarity Lanes predated the BSGI, and both were successful in allowing Ukraine’s agricultural exports to reach world markets, lowering world grain prices, and averting a global food security crisis. The original BSGI agreement was established on July 22, 2022, and was set for 120 days, but several extensions were granted. Unfortunately, before Russia withdrew from the deal in July 2023, Ukraine’s grain exports from Black Sea ports had already slowed because Russia was dragging its heels on inspections of outbound ships, and Ukrainian grain production had fallen significantly due to the war.

**Ending the BSGI Could Backfire for Russia and Further Harm Low-Income Countries**

The BSGI allowed Ukraine to export almost 33 mmt of grain and other food via its Black Sea ports. Russia repeatedly complained that the deal benefited developed countries more than developing countries. However, an examination of the international trade statistics for the 2022/23 marketing year reveals that more than 50% of the grain from Ukraine went to developing countries, a marked increase from the pre-war period.

Before the war, the Ukrainian Black Sea ports could handle up to 4.5 mmt monthly. The maximum monthly grain shipments through those ports were less than 3.8 mmt under the BSGI. Ukraine also has the capacity to ship up to 2 mmt per month by rail and truck via the western route and up to 2.5 mmt via the Danube inland ports. The recent damage at those inland grain terminals by Iranian-made drones and cruise missiles launched by the Russians will further hinder Ukraine’s ability to get its grain to market. The European Commission expects the Solidarity Lanes to handle up to 22 mmt in the current crop year, falling short of the 2023/24 expected Ukrainian corn and wheat harvest, which totaled about 42.5 mmt—30 mmt of which would be available for export.

Figure 4 (on page 4) compares the top 10 Russian and Ukrainian grain export destinations, by volume, before and after the Russian invasion. In the top panel, we show that Russia’s grain exports to Bangladesh, Sudan, and Nigeria were diverted elsewhere after the war started. Turkey’s imports from Russia increased significantly, and presumably, these imports were re-exported to other countries but with added costs.

In the lower panel, we find that Ukraine’s grain exports to Egypt, Indonesia, and Bangladesh have been diverted during the war. More grain from Ukraine is being sold into Roma-
nia, Turkey, and Poland and undoubtedly re-exported at a higher cost. It is likely that import costs for grain rose in places such as Egypt, Indonesia, and Nigeria, which depended on Black Sea grain shipments. Rising food prices affect developing countries disproportionately because food expenditures represent a higher share of household expenditures. The end of the BSGI creates instability and uncertainty in global food markets and increases food insecurity for vulnerable nations.

The Russian decision to further weaponize grain exports is likely to backfire. At the recent Russia-Africa summit in Saint Petersburg, Putin promised six of the African leaders at the summit 25,000–50,000 tons of free grain each in the coming months, sharing additional Russian profits from grain sales enhanced by the Russian-caused price spikes. This offer is ironic, considering the record grain harvest Russia expects and the severely diminished grain export potential of Ukraine. The recent Ukrainian naval drone attack on a Russian oil tanker in the Kerch Strait and a Russian navy ship in the port of Novorossiysk reveals the vulnerability of Russia’s own Black Sea grain shipment routes during wartime. These attacks also threaten Russia’s oil exports, as Novorossiysk exports about 1.8 million barrels daily.

**Conclusion**

The Western sanctions against Russia in response to the Russian invasion of Ukraine did not block grain exports from Russia, and therefore the Russian retreat from the Black Sea grain deal was nothing more than another form of Russian aggression towards Ukraine. Fortunately, the Solidarity Lanes successfully moved a large share of the 2022 Ukrainian harvest to world markets. Given the large drop in the expected 2023 crop in Ukraine and the operation of the Solidarity Lanes, going forward, grain traders may be less concerned about getting Ukraine’s grain to export position than the possibility of the loss of Russian wheat exports on the Black Sea.

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**Authors’ Bios**

Colin A. Carter is a Distinguished Professor in the Department of Agricultural and Resource Economics at UC Davis. Sandro Steinbach is an associate professor in the Department of Agribusiness and Applied Economics and the Director of the Center for Agricultural Policy and Trade Studies at North Dakota State University. They can be reached at cacarter@ucdavis.edu and sandro.steinbach@ndsu.edu, respectively.

For additional information, the authors recommend: