

Projected risks and trends for Potash in a de-globalising world

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Overview

By Antonio Visani

Potash is a mineral fertiliser that supplies plants with potassium. It is a crucial nutrient for plant growth, and its strategic importance is likely to grow in the future. This introductory section will analyse why this is so.

First of all, while the world's cultivated land area remains static, the global population is surging. The world's population is expected to increase by 2 billion in the next 30 years, almost reaching 10 billion in 2050. At the same time, extreme poverty is shrinking, and the global middle class is growing, mainly in East Asia. While, in 1981, 2 percent of the world population had an income of less than USD 1.90 per day, in 2019 this number had decreased to 0.6 percent. On the other hand, in 2021, the global middle class reached a total of 3.2 billion people, at an annual rate of 140 million new joiners. This trend will grow in the future. By 2030, the middle class is projected to increase to about 5.2 billion, 65 percent of the planet's population. This will lead to a combination of having more mouths to feed and, at the same time, a rising average calorie intake due to the adoption of more varied diets. As a result, global demand for food is rising faster than global supply. Indeed, the global cultivated area is remaining almost static. In 2000, arable land per capita was 2,500 square metres, in 2012 this was 2,100, and in 2100 it is estimated to fall to 1,900. Consequently, an increase in soil productivity is essential to continue to feed the world. Potash will have a key role in this effort.

Potassium is for plants what blood is for humans. It fosters all vital functions, from nutrient uptake to photosynthesis and rate of growth. Indeed, without an adequate provision of this mineral, plants cannot fully absorb nitrogen through their roots. There are two main negative consequences. First, field productivity decreases with lower yields, more winter damage and increased susceptibility to diseases and droughts. Second, the nutritional quality of the agricultural products falls due to a reduction in the size, vigour and protein content of seeds, grains or fruits. A sufficient quantity of potassium alongside optimal nitrogen increases on average the annual yield from 9 to 14 tonnes per hectare and boosts the protein yield by 45 per cent [Figure 1 below]. Potassium can be found in the native mineral content of the soil, and farmers can gradually increase its quantity by ploughing the field. But the intensive agricultural production has depleted this resource. Thus, potash fertiliser is needed to restore the optimal potassium level.

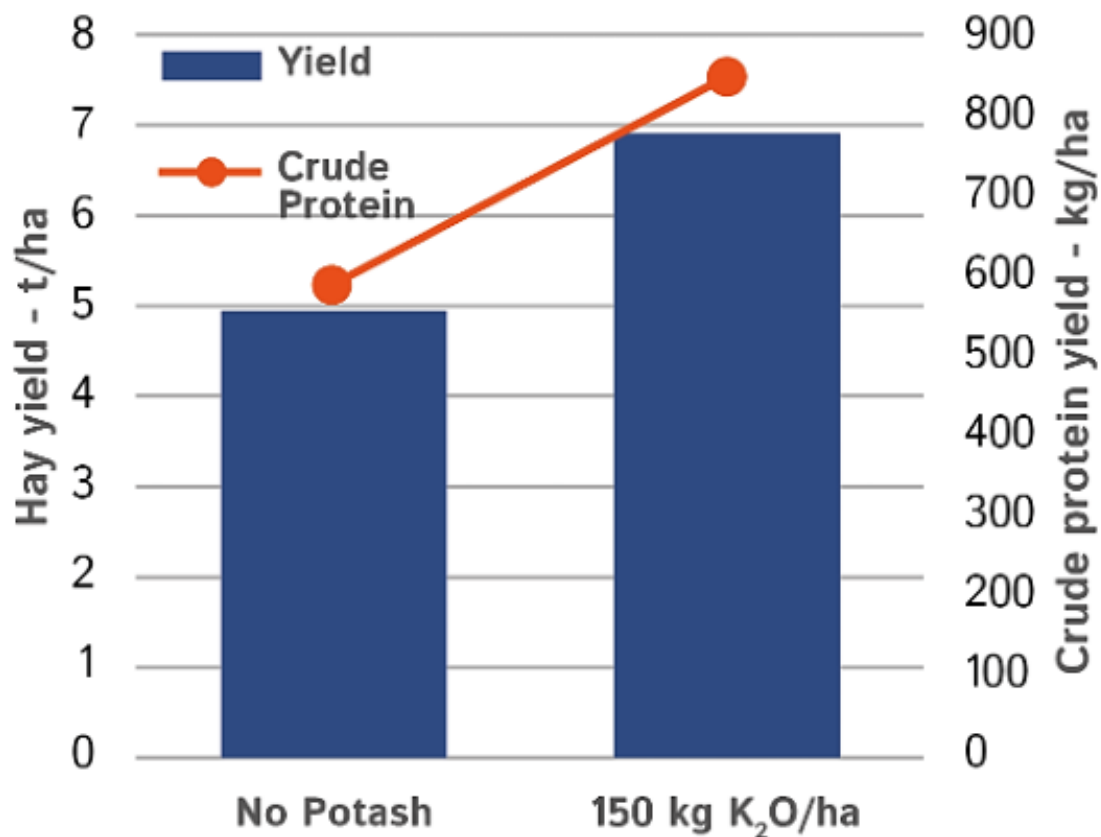


Figure 1: Hay yield and protein level at different potash rates

In 2021, the potash industry produced over 65 million tonnes of fertiliser, but the global demand for this good is rising faster than the supply. This is shown by the increase in the market price of potash, which on average has grown by 56 per cent since 2017. Lately, the situation has worsened. The Ukraine war and the consequent sanctions against Belarus and Russia are disrupting the potash supply chain. Indeed, those countries cumulatively account for 40 percent of the global trade in this good. As a result of these factors, the relevance of potash is rapidly increasing. Currently, it has become a strategic good for many nations. In the long term, its importance will grow, pushed by the need of countries to feed an increasing number of people, who demand a higher standard of living.



Major Stakeholders

Shyla Robinson

The potash market is highly consolidated with the majority of production concentrated in either Canada or in Russia and Belarus. To quantify their market share, according to the Canadian Government the three countries together accounted for [79% of the potash traded internationally](#) in 2019. Due to the Russian invasion of Ukraine, however, there has since been a notable decrease in potash output from the two Eastern European countries due to Western sanctions and supply chain disruptions. Expanding on the latter, there have been significant barriers to shipping through the Black Sea with neighbouring countries like [Lithuania blocking Belarus](#) from using their ports and railway networks – a major setback since ports like [Klaipeda previously handled 90% of Belarusian exports](#). Given that Russia and Belarus together account for [two-fifths of global potash exports](#), the current geopolitical situation in the country has triggered a supply shock with a recent report by the World Bank [estimating](#) that the global spot prices of the commodity have “more than doubled to record-high levels in the past year.”

Russia and Belarus are not alone in contributing to the spike in prices. Across the Atlantic, labour disputes in Canada have contributed to supply chain [disruption through rail strikes](#), albeit at a comparatively small scale. Additionally, a Chinese and Indian importers’ contract settlement at the beginning of 2022 that [set the price for potash at \\$590/mt](#) for the whole year resulted in an approximately [80% spike in prices](#) in the first quarter of the year. The confluence of these factors has increased [potash prices to 1.5 times higher](#) than in 2021, with the World Bank predicting that the situation is likely to remain unchanged through 2023 unless there is a resumption of trade from Belarus and Russia.

The incapacity of the Eastern European producers has thus resulted in Canadian companies like [Nutrien](#), the world’s largest potash company based in Saskatchewan, to boost production with estimates suggesting that the company will [increase output by 20%](#) in 2022 compared to 2020 levels. This expansion of production capacity is in line with trends in the wider mining industry to transition away from fossil fuels to fertilisers due to heightened demand for such commodities to feed growing populations in an increasingly nutrient-depleted world. In 2021, for example, the BHP Group decided to go ahead with their [\\$5.7 billion Jansen potash mine](#) in Canada which is set to start production in 2026 and will be the largest potash-producing mine in the world.

Other major potash players in North America include Mosaic Mines, Intrepid, and the Potash Corporation of Saskatchewan. From Eastern Europe, the primary industry operators are [Uralkali](#) in Russia, which accounts for [roughly 20% of global supply](#) producing 9 million mt, and [Belaruskali](#) in Belarus, which accounts for approximately 18% of global supply producing [8 million mt of potash production](#) as of 2021. Aside from these two global potash hubs, there are smaller-scale operations across the globe including [K+S](#) in Germany, [Israel Chemicals](#) (ICL) in Israel, [Arab Potash Company](#) in Jordan, [SQM](#) in Chile, and [Geoalcali](#) in Spain. China is also a major player in this market being the fourth largest potash producer after Canada, Russia, and Belarus. However, since the country also accounts for approximately [20% of world potash consumption](#), China continues to be reliant on imports to fulfil its fertiliser needs. Indeed, estimates suggest that [50% of the country’s potash is imported](#), of which Russia accounts for roughly [30% of the total potash imports](#) at 2.25 million mt.



Switching to demand-side dynamics, potash is essential to ensure global food security, the fertiliser will continue to be a highly demanded commodity with the major contract price markets being China and India and the [spot markets being the US, Brazil, and Southeast Asia](#). The ongoing war in Ukraine has notably impacted Brazil as the country imports [85% of its fertilisers](#) of which Russia and Belarus account for [44% of their potash imports](#). Soaring prices and scarcity have led to a renewed push for [Brazil Potash's delayed \\$2.5bn potash mine](#) in the Amazon, an effort [backed by](#) President Jair Bolsonaro who has been long looking to open the rainforest up to industry. Although at present the mining companies must first obtain environmental licences in consultation with indigenous people, this scenario brings into question the sustainability of this shift and expansion in the mining industry – especially given that Russia and Belarus are unlikely to stay out of the picture indefinitely.

Critical Infrastructure for Mining and Extraction

Ruy Scalamandr 

Production

Potassium is the [seventh-most common element](#) on the Earth's crust, as reserves formed with the evaporation of seawater hundreds of millions of years ago, and is extensively mined. The potassium compounds necessary to produce potash fertiliser are mined from the earth's crust. The ore mined is called [sylvite](#) – a sedimentary rock that is highly soluble in water. Other mineral ores mined for potash production include [langbeinite](#) and [polyhalite](#). There are two [main mining processes](#) used to extract potash from the Earth's crust; conventional mining and solution mining.

The conventional mining process involves [boring holes](#) into the earth to extract potassium ore, from which the necessary compounds for the production of potash are extracted. Conventional mining for potash is limited to relatively low depths – around 1200 metres – due to the [fragile nature](#) of sedimentary rock. This can be dangerous because, like most conventional mining of minerals, caves are formed underground and so if the rock is not particularly strong, there are some health and safety risks within the quarry. Conventional mining also results in [excess waste](#).

To overcome these issues, especially mining depth, solution mining is used. Solution mining effectively dissolves the potassium compounds from the ore using brine. This is achieved in two stages. First, fresh water is pumped into bored holes to dissolve potassium compounds from the rock, then a sodium chloride (NaCl) solution is used to extract KCl. A detailed overview of both processes made by the International Fertiliser Society is available on the [FerTech Inform website](#). A [video by Yancoal](#) – a Sino-Canadian potash mining company – explains visually the operations of the solution mining process.

Critical infrastructure to operate potash mines include boring machines used to cut through the Earth's crust and trucks to transport potassium ore, with conventional methods requiring



additional digging vehicles manoeuvre around open pit mines or quarries. Solution mining also requires additional ‘pools’, otherwise known as [crystallisation ponds](#), so that the brine potash solution can be cooled and the potash salts extracted from the mixture. In addition to the infrastructure required for the mining process, a high standard of transport infrastructure is required for potash mining.

Transport and Storage

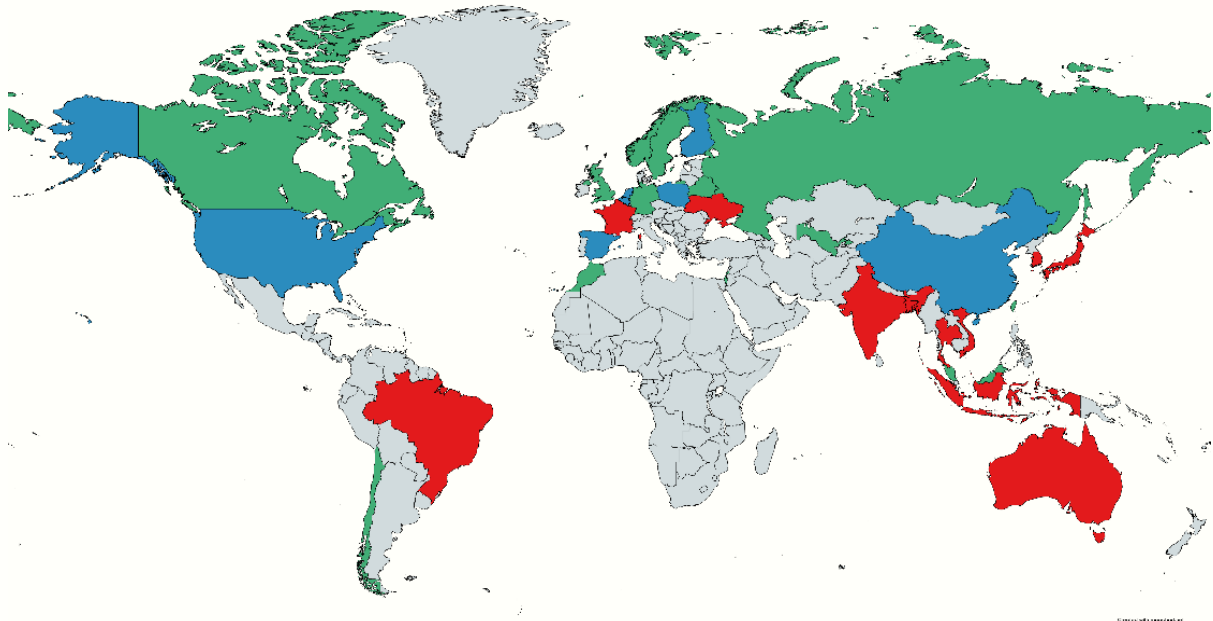
For potash fertilisers to be used safely, there are some things that need to be considered about potassium – potash’s key element. For one, potassium hydroxide – a common caustic potash – is highly reactive with water. When potassium hydroxide mixes with water, an exothermic reaction occurs, meaning that heat is released. The scale of this reaction can be violent and potentially [“ignite combustible materials”](#). Additionally, potassium hydroxide is also corrosive; direct exposure to the compound can lead to [caustic corrosion](#) to the skin and damage to the [respiratory tract](#) when inhaled. For these reasons, potash should be stored and sealed in a well-ventilated cool and dry environment; [PolyProcessing](#) recommend their [SAFE-Tank Double Wall System](#). Another solution is the alternative provided by [Dome Technology's](#) potash storing dome. The dome aims to limit the risk of corrosion typically associated with silos and flat storage, as well as insulating the potash from external temperature changes, amongst other things.

Despite the risks associated with the exposure of potash to air and the health risks posed by potash solution to human tissue, potash itself is pretty [harmless](#). Due to the relative safety of potash granules transportation options are ample, provided the basic safety risks outlined above are considered. In-land transportation is typically done via rail. In Canada and North America, Canpotex operates [critical infrastructure](#) that transports potash to shipping ports by rail, mainly on the west coast. In the UK, [Freightliner](#) operates similar operations from Boulby Mine to Tees Dock and Cobra Rail-freight in partnership with Cleveland Potash. Another alternative for in-land transportation of potash is pipeline transportation. In 1968, employees of the Esso Research and Engineering Company were awarded a U.S. patent for a method of transporting [potash in a suspension](#) along pipelines. A similar U.S. patent was awarded to employees of the Continental Oil Company in 1969 for a method of transporting [potash in a slurry](#) form with the help of a hydrocarbon solution. However, long-range in-land transportation is still typically conducted by rail. For overseas transportation, freight shipping is commonplace. Canpotex, for example, operate [four shipping terminals](#) in North America: Vancouver, British Columbia and Portland, Oregon on the west coast, and Thunder Bay, Ontario and Saint John, New Brunswick on the east coast.

