

Climate Change Food Bowl

Global food bowl risk scenarios

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Insights

1

The war in Ukraine has created further turmoil for global markets as ongoing deteriorations in availability and affordability add to growing food security concerns.

2

Several countries globally have imposed food export bans and international trading restrictions with the aim of lowering domestic food prices and reducing concerns of food shortages and higher prices.

3

Current EU farming practices have come under increasing pressure from animal rights activists and environmental protest groups. Variable weather patterns and unpredictability will impact the use of GM crops, fertilizers and pesticides, and challenge the food production sector to rethink traditional ways of farming.

Introduction

Besides providing shelter as well as internal and external security, keeping the population well fed is probably every government's key task and failure to do so can lead to food insecurity protest action which can ultimately threaten the survival of the administration.

Unfortunately, food security has become a more pressing issue over the past years due to a combination of several factors. While ongoing global warming and weather phenomena like El Niño endanger harvests, thereby also contributing to rising prices, political events also play a part in the deteriorating trend.

In this white paper, international economist Markus Kuger examines three scenarios that focus on the role of policymakers in the current food security debate. Scenarios 1 and 2 look at the effects of the Russia-Ukraine war and the introduction of food export bans (which have become more common in recent years). The third scenario will analyze how public resistance against the introduction of genetically modified (GM) crops and the potential ban of widely used weed killers impact on food supply.



Scenario 1: The Russia-Ukraine war and its consequences on food security

Russia's invasion of Ukraine came at a time when prices for agricultural products were already elevated and global food security was under stress. The Global Food Security Index (GFSI), compiled by Economist Impact (which belongs to The Economist magazine) had improved steadily between its inception in 2011 and 2019. Since then however, things have taken a turn for the worse as COVID-caused supply chain disruptions and rising food prices have taken their toll. The 2022 index shows ongoing deteriorations in the "availability" and "affordability" sub-indices while the "quality and safety" sub-ratings also performed badly.

Against this backdrop, the war in Ukraine creates further turmoil on global markets as both Russia and Ukraine are major food producers and exporters. According to the European Parliamentary Research Service, Ukraine accounted for 10% of global wheat exports in 2021, the last pre-war year.

At the same time, 24% of global wheat exports originated in Russia which means that both countries combined were the source of a third of global wheat trade. The reliance on Russia and Ukraine is even bigger when it comes to sunflower oil: Ukraine produced 31% of global exports while Russia was responsible for 24%. Meanwhile, 61% of global sunflower oil cake (which is a high-protein and fat feed source for livestock) exports are produced in Ukraine with Russia contributing an additional 20%. When other product groups like maize (15% Ukraine, 2% Russia) or barley (13% Ukraine, 14% Russia) are added to the analysis, it becomes even more evident that the two neighboring countries are one of the globe's most important food bowls. Overall, Ukraine is the source of 6% of globally traded food calories, narrowly above Russia's share (5.8%).¹



Percentage share of global exports 2021

Commodity	Ukraine	Russia	Ukraine + Russia
Wheat	10%	24%	34%
Maize	15%	2%	17%
Barley	13%	14%	27%
Sunflower oil	31%	24%	55%
Sunflower cake	61%	20%	81%
Fertilizer mineral intermediates	-	13%	-
Finished fertilizers	-	16%	-
Food calories traded globally	6%	5.8%	11.8%

Source: UN Food and Agriculture Organization, *AMIS Market Monitor*

Worryingly, North Africa and the Middle East (which tends to score poorly in the GFSI) sources around 50% of its cereal imports from Russia and Ukraine while in Eastern Africa, the exposure is even bigger: 72% originate from Russia with Ukraine providing an additional 18%.

In addition, Russia is also a major fertilizer producer, thereby also impacting on global food markets. According to information from market intelligence provider Argus, Russia is the world's biggest ammonium nitrate, urea, and NPK (nitrogen, phosphorous, and potassium) exporter while also playing a key role in sulphur and muriate of potash (MOP) markets.²

Percentage share of global exports 2021

Product	Tonnage	Export Market Share	Export Market Rank
MOP	11,832,717	27%	3 rd
Ammonium nitrate	4,313,229	49%	1 st
Urea	6,999,814	18%	1 st
NPKs	5,928,142	38%	1 st
Ammonia	4,424,342	30%	1 st
DAP/MAP	4,048,081	14%	4 th
Sulphur	1,805,567	9%	3 rd

