Farmers Need Fertilizer:

Supply and Pricing Challenges Impact Ontario's Food Production and Security

Grain Farmers of Ontario

StoneX Financial Inc – FCM Division

Index

Canadian Fertilizer Outlook / Executive Summary

Background:

In recent years we have lived in a world of increasing instability. While most have been focused on Covid and the global response, an equally worrisome global security concern has been taking shape. After months of buildup, Russia invaded neighboring Ukraine while China continues to threaten a similar invasion of Taiwan. Both situations are meeting pushback from global powers and creating tension not seen in decades. As a response, countries such as Russia and China have attempted to weaponize global food supplies by limiting the export of agricultural commodities, fertilizers, or the energy supplies needed to produce fertilizers elsewhere.

Food production and food guarantee are at the base of every economy around the world. According to the Food and Agriculture Organization of the United Nations (FAO), commercial fertilizer is directly responsible for approximately 60% of total world food production. Thus, without commercial fertilizers, global food security would become considerably harder to attain, especially with a growing population.

For Canadian farmers, in particular east of Manitoba, who grow corn, soy, wheat and other crops in rotation, fertilizer remains one of the most important and highest cost inputs for their operations. Due to this, new practices such as variable rate application, 4R Stewardship practices and the development and increasing use of alternative products like slow-release fertilizers and micro-nutrients have been used to efficiently improve yields with less use of fertilizer. Even with those steps, having access to affordable and reliable fertilizer supplies remains extremely important to the Canadian agricultural sector. As the world's population grows, and with it, food demand, Canadian farmers need the tools necessary to compete in world markets and produce the volume the world, and Canada, need.

Where does Canadian potash, phosphate and nitrogen fertilizer come from?

Until now, fertilizer supplies for farmers across Canada have never been in question. 2022 was the first year where a true supply concern occurred.

Potash

Due to plentiful domestic reserves in western provinces and ample production capacity, Canada has been and remains the world's largest single potash producing and exporting nation. Though Canadian agricultural sectors continue to contend with limited/expensive west-to-east rail logistical capabilities, there is more than sufficient potash production to cover domestic demand.

Nitrogen

High crop yields require more nutrients. As farmers across Canada continue to grow more food to address local and global food security needs, the demand for nitrogen has also grown. Domestic production rates have failed to keep pace with rising demand which has resulted in a growing reliance on imported product.

When the lack of new production is discussed, the most common explanations cited include the following:

- **Environmental laws and regulations -** have challenged efforts to either de-bottleneck current production facilities or attract investment in new production facilities. With a perceived hostile environment to extend production capabilities, investments in productivity and new production have lagged.
- **Lack of capital investment -** Growing concerns over CO2 emissions have also hindered the willingness of investors to deploy capital into traditional nitrogen facilities amid concerns over the potential addition of new environmental regulations that could 1) negatively impact the operation of a new facility; 2) require significant

additional capital to meet potential new environmental standards and avoid being labeled an "Anti-Green" project. This has shifted the focus of new capacity development to "Green" or "Blue" projects. However, these projects have significantly higher capital and operating costs and given current technology, are not financially viable without substantial government assistance.

Unfortunately, the combination of growing demand and lack of new domestic production means a reliance on imports. When looking at the two most popular nitrogen sources, urea and urea ammonium nitrate (UAN), it quickly becomes apparent that Canada is highly dependent on Russian imports, which accounted for 63% of all imported urea and 21.6% of all imported UAN in 2021.

This dynamic is even more prevalent for Ontario farmers. While western Canadian farmers have local nitrogen production in Ontario, farmers are much more dependent on imports from North American/international sources. This creates a situation where retailers and farmers must often commit to their needed tons of fertilizer well in advance of application periods, putting them at a higher risk of price fluctuations.

Phosphate

The two most used phosphate fertilizer sources are diammonium phosphate (DAP) and monoammonium phosphate (MAP). Canada remains highly dependent on U.S. produced phosphate to meet farmer demand. While this relationship has not been in question due to adequate North American production, 2022 marked the first time that questions about phosphate supplies have arisen.

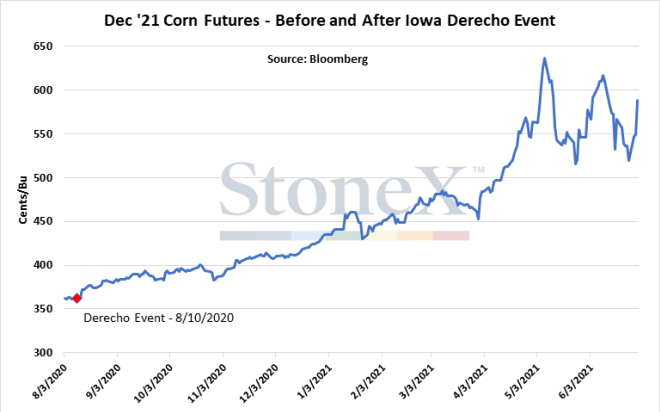
The majority of U.S. phosphate production occurs in Florida. While ample phosphate reserves remain, environmental restrictions due to environmental concerns have limited production expansion.