Trade Routes



According to NationMaster, the top [exporters of potash by volume](#) in 2019 were Canada, Russia, Belarus, Germany, and Israel. In the same year, the [top five importers](#) were the United States, Brazil, China, India, and Indonesia. Using the data provided by NationMaster, the map below (made using [MapChart](#)) illustrates top importers and exporters of potash to better visualise the flow of potash trade. A more in-depth overview can be found on the International Commodity Intelligence Services (ICIS) [website](#).



Considering the map above and the ICIS overview, potash trade flows follow two general trends. Firstly, the flow of potash follows a north-south route, and secondly, Europe is relatively isolated from international markets.

To corroborate the ICIS overview of potash trade flows with the map above; Canada is a large exporter to the Far East and Oceania. Canadian potash's largest importers in the region are Australia, India, Malaysia, South Korea, and Thailand. Russia is also a big exporter to the region, primarily supplying China, India and Indonesia. Canada and Russia are also big exporters to Brazil which also imports substantially from Belarus, Germany, Israel, and Poland. The United States also imports significant amounts of potash from Belarus, Canada, India, and Russia. Increasing sanctions (direct and indirect), even before the Russian invasion of Ukraine, have limited trade flows from [Belarus](#) and [Russia](#) into Western markets. Generally speaking, European exports are relatively limited beyond the continent. Belarus has historically been the continent's largest exporter outside of Europe. Within the continent, France and the United Kingdom import substantially from Germany, Poland, and Spain – which also exports some potash to Asia.

Up until a few years ago, the global potash market was an [effective duopoly](#), with Canpotex and a partnership between Belaruskali and Uralkali. Since the breakup of the Belaruskali-



Uralkali partnership in 2013, there has been global competition and a brief period of lower prices. However, as a result of sanctions against Belarus and Russia, as well as significant population growth in Asia and South America, potash prices have [increased since 2015](#). In addition to this, more [players from East Asia](#) have been entering the global market.

Key Risks

Sharif Fatourechi

Potash is a primary nutrient for plants with functions such as increasing crop yield and so is a critical commodity. With Russia and Belarus, as of 2020, supplying [37.6 percent](#) of the world's potash (around 26 million tonnes), there exist great geopolitical risks. The current drivers of supply-side risk attributed to potash are sanction regimes proposed and implemented as a consequence of the war in Ukraine and disputes within Belarusian domestic politics. Demand-side risks also exist and are predominantly a result of the growing global population and climate change.

Supply-Side Risks

Belarus has faced backlash from Western countries amid its human rights violations, crackdowns on political oppositions and collaboration with the Kremlin in the war in Ukraine. The European Union has introduced [sanctions](#) on potassium chloride (KCl), the source of [95 percent](#) of agricultural potash worldwide, as well as individually sanctioning Belaruskali, the Belarussian state-owned fertiliser giant. [The U.S. Department of The Treasury](#), the [United Kingdom](#), and other western allies also have active sanctions designations for Belaruskali, restricting its export capacity and, subsequently, world potash supplies. Lithuania has also [terminated](#) their railway transport agreement that handled [90 percent](#) of Belarussian fertiliser exports. The initial sanctions on the basis of human rights and political corruption, and subsequent augmentation after the war in Ukraine, have greatly increased fluctuations in supply that are unlikely to be resolved in the short to medium term unless great strides in the way of reform, such as administering free and fair elections, are taken.