Source: Argus



Although the West has not directly targeted Russia's fertilizer and agri-food sector, given their importance for global food security, the imposed sanctions do have a negative impact. Disconnecting Russia's banking sector from the SWIFT network, the seizure of companies' overseas assets, the inclusion of several oligarchs on no-entry lists and the closure of pipelines between Ukrainian Black Sea ports and Russia are all hampering Russia's fertilizer and grain exports, at least according to the Kremlin.³

Meanwhile, the collapse of the Ukraine-Russia grain export deal in mid-2023 also leads to upward pressure on global food prices and creates scarcities. After Russia refused to renew the agreement (brokered in 2022 with the help of the UN and Turkey), Ukrainian vessels can no longer pass safely through a corridor from three Ukrainian Black Sea ports to the Bosphorus as the Russian navy poses a severe threat to them. Grain now has to be exported via roads and railways, freight barges on the Danube river or Romanian and Bulgarian territorial waters, methods that are much more time-consuming and costly.⁴

As a result of the war in Ukraine (which also undermines the agricultural output in the country), the blockade of the Black Sea for Ukrainian ships and the ongoing problems for Russian exporters, the UN's Food and Agriculture Organization expects 7.6 million to 13.1 million more malnourished people around the globe, depending on the severity of the shock. Asia Pacific (4.2 million–6.4 million), Sub-Saharan Africa (2.6 million–5.1 million) and the Near East and Northern Africa (0.4 million–1 million) are most exposed to the developments.⁵

Positively, some of the adverse price effects of the invasion have reversed in recent quarters. After having peaked at 294 points in the immediate aftermath of the outbreak of the war in April 2022, the Fertilizer Price Index has gradually moderated to 158 points in September 2023 (but still stands above pre-war readings).⁶ The same applies to global food prices: wheat prices were down by around 35% year on year (y/y) in early October 2023 while maize was down by 28% y/y.⁷ That said, most agri-food price levels still considerably exceed their long-term averages and with no end of the conflict in sight, this situation is unlikely to change in the foreseeable future.

Scenario 2: Global food prices and the role of export bans

As a response to elevated food price inflation, several countries around the globe have introduced international trading restrictions on agricultural products. While a few countries had already put measures in place before March 2022 (for example, Argentina had capped its wheat and maize exports volumes in December 2021 already⁸), the outbreak of the Ukraine-Russia war has accelerated this trend. As a result, the GFSI shows a 6% deterioration in the "trade freedom" sub-index between 2019 and 2022.⁹

The rationale behind imposing trade restrictions is simple: rather than exporting harvests to foreign countries, the barriers (which range from quotas and taxes to outright bans) will lead to higher supply at home which in turn lowers prices for domestic consumers/voters. However, these policies also create losers: domestic producers obtain lower revenues (which could weigh on investment in the medium to long run) while consumers in foreign countries also face shortages and higher prices.

According to the *Food and Fertilizer Export Restrictions Tracker*,¹⁰ created by the International Food Policy Research Institute¹¹ there were 37 export restrictions in place in early October 2023. While 19 countries have banned certain exports outright, impacting 25 product groups, five states (Argentina, Azerbaijan, Belarus, India, and Turkey) are currently operating export licensing regimes that in total involve six products. In addition, four countries (Argentina, India, Russia, and Uganda) have active export taxes in place, also impacting six products. In addition to the food-related restrictions, China, Ukraine, Russia, and Vietnam, are currently limiting the free trade of fertilizers.

Most recently on the food front, India has launched three new measures: since August 2023, a 40% tax on onion exports, a 20% duty on parboiled rice exports and a minimum export price of USD1,200 per ton on basmati rice have been in place.

These measures will run until the end of 2023, at least and can be seen as an attempt to keep key food staples affordable, ahead of the parliamentary election in early 2024. In fact, in order to shore up support for the incumbent government, India's administration has interfered heavily with markets for agricultural produce: more than 51% of the country's food exports are now restricted (when measured in calorie-terms, in US dollar terms the value still stands at a high 30%), causing severe strain in key export markets such as Bangladesh or the Philippines.¹²

Looking ahead, food (and fertilizer) export restrictions are likely to be scaled back somewhat. Elections will have taken place in India by April or May 2024, thereby increasing the likelihood that the government might return to a more free-market approach. At the same time, falling food prices (see Scenario 1) have removed some of the pressure on domestic governments to interfere with domestic price setting. In fact, 19 states have already phased out export bans between March 2022 and October 2023 while five countries have discontinued their export licensing regimes. Furthermore, Indonesia and Mexico both stopped their export tax policies in 2022 after having been in place for a few months only.