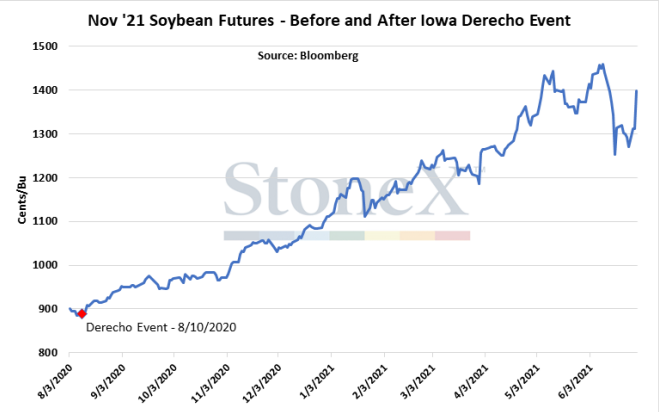
Not only have restrictions been placed on expanding production, but the U.S. has also lost the title of low-cost world producer as countries like Morocco and Russia have expanded their footprint. These bigger producing countries helped to alleviate fears of inadequate supplies. However, that fear was reborn as the U.S. government took steps during the summer of 2020 to place countervailing duty rates against both Moroccan and Russian produced phosphate, which largely eliminated shipments to North America.

What has happened to cause record high fertilizer prices and global supply concerns?

Over the last 24 months, the global fertilizer market has experienced a period of instability never seen before. While this list is far from complete, it highlights the major recent 'Black Swan' events that have occurred:

- **June 2020** – The U.S Department of Commerce issued countervailing duties, which in-effect blocked phosphate imports from Morocco/Russia. The indirect impact was increased consolidation of the global phosphate product/export into a single entity, influencing traffic through ownership, duty rates, or major producing countries not exporting.
- **August 2020** – A devastating Derecho event pushed its way through the U.S. Corn Belt. An estimated 3.57 million acres of corn and 2.5 million acres of soybeans were lost because of the storm. Grain values moved substantially higher with December 2021 corn futures values rising 78% and November 2021 soybean futures values rising 62%. This pushed cash prices to the Canadian farmer higher and higher, sparking more fertilizer demand as farmers looked to maximize production to take advantage of the higher prices.





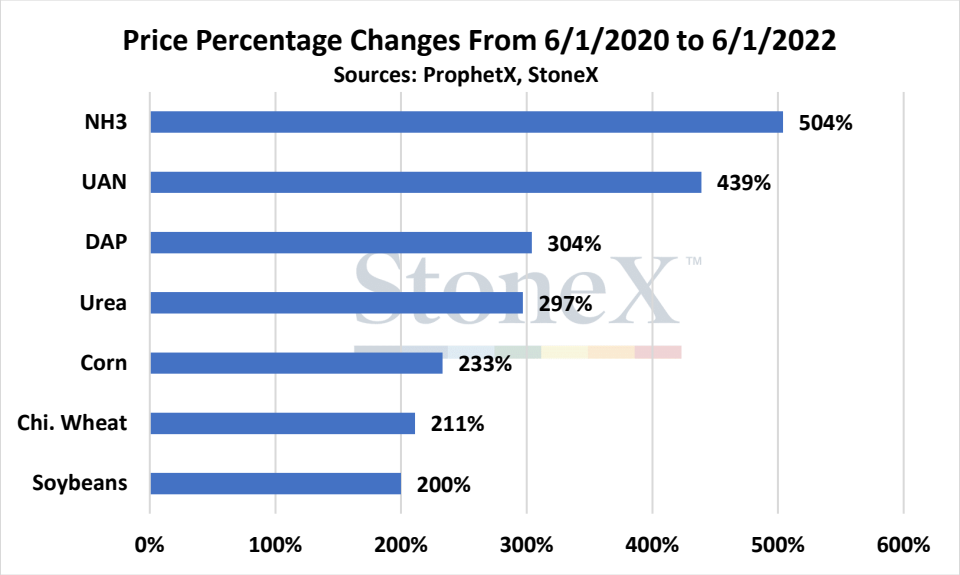
- **August 2020** – While the U.S. government approval of Covid farm relief payments had been made before the storm, the bulk of the cheques began arriving in mailboxes around the same time as the Derecho event. The combination of significantly higher grain values and an influx of cash combined to create the largest fertilizer demand turnaround most have ever seen.
- **February 2021** – North America experienced an Arctic Blast which resulted in prolonged freezing temperatures reaching as far south as the U.S./Mexico border. The resulting residential home heating demand spike carried natural gas prices with it. Values rose to a level that caused North American nitrogen production facilities to

implement a short-term production closure. This was either due to a lack of gas supply, the high cost of spot natural gas resulting in a loss for every ton produced or, if the facility hedged their natural gas, being able to sell the contracts back to the market at substantially higher profits than could be made producing finished product. Supplies were reduced just before the start of spring application.