Russia is also facing similar sanction regimes that limit its ability to export. Although the industry does not have sanctions directly imposed on it, the [logistics and financial](#) aspects of the operation are under immense pressure which are consequently restricting Russia's export capabilities. The greatest financial barrier is the lack of access to international banking facilities and services such as SWIFT. Although it is important to note that Uralchem Group, Russia's fertiliser giant, has had some of its top senior executives directly sanctioned. An example is the majority shareholder and chair [Dmitry Mazepin](#). With the ongoing war and sentiments towards Russia not improving, it is reasonable to predict that, similar to Belarus, Russian exports of potash will not return to normal in the short to medium term. However, there are signs that Russia may



continue to have a strong presence in the market through the offer of donations to developing countries, continuing exports to ‘friendly’ countries such as China (19% of Russia’s export in 2020), and providing a method of transport for Belarussian potash through rail and sea ports. Though it must be considered that increased logistics costs would be reflected in the commodities price, especially when compared to other major producers such as Canada.

The impacts of restrictions on Russia and Belarus are currently being slightly softened by increased Canadian production. Canada being the world’s largest potash producer at 31.8 percent of world production, has announced that it will ramp up production with Nutrien Ltd, the world’s biggest potash miner, estimating a possible 29 percent increase.

Demand-Side Risks

Estimates show that the global population is likely to increase to 9.7 billion in 2050. This population growth will be accompanied by growing demand for food as all people need to eat for their survival. The increase in food demand will also increase global potash demand. This demand will present risks to food security if potash supplies face restrictions. As well, potash production faces blowback from environmental groups advocating for lower agricultural emissions in order to combat climate change. This will impact Canada’s production the greatest as it has a respectable track record of taking action against environmental degradation. This is especially the case if diets continue to change and move towards environmentally sustainable foods such as vegan alternatives. The reduced use of fertiliser could have grave implications for food security if alternatives are not developed.

Conclusion

The absence of a strong Belarussian and Russian presence in the market will continue to hurt potash supply stability and security in the short to medium term as the war in Ukraine continues and anti-Russian policies continue to be popular among Western governments. Canada is trying to mitigate the problem by increasing its production however it will not be enough to completely replace the two restricted countries. However, Russian exports can possibly continue with countries such as China and India if Western sanctions are bypassed as they are currently. Supply instability could also exasperate food security conditions as the global population continues to grow and fertiliser use faces environmental backlash.

Forecasted Trends

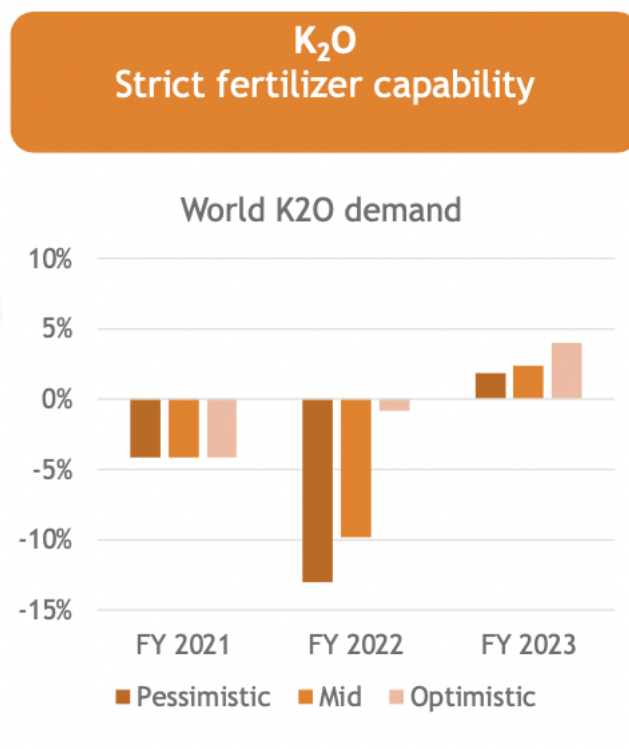
Jonathan Topez



Muriate of Potash (MOP) is the most common form of potash, representing around 90% of agricultural potash globally. It is obtained through underground or solution mining in large deposits created by ancient, now-evaporated sea beds. MOP is used to fertilise carbohydrate crops including wheat, oats, and barley, where it provides potassium for increased crops yields, strengthens plant health and nutritional value, and enriches soil chloride content. The other main form of potash is Sulphate of Potash (SOP), which is a chemically manufactured, premium-priced, specialty fertiliser used for crops such like fruits and vegetables.