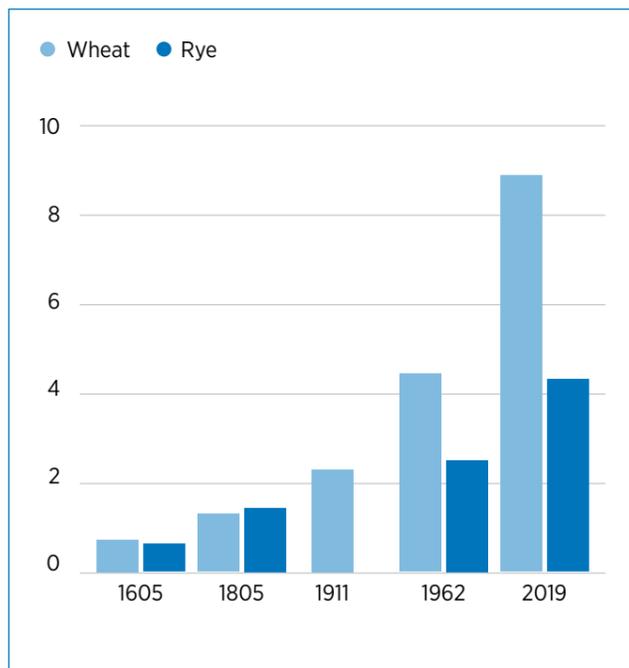
At the same time however, ongoing weather phenomena, persistent global warming, and the prospect of another poor rice harvest in Asia (India has experienced the driest August in a century) will put pressure on politicians to favor the domestic population against foreign consumers. On balance, it seems likely that certain trade barriers will remain in force for the next years, thereby also reducing global food supply, especially in the world's poorest regions.



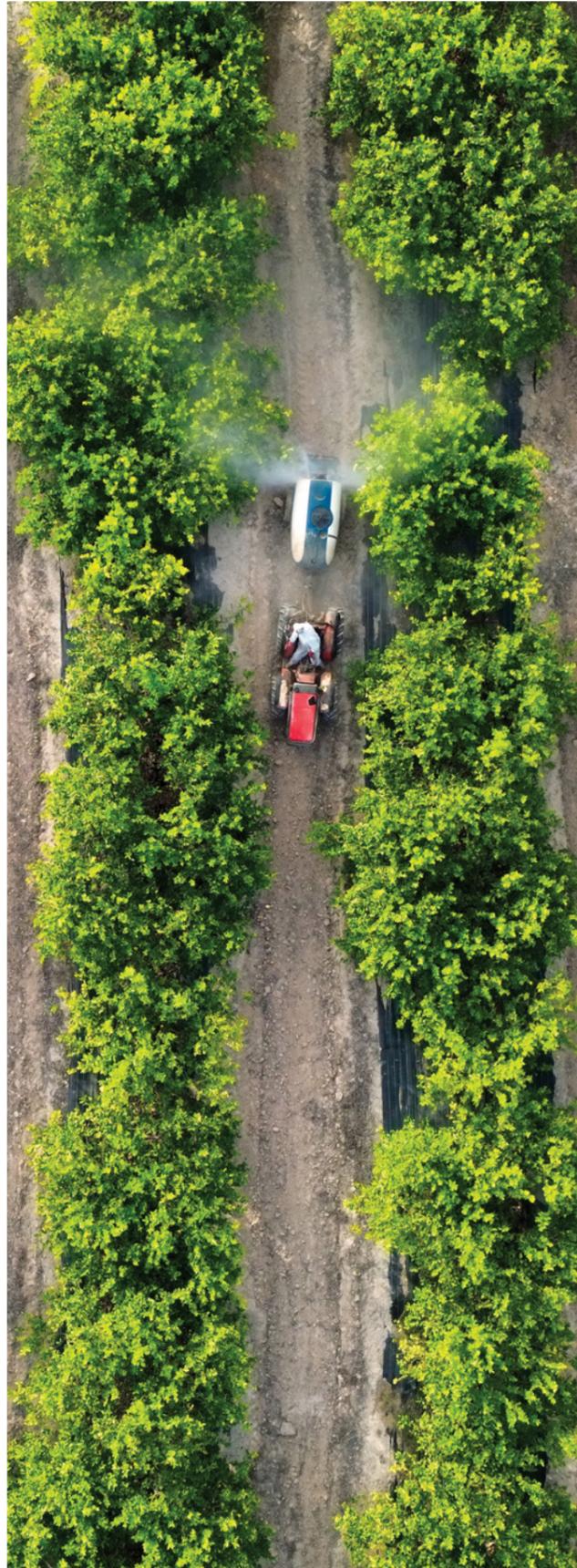
Scenario 3: Genetically modified crops and weed killers—what’s next?