- **Summer 2021 –** During Covid-19 restrictions, fertilizer production plants could not make normally scheduled repairs due to inability to receive parts or for workers to be near each other. Once restrictions were reduced, it resulted in a surge of production downtime as plants around the world shut down production to make much needed repairs.
- **August 2021 –** Hurricane Ida became the most destructive hurricane in the U.S. Gulf Coast region since Hurricane Katrina. The electrical grid sustained significant damage that resulted in production downtime at some of the largest fertilizer production plants in the world.
- **September 2021 –** Conflicts between Russia and Europe resulted in Russia threatening to cut natural gas shipments to Europe resulting in Dutch TTF (natural gas) values spiking to price levels that have curtailed current European production by 40%.
- **October/November 2021** – As global fertilizer supplies became tighter and values started rising rapidly, nations around the world took steps to limit exports to ensure domestic availability. These rare actions resulted in a scarcity mindset in the global fertilizer market.
- **February 2022 –** After months of speculation, Russia invaded Ukraine. As the world's top exporter of urea, UAN, and ammonia, as well as the fourth largest exporter of phosphates, the initial disruption and loss of Russian fertilizer sent global prices skyrocketing further as nation's scrambled to find replacements.
- **August 2022 –** As Russia cut natural gas supplies to Europe further, Dutch TTF (natural gas) values pushed even higher, leading to even more European production being taken offline.

What has been the effect on North American grain and fertilizer prices?

While the price of grain has jumped significantly during the same time, the price has not kept up with the price increases in the fertilizer sector, leaving farmers in a far worse situation than before.



This price imbalance has caused significant challenges for Ontario farmers.

Due to Ontario's reliance on imports and the lead time necessary for product to arrive, the supply chain was forced to import product during Q4 2021 and Q1 2022 –when fertilizer prices were at, or near, record highs. Since late March '22, global fertilizer values have steadily declined, but values in Ontario remained high due to the high-priced positions clogging the system.

This reality has forced Ontario and surrounding area farmers to contend with significantly higher costs.

Long-term global supply issues brewing

Like most commodities, fertilizer prices are determined by supply and demand.

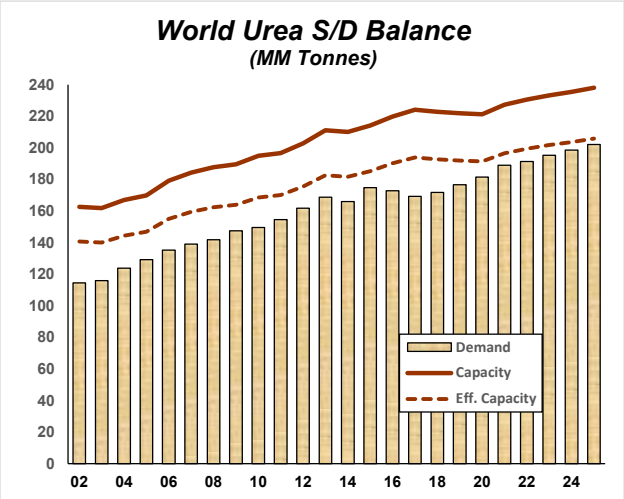
Nitrogen is the most used and produced fertilizer in the world. The concept of expanding world production is quite simple: find a reliable source of natural gas and build a facility. But the practical reality is much more challenging. Current cost estimates for a new 'world scale' greenfield ammonia urea complex run as much as CAD $5 - $7 billion. If funding can be secured, the next major hurdle is where to build. Factors that must be considered include reliable natural gas supplies, access to demand, long term lost energy costs, trust in government allowance of production, and geopolitical events.

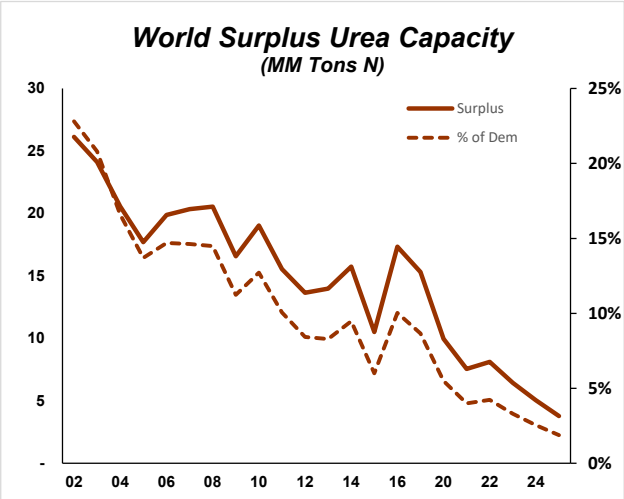
Because of this, nitrogen remains a highly cyclical business with periods of high profitability and capacity expansions followed by periods of overcapacity, low prices, and low profitability. Following a period of rapid capacity growth from 2010 to 2018, the global industry experienced a period of adequate supplies and relative low pricing. The industry is currently at the beginning of an "up cycle" which began in 2018/19 and is expected to remain through at least the latter half of this decade until new capacity additions exceed the growth in demand. The net impact is a tightening global market with little to no surplus capacity to "fill in" short-term spikes in demand and/or unexpected interruptions/shortfalls in production. This has certainly been the case recently given the Covid-19 related outages and geopolitical impacts of the Russian invasion of Ukraine.