Demand

Potash is one of the three macro-nutrients, or basic fertiliser substances, that are key to crop yield maximisation and plant health, Nitrogen (N), Phosphorous (P) and Potassium (K), or NPK for short. Each element fulfils different requirements of plant nutrition, so potassium does not have any known, direct substitutes. Combined with potassium's importance as a key input for basic food crops like wheat and barley, these characteristics make demand for potash highly inelastic and secure, as seen by its stable and increasing price during the COVID-19 pandemic, while many other goods suffered from lower demand. The increasing need to feed a world population that is [growing](#) at a rate of 1%, or about 80 million people a year, only further guarantees robust long-term demand for potash in the decade ahead. According to United States Geological Survey (USGS) [estimates](#), potash consumption for all uses increased from 44 million tons (of K₂O equivalent) in 2020 to 45 million in 2021.



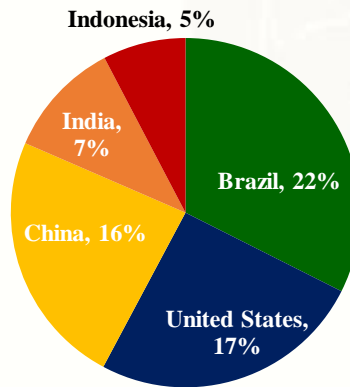
World potash demand (Source: [IFA](#))

Nevertheless, as the fertiliser with the highest trade exposure, with 80% of global demand met by imports ([per the IFA](#)), potash supply and demand are highly susceptible to shocks and disruptions caused by the Russia-Ukraine War. The International Fertiliser Association (IFA)



[estimates](#) that potassium consumption decreased by 4% in 2021 after an 11% surge in 2020, citing lower fertiliser affordability, reduced crop planting due to the Russia-Ukraine war, and advance fertiliser purchases by farmers. This is forecasted to be followed by even larger declines in 2022, before recovering in 2023.

Percentage of MOP world imports by country, 2019 (World Bank)

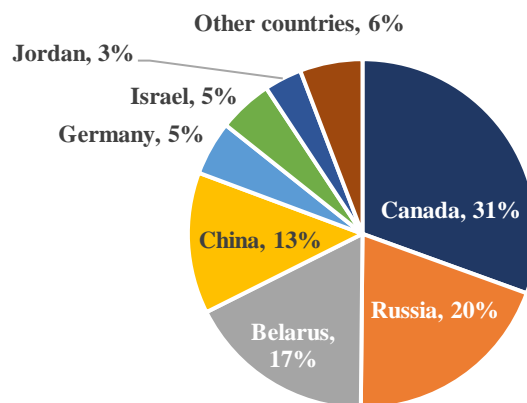


MOP imports by country, 2019 (Source: [World Bank](#))

Supply

Potash production is highly concentrated, with the top five potash producing countries accounting for 85% of world production. IHS Markit [estimates](#) that 84% of MOP is provided by the top 7 corporate suppliers.

Potash Mine Production, 2021 (K₂O million tons) (USGS)

