



An unfolding food crisis: a perspective from the fertiliser industry

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One hundred years ago, the world was in a global food shortage. The discovery in the early 1900s of an efficient process for making ammonia out of hydrogen and the nitrogen that is in the air led to the production of nitrogen-based fertilisers. This innovation vastly expanded the availability of food such that today mineral fertilisers are responsible for half of the food we eat. But now conflict in Europe is interrupting the availability of agricultural commodities including fertilisers, weakening a global food system already stressed by the effects of climate change and the Covid-19 pandemic, and prompting calls for action to mitigate a growing food crisis, especially in emerging markets.

Fertilisers are a vital ingredient for feeding the world sustainably

To understand the importance of fertilisers in this scenario, think of fertilisers as food for plants. Just like people, plants need nutrients to grow and thrive. Nitrogen-based ammonia fertilisers and the mineral fertilisers, phosphate and potash (potassium), which are processed from mineral deposits taken from the ground, are often referred to as N, P and K. It is a widespread practice of farmers and agronomists to apply the right nutrient source, at the right rate, at the right time and in the right place (the '4R' approach). Combinations of fertiliser applications vary, depending on the type of crop, the soil at the farm, local climate conditions, geography and so on. Organic fertiliser (manure, for example) has a role too; although, not at a scale to provide the high yields necessary to feed billions and not within planetary boundaries for methane. If farmers do not apply fertilisers, their crop yields go down - and with the main exception of legumes, which can get one of the nutrients, nitrogen, from the air by themselves, all crops need plant nutrients. The efficient production, distribution and use of plant nutrients including mineral fertilisers are essential to the global food system.

The war in Ukraine is the biggest geopolitical disruption to hit the global fertiliser market in decades

Global fertiliser market facts

Fertilisers are consumed in almost every country. The largest suppliers are countries which have the relevant raw materials needed for fertiliser production, as follows:

- For **nitrogen**, the raw material is hydrogen, typically from natural gas or coal (the trend in fertiliser production is to move toward low-carbon and ultimately net-zero emissions, using renewable energy and innovative recycling techniques). In 2020, global nitrogen production totalled 85 million tonnes (Mt) of ammonia. The top four producing countries were China, Russia, USA and India.
- Gross phosphoric acid production can be used as a proxy for total processed **phosphate production**. Global processed phosphate production totalled 87Mt of phosphoric acid. In 2020 China, Morocco, USA and Russia led production.
- Global **potash production** was 71Mt in 2020 and the top producers were Canada, Russia, Belarus and China.
- The top five **ammonia** fertiliser producing countries accounted for 61% of the world total in 2020. For phosphoric acid and potash, the top five countries accounted for 79% and 85% respectively. See figure 1.

Global fertiliser prices are market-driven and determined by the balance between supply and demand among other factors such as export restrictions, logistics constraints and the time of year in the agricultural cycle of planting and harvesting ('seasonality'). The war in Ukraine is the biggest geopolitical disruption to hit the global fertiliser market in decades.

The role of Russia, Ukraine and Belarus in fertilisers

The war in Ukraine is having several repercussions on the fertiliser supply chain. Russia is a major player in global fertiliser trade, and international sanctions on Russian individuals, entities and financial transactions have disrupted the flow of many commodities, including nitrogen, phosphate and potash fertilisers. This trade disruption from Russia alone has halted 14% of the urea volumes traded globally, 11% of ammoniated phosphates trade and 21% of global potash trade. Russia also supplies 23% of the world's traded volume of ammonia and 46% of the ammonium nitrate trade.

Add to the picture Belarus, sanctions on which have restricted a further 20% of global potash trade, resulting in a disruption of 41% of world supply. To replace this volume is not easy, despite other producing countries ramping up supply as quickly as they can. Potash comes from deep mines and bringing capacity online takes years; in fact, across the inorganic fertilisers it can take from three to up to 10 years to reach that point. See figure 2.

Some of the largest fertiliser consuming regions import significant volumes from Russia and Belarus. While some regions may be able to turn to alternative suppliers, global supply outside of Russia and Belarus is definitively not enough to satisfy global demand. Europe, Latin America and South Asia are most exposed in volume terms. See figure 3.

Sanctions on Russia have also led to record high gas prices in Europe, which has been passed through to fertiliser production costs. Natural gas accounts for 70-80% of nitrogen fertiliser production costs, and spiraling gas prices have led to unsustainably high costs for European nitrogen fertiliser producers - reinforcing the case for decarbonising the fertiliser and other sectors, already a driver in response to climate change.

The war in Ukraine has placed a cloud of uncertainty over the Black Sea ports and shipping, coupled with sky-high insurance premiums and barriers to financing and payments due to sanctions on financial transactions. Precise information is difficult to obtain, but it is safe to say that this year will not be the usual planting season in Ukraine and farmers elsewhere in the northern hemisphere are concerned about implications for the 2023 season.