Phosphate and potash price and supply dynamics are subject to the same factors as nitrogen and contend with the added difficulty of finding adequate reserves to mine, and regulations surrounding access to those reserves.

One of the largest concerns in the coming years lies with the global urea supply and demand. Before the previous two years, urea prices had been in a long-term down cycle, keeping most companies/countries from investing in new production. That, coupled with the length of time for a new build, means that supplies are expected to be extremely tight between now and 2025. By 2025, we expect that global demand and production will be nearly even, which means any global production hiccup or demand surge will not have the excess supplies to meet it.

These are the types of supply situations we must consider when thinking about what needs to be done today.





Strategies to Consider

Short-term (present to two years)

No single strategy will ensure that the events of the past two years never happen again. However, multiple steps could be taken in the short term to medium term to set Canadian farmers on a clearer fertilizer cost/supply path:

- **Secure global supply guarantee's** – Work to establish stronger relationships with major fertilizer producing/exporting countries to ensure more sustainable supplies in the future. Example origins include:
  - **Nitrogen**
    - Middle Eastern producers – currently the lowest cost producers in the world due to extremely cheap natural gas values. Also, most of the nations in this region (excluding Iran) are listed as a "most favoured nation" (MFN) by the Canadian government.
  - **Phosphate**
    - Middle Eastern producer (Maaden) – currently the third largest phosphate exporter in the world and considered a "MFN" by the Canadian government.
    - Moroccan producer (OCP) – currently the largest phosphate exporter in the world and considered a "MFN" by the Canadian government.
- **Assess the possibility of emergency/strategic reserves –** Follow the lead of countries like China and maintain emergency fertilizer reserves to ensure domestic supplies during exogenous shocks.
- **Address potential supply chain logistical concerns that may limit import availability –** including the need, if any, to expand port storage, offload capabilities and truck/rail limitations and accessibility, particularly in-season.
- **Address the weaponization of fertilizer trade with the United Nations and other multi-lateral bodies**
- **Create a fertilizer exemption in Russia and Belarus' Most Favoured Nation status** – creating this exemption would remove the 35% tariff rate on imports and help free up normal, efficient trade flows. Post-war, it is likely that Russian urea will again be the most cost-efficient. Thus, Canadian buyers should be allowed access to buy from those regions. Other countries have labeled Russian-produced fertilizer a vital good and have not placed duties like the Canadian government has.
- **Look for avenues to increase cooperation and transportation with U.S. to improve trade-flows between the U.S. and Canada.**

- **Assess and finance additional fertilizer storage space in eastern Canada** – increased storage capacity (on-farm and at ports) allows more tons to be acquired during low priced periods, as well as having more on hand during the demand period.
- **Help farmers become more resilient to fertilizer disruptions - k**eep parity with other major agricultural countries' fertilizer programs.
    - Develop a "Fertilizer Affordability Index" which would trigger a farm level assistance program, ideally based on fertilizer products' cost relative to grain prices (how many bushels of a given grain does it take to buy one ton of a given fertilizer, what percentage of a crop's budget is going to fertilizer, etc.). If triggered, aid could be provided through direct payments, low-cost loans and/or other market mechanisms.
        - A recent example would be Poland, which introduced per hectare subsidy payments to offset the impact of lost Russian tons this spring.
    - Improve Business Risk Management programs to help mitigate the impact of large swings in international pricing on Canadian importers and sellers.

Long Term (2 – 5 Years) Strategies to Consider

As we look to the future of the global fertilizer markets, we know that challenges lie ahead that will see demand outstrip supply. Increases in logistical capacities and fertilizer production can take years (if not decades) from start to finish. Acting on these strategies today will help alleviate future supply issues.