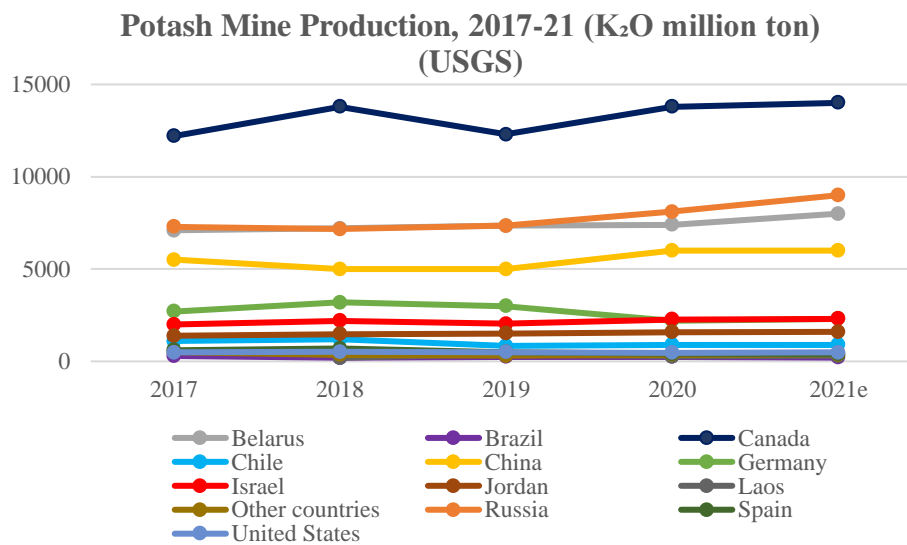


Potash mine production, 2021 (Source: [United States Geological Survey](#))

The supply disruptions created by the war in Ukraine stem from the involvement of Russia and Belarus, the world's second and third biggest potash producers respectively, [with](#) 41% of globally traded potash. Western sanctions against Belarus, first imposed in 2021 due to reported human rights abuses by the Lukashenko regime, were tightened in 2022, following the government's support of Russia's war in Ukraine. As a result, Belarus was denied access



to Lithuania's railroads and its Baltic Sea port of Klaipeda, through which it previously [exported](#) 90% of its fertiliser. Russian fertilisers, meanwhile, have not been targeted directly by sanctions, but financial sanctions have hindered the flow of potash exports, as have logistical problems at its ports. While potash production is not as energy intensive as nitrogen fertilisers, which has spared production from the worst effects of high coal prices in China and an energy crunch in Europe, its high reliance on rail and sea freights has left it seriously exposed to geopolitical turmoil. The resulting supply shortfalls have caused MOP prices to [reach](#) \$562 per ton in July 2022, more than double from a year earlier. Rising fertiliser prices have prompted UN officials to warn of an impending [global food crisis](#).



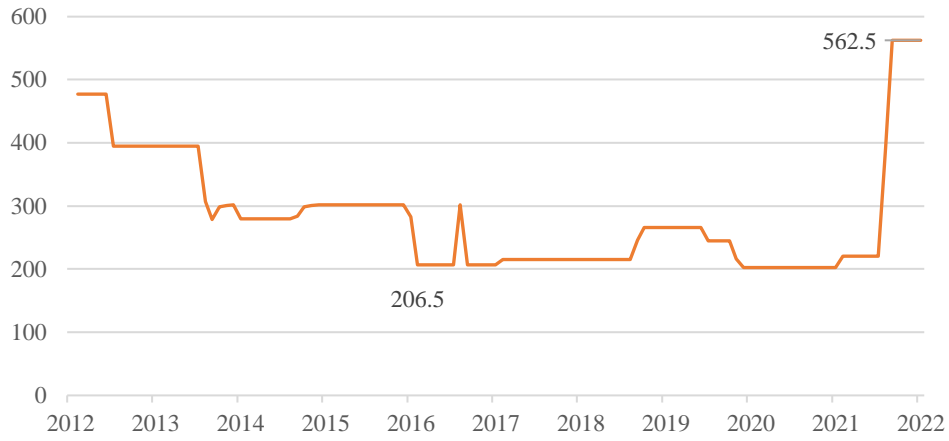
Development of potash production by country, 2017-2021 (Source: [United States Geological Survey](#))

Conclusion

With strong demand fundamentals and serious supply shortages, potash prices can be expected to remain at historically high levels in the near term (1-2 years), to the benefit of suppliers and to the detriment of major crop growers and food-insecure populations. In the longer term, demand is likely to persist, while suppliers increase production capacity and resolve supply-chain bottlenecks to profit from higher market prices, leading prices to stabilise at a lower equilibrium, likely closer to the \$250 per ton level seen in the previous decade.



MOP Price per ton in USD 2012-2022 (World Bank)



Potash price per ton in USD, 2012-2022 (Source: [Fertiliser Week](#), [Fertiliser International](#), [World Bank](#))