A precarious balance

In 2021, Russia or Ukraine (or both) were in the top three global exporters of wheat, maize, rapeseed, sunflower seeds and sunflower oil, according to the FAO, which also states that most of the countries that are highly dependent



Figure 1: The countries with the largest production of fertilisers are dictated by the presence and economics of the relevant raw materials
(Production by country, million tonnes product, 2020)

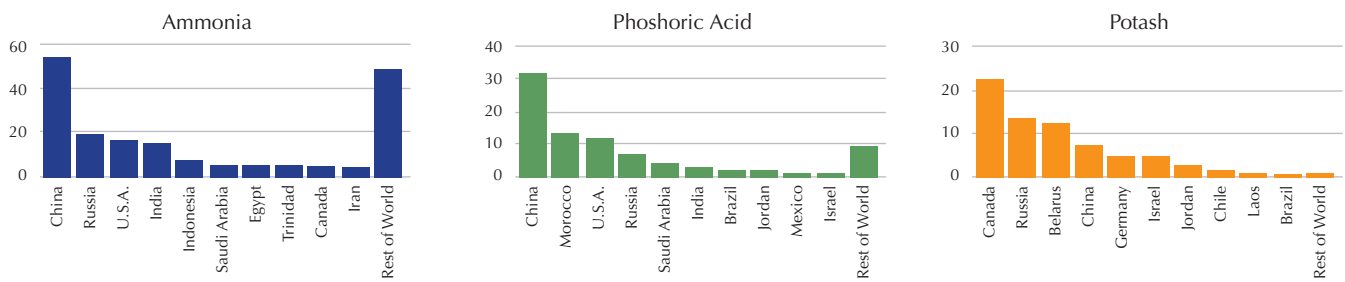


Figure 2: Russia, Belarus and Ukraine are major suppliers to global nitrogen and potash trade
(% share of global trade, 2020)

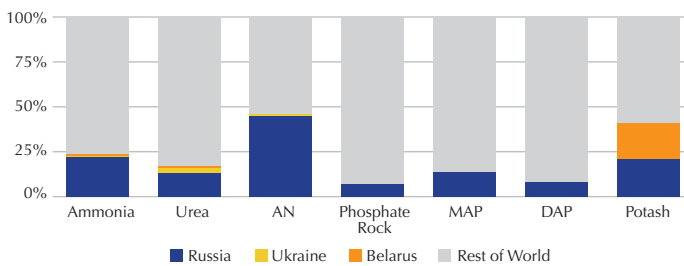


Figure 3: Europe, Latin America and South Asia are highly exposed to imports from Russia, Belarus and Ukraine
(Imports by source, million tonnes product, 2020)



on imported foodstuffs rely on Ukrainian and Russian food supplies. Russia is the world's largest exporter of wheat. In addition, the World Food Programme says that over the past 10 years Ukraine has become its biggest supplier of foods such as sunflower oil.

These and other statistics point to serious shortfalls in food supplies. At times like this, it is common for governments to restrict exports of strategic commodities and products. It was already the case during the Covid-19 pandemic and was a feature of previous food crises. The International Fertilizer Association (IFA) is apolitical; we describe what we see and reflect on experiences from the past. While solutions to replacing production capacity are long-term, steps can be taken now to mitigate the situation.

These include eliminating export restrictions, as the FAO has called for, and governments with surplus stocks in vegetable oils and grains, among others, to release some of their surplus on world markets, as the WTO advocates. IFA members are bringing on supply and tackling distribution challenges where they can.

And last but not least, it is time to make fertilisers essential goods. Mineral fertilisers are precursors to wheat, soy, corn and many other everyday staples. Without fertilisers, there will be limited production of staple commodities and food. Fertilisers were declared essential during the pandemic by many countries, and now it is time to do so for all.

The International Fertilizer Association (IFA) is the only global fertiliser association, with some 400 members in approximately 70 countries and a mission to promote the efficient and responsible production, distribution and use of plant nutrients. The mission plays a critical role in helping to feed the world sustainably.

Countries addressing the fertiliser situation

Most nations that produce food have had to reassess their domestic fertiliser markets, to ensure the soaring input costs do not limit production at a time when food supply is also compromised. Some examples are:

Brazil launched a national fertiliser plan in March aiming to reduce the country's dependence on imports from just under 85% to around 45% by 2050. With concerns about fertiliser supplies for the 2022/23 crops, short term actions include the launch of the "Caravana Embrapa FertBrasil" which aims to increase efficiency in fertiliser application and reduce usage by around 20% for the next crop. For the longer term the government aims to encourage investment in the production of natural gas, the raw material for nitrogenous fertilisers, as well as increasing domestic production of potash and phosphates.

The EU has a medium-term objective of reducing fertiliser usage by 20% by 2030 under its Farm to Fork Strategy. The EU Commission issued a Communication in March on "Safeguarding food security and reinforcing the resilience of food systems". Short-term plans include the provision of direct aid to farmers to cover increased input costs and to EU ammonia manufacturers to subsidise raw material costs. It states that free trade agreements already in place should facilitate the replacement of Russia

and Belarus for potash and phosphate imports. Those two countries currently account for 60% and 35% respectively of EU imports of potash and phosphates. In the longer term, the Commission is encouraging farmers to prioritise the efficient use of fertilisers and decrease their usage through practices such as precision and organic farming and agro-ecology, and also to encourage research and innovation into the substitution of synthetic fertilisers and development of greener production methods.

The US government in March announced it would support additional fertiliser production for US farmers to address rising costs. The USDA will provide \$250M through a new grant programme to support domestic, independent, innovative and sustainable fertiliser production to supply US farmers. "Recent supply chain disruptions...have shown just how important it is to invest in this crucial link in the agricultural supply chain here at home," said Agriculture Secretary Tom Vilsack. A public inquiry has also been launched on the competitive nature of the markets in fertiliser, seeds, other agricultural inputs and retail.