- **Work with railroads to create more competitive west to east rail freight rates and invest in new rail capacity**
    - Western and Eastern Canada currently have very little collaboration in the fertilizer trade due to lack of infrastructure. Invest in improved logistical capabilities to bring the two sides together for efficiency.
- **Improve trucking capacity**
    - Make it easier for new truckers to enter the space (easier/cheaper training, easier border crossings/updated insurance processes).
- **Incentivize Canadian nitrogen production to upgrade ammonia which currently flows to the U.S.**
    - Invest in both large-scale and small-scale nitrogen production to use domestic ammonia instead of simply exporting it south and importing finished products from elsewhere. However, governmental concerns on environmental issues must be taken into consideration in the building process.
- **Invest in greenfield nitrogen production in Canada**
    - **Loan guarantees for new production** – funding remains the biggest hurdle.
    - **Direct grants** – streamline the money flow to quicken the process.
    - **Federal/provincial tax breaks** –look at tax breaks to make new nitrogen/phosphate production facilities more feasible.
    - **Streamline permitting processes and, if possible, move toward "single" permitting to limit barriers to construction.**
    - **Examine past new fertilizer production projects that were never completed to remove barriers to entry**
- **Explore potential investments in new domestic phosphate production**
    - Canada has available phosphate rock deposits in both the East and West that could be mined to reduce reliance on imports.
- **Increase west coast import capacity to improve direct access to world production**
    - Increasing storage and rail capacity in Western Canada would allow more imports from heavy fertilizer exporters such as China and Russia**.**

Conclusion

Canada and the world require a dependable food supply, and the situation is becoming more dire every day. Fertilizer is essential to growing cereal grains, used for animal feed, food production, and exports.

This report examines the global fertilizer market and how various factors impact Canadian farmer's access to these critical farm inputs. We briefly explore the market dynamics for potash, nitrogen, and phosphate fertilizers and how they differ in complexity and exposure to geopolitics. We also make general recommendations policy makers should consider when looking for solutions to ensure an affordable, secure supply for Canadian farmers.

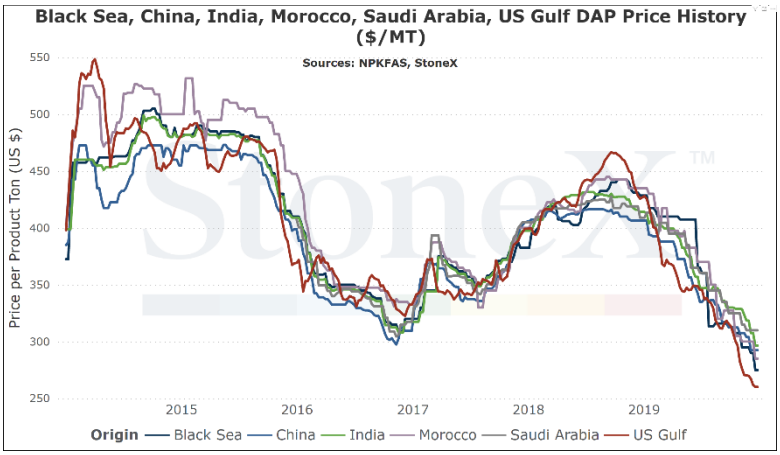
Farmers east of Manitoba are in a much different position than western producers in terms of their fertilizer supply chains and related access. Ontario, Quebec, and Atlantic Canada farmers depend more on foreign, non-U.S. nitrogen, than their western counterparts. While novel production methods are an obvious antidote, they must be proven before entrusting them. To be successful, new domestic production will also require reliable rail transportation and cost-effective delivery before they are considered viable alternatives to the current supply chain.

In the meantime, the government needs to remove obstacles like tariffs for Ontario and Canadian farms so that they can access fertilizers at the market price. Canada is a resource rich nation and policy makers should work to better position Canadian farmers to deal with events such as the Russia invasion of Ukraine.

Global Fertilizer Black Swan Events

June 2020: Mosaic Files Countervailing Duty Case Against Moroccan/Russian Produced Phosphate Imports

Following the 2008 super cycle and less volatile 2011/12 price spike, 2014 ushered in a period of relative calm in the global phosphate markets with the general price direction being lower. New production lines being added around the world combined with reduced phosphate demand due to the low price of grains caused excessive inventories to build.



Following a disappointing spring 2019, fall 2019, and spring 2020 cycle, NOLA (New Orleans, Louisiana) DAP values plummeted with market participants wondering when the plunge would stop.

That answer came as Mosaic announced production curtailments. With NOLA DAP barge values reaching $250/t USD and many believing Mosaic's production cost to be higher, they had little choice but to cut production to limit losses and balance the supply and demand through lower supplies. However, this was just their first step.

On June 26, 2020, Mosaic filed countervailing duty paperwork, claiming unfair practices by producers in Morocco and Russia. The filing claimed that both countries' producers had unfair market practices in the form of lower environmental standards and preferential input pricing.

Mosaic would eventually win its case with substantial duty rates imposed on producers in each country. While Canada never played a part in the case, the effect on its farmers were just as steep. Chinese tons already had duties imposed on them. The addition of duties against Morocco and Russia meant that much of the worlds phosphate production and exports were now blocked from North America.