Positively, output in the agricultural sector has increased steadily over time, especially since the mid-20th century when the mechanization of labor, the usage of fertilizers and more modern crop varieties all led to immense efficiency gains. In the UK, the wheat yield stood at 0.43t per hectare in 1400, gradually rising to 0.74t in 1605 and 1.26t in 1805. Standing at 2.12t in 1911 output doubled within the next 50 years (to 4.35t in 1962) before reaching almost 9t per hectare in 2019. Meanwhile, the global average wheat yield per hectare has increased from 1.21t in 1962 to 3.54t in 2019.¹³ Other crops such as maize, potatoes, rice, or rye show similar developments. At the same time, the world population has increased from around 3.1 billion in 1962 to almost 8 billion in 2021 and the amount of cropland per person halved between 1960 and 2010 (from 0.4 hectares to 0.2 hectares).¹⁴ In other words, technological advances enabled us to feed more people with much less arable land per head.

Rye and Wheat Yields in the UK Over Time (In Tonnes per Hectare)



Note: Data for 1911 rye yield not available
Source: <https://ourworldindata.org/crop-yields>



Looking ahead, it remains questionable though whether this trend will last, at least in Europe. In large parts of the EU, the current way of farming has come under pressure from environmental and animal rights activists. For example, the widespread use of fertilizers has led to a contamination of soils and groundwater.¹⁵ EU-set environmental protection rules are often breached and measures to reduce fertilizer usage have to be followed more strictly going forward.

At the same time, there is still sizable, albeit decreasing opposition in Europe against the use of GM crops. This is especially noteworthy as the productivity of many currently grown crops will suffer from the ongoing global warming process. Positively in this context, the amount of people worried about the use of GM ingredients in food and drinks has dropped from 63% in 2005 to 27% in 2019.¹⁶ Meanwhile, the European Commission is currently working on a new proposal that will supersede the decades-old (and ultra-restrictive) GM crops regulation. For example, according to leaked drafts, member states will no longer be able to veto the cultivation of GM crops in their countries.¹⁷

At the same time, Glyphosate, the world’s best selling weed-killer (and hence a cornerstone of global food production) has come under pressure as it could be carcinogenic. In the US, there are several law suits against Bayer, the German chemical giant that owns the product after it bought Monsanto in 2018 while countries like Vietnam, Mexico, Luxembourg, and Germany have either already banned glyphosate or intend to do so in the near future.¹⁸

Looking ahead, the “traditional” way of farming in the developed world will come under increased pressure. While higher temperatures and weather phenomena like severe droughts and heavy rain will force farmers to adapt, the electorate is split into a smaller (but seemingly growing) part that increasingly cares about environmental protection and animal rights (vegetarianism and veganism are on the rise) and those that favor affordability. Politicians will have to find a balance between these opposing forces. The proposals for the new EU GM Directive and the looming 10-year renewal of Glyphosate in the EU,¹⁹ despite their potential harmful effects on the environment, indicate that food security is currently a bigger worry for politicians than sustainability.



About the Author



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Markus Kuger is an economist specializing in labor markets, monetary policy, and European economics with more than a decade of experience in analyzing the global risk landscape. After working for the Economic and Monetary Affairs Committee of the European Parliament in Brussels, Markus joined Dun & Bradstreet's Country Insight Services in London in 2010 and from 2018 as their Chief Economist. After returning to Germany in 2021, Markus currently works as a freelance economic consultant to multinational clients.

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