Mosaic Countervailing Duties	
OCP (Morocco)	19.97%
Phosagro (Russia)	47.05%
Eurochem (Russia)	9.19%
Other Russian Producers	17.20%

Today, China, Morocco, and Russia continue to have duties fixed to phosphate imports. These three nations combine for 55% of global phosphate production capacity and approximately 64% of global trade flow. India and Brazil account for 11% of global production but do not export. The U.S. accounts for 14% production and 11% of export trade and is dominated by Mosaic. Saudi Arabia has no duty imposed against it and accounts for 7% of global production, and 14% of global trade, and Mosaic has a 25% ownership interest in a joint venture with Ma'aden, a Saudi state-owned phosphate producer.

	2022 DAP/MAP Capacity by Region			
	Production Capacity		Exports	
Region	(000 P2O5 Tons)	Market Share	(000 P2O5 Tons)	Market Share
China	15,785	38.0%	3,801	25%
U.S.	5,804	14.0%	1,643	11%
Morocco	4,710	11.0%	4,246	28%
India	3,840	9.0%	0	0%
Saudi Arabia	3,060	7.0%	2,222	14%
Russia	2,609	6.0%	1,710	11%
Brazil	788	2.0%	0	0%
Other	5,309	13.0%	1,752	11%
World Total	41,905	100%	15,374	100%
Subject to U.S. Import Duties				
Source: International Fertilizer Association				

This means that the top seven phosphate-producing nations in the world, who account for 87% of global production and 89% of global trade, are controlled by North America's largest producer.

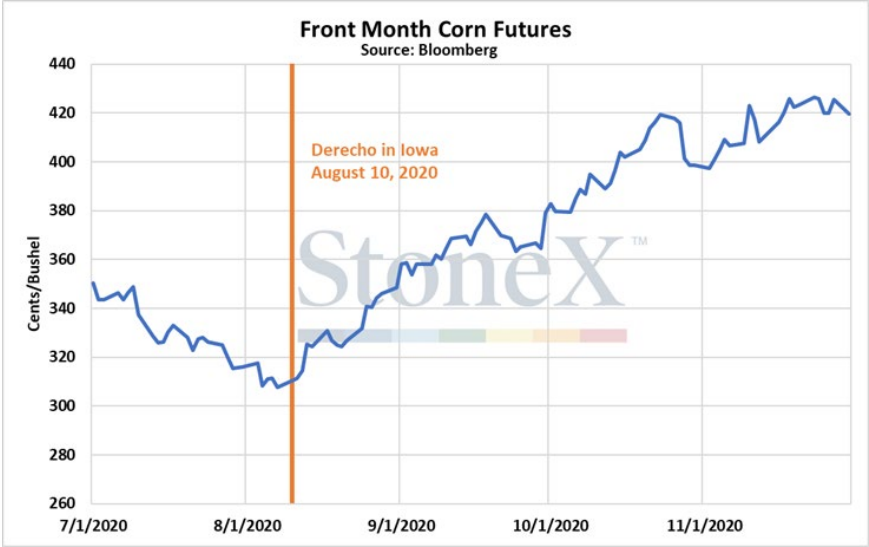
While the Canadian government played no part in this case, most of Canada's phosphate comes from the U.S. The effects on Canadian farmers were significant.

August 2020: Largest North American Fertilizer Demand Turn Around in Its History

Before August, commodity markets struggled with low values and a bleak outlook. Grain values were generally under pressure, farmers across North America were looking ahead to negative balance sheets for the 2021 crop cycle, and fertilizer demand was near non-existent.

The entire outlook changed on August 10th and 11th.

A wide ranging, highly damaging Derecho event began in southeast South Dakota/northeast Nebraska and blew through Iowa, Illinois, Wisconsin, Indiana, Michigan, and Ohio. By the storm's end, approximately 90,000 square miles had been affected with a large portion of that area being some of the highest producing farm acres in the world. Initial hopes were that crops had just been laid down with the potential of recovering. Unfortunately, the damage was so severe that many fields would eventually claim complete losses.

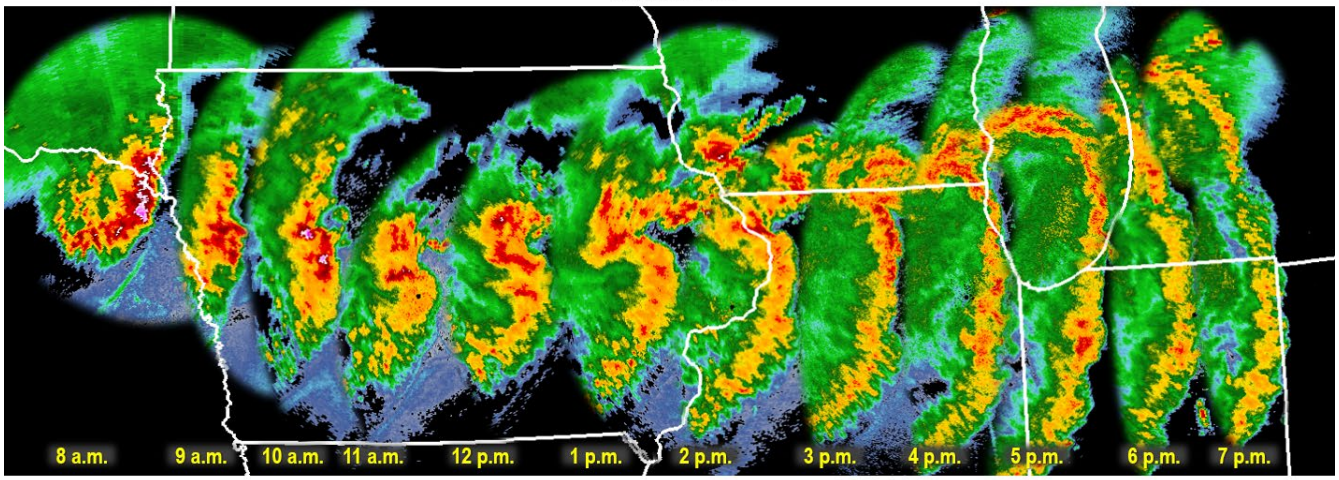


In the days and weeks that followed, grain values started to rebound due to these losses. Farmers, who had previously been looking at 2021 with negative balance sheets, were now anticipating large profits. An almost complete lack of interest in fertilizer quickly changed.

Around the same time as the storm, the U.S. Coronavirus Food Assistance Program (CFAP) checks began arriving in the mail. Not only were farmers looking at substantially better grain prices than originally believed, but they also received an influx of CFAP subsidy funds to spend on their fertilizer needs. The net result was a demand turnaround that had never been witnessed in the history of fertilizer. In the days/weeks/months that followed, North American fertilizer markets would struggle to catch up with the newly found demand.

August 10, 2020 Derecho: Lowest Angle NWS Radar Reflectivity at One-Hour Time Steps

All times in CDT



This long-lasting, severe wind thunderstorm complex (known as a derecho) produced hundreds of reports of damage along with likely a few tornadoes.

NWS Chicago | weather.gov

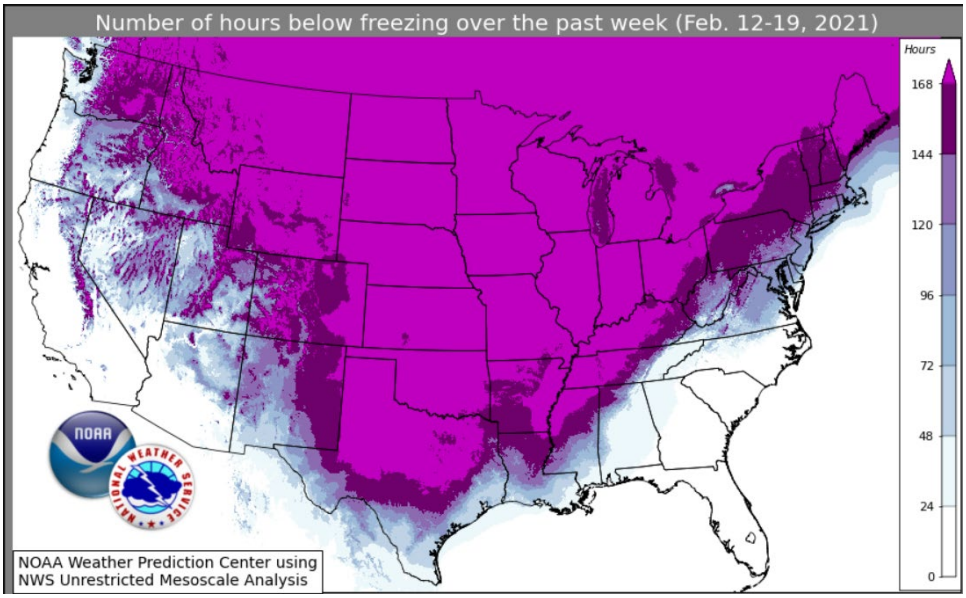
Aug 11, 2020

February 2021: North American Artic Blast Pauses Nitrogen Production

By February, the North American fertilizer markets were preparing for a solid spring demand season. This included processing large amounts of imported nitrogen and anticipating domestically produced product. Given the large calendar lead times needed to call upon further imports, any shortfall in production would disrupt plans and panic buyers and sellers.

Normally, domestic production issues would be relatively rare.

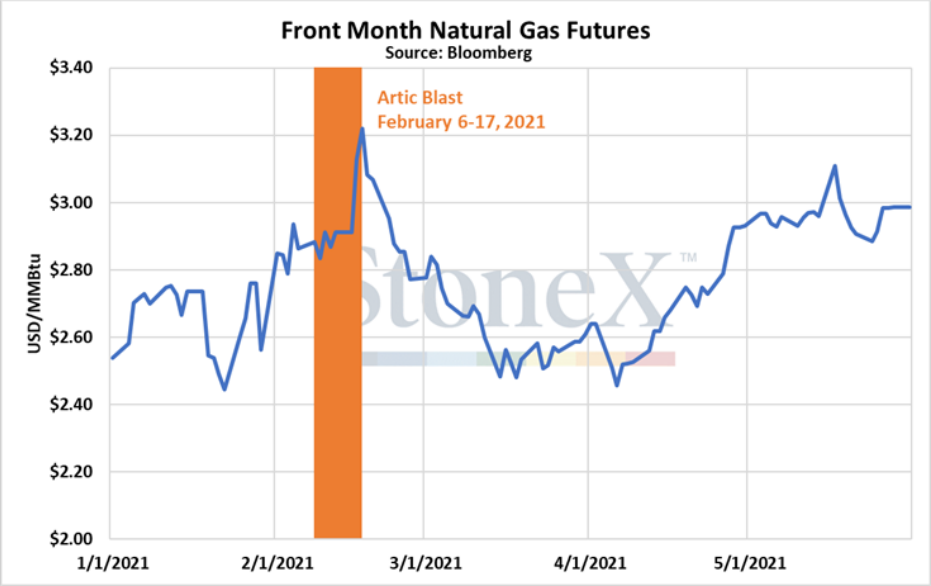
Unfortunately, the markets were learning that normal was no longer in the cards.



Starting February 12th, 2021, an unprecedented artic blast covered most of North America. While artic blasts are far from unprecedented, the scope of this event was. Freezing temperatures reached as far south as the U.S./Mexico border and lasted for days. The response was that demand for natural gas to heat homes jumped significantly and natural gas prices followed.

With natural gas prices spiking to unfathomably high price levels, North America nitrogen producers had to choose between continuing to produce nitrogen fertilizer or selling natural gas contracts back to the market at huge profits. Producers, keen on profits, opted to slow or stop production at their plants to take advantage of the opportunity.

The February timing meant the market had little time to react. North American producers were operating at max capacity once they restarted, which was still not enough to make up for lost production time. Importers were tasked with replacing lost tonnages from global producers.



Fertilizer shipments from most countries with production plants take nearly 30 days to sail to North America with an additional 30 days to move the product into Canadian warehouses. This 60-day shipment window assumes product and load window availability.

Eventually, the North American market scraped together enough nitrogen tons to cover demand for the 2021 growing cycle. However, this caused ending inventories of all nitrogen products at the end of spring '21 to be extremely low which would continue to support higher values and cause reactions to upcoming issues to be even more violent.

August 2021: Hurricane Ida

Approximately one year after the largest fertilizer demand turn around ever witnessed, unique Black Swan events continued, with August 2021 marking the landfall of Hurricane Ida and the destruction it left in its wake.

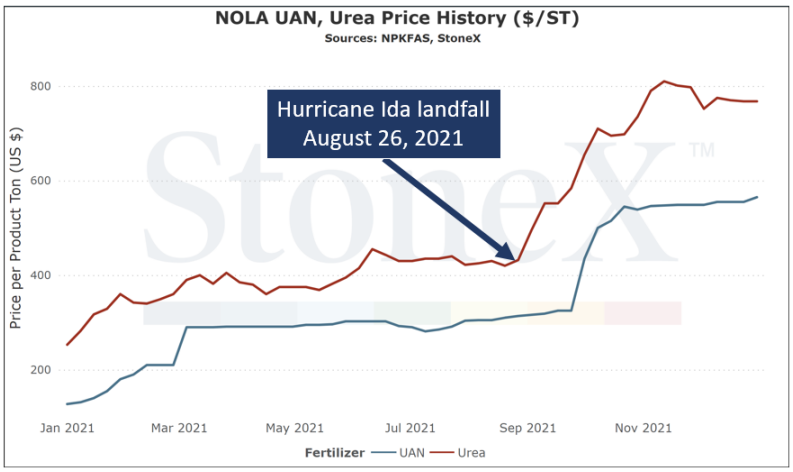
The shocking part of this storm was its unassuming nature. While in the Gulf of Mexico, this storm took a similar trajectory to Hurricane Katrina, which was still fresh in the region's memory. However, it proceeded through the Gulf as a relatively minor hurricane which meant perceived danger was considered very low. That was until the hours leading to landfall. Very warm waters near the coast fed the storm at a rate unsuspected by many meteorologists. These near perfect conditions allowed the storm to grow into a Category 4 hurricane.

Fortunately, from a humanitarian perspective, the situation was not nearly as dire as Hurricane Katrina had been 16 years prior.

However, for nitrogen markets, the pain was still to come.

Initial reports from CF's Donaldsonville plant, (and other regional nitrogen plants were positive) wind and rain damage were extremely limited and the effects on production were negligible. In the days that followed, we learned that even if a plant is unharmed and capable of being fully operational, it means very little without electricity.

Production in the region remained down for approximately a month before restarting. The loss of production was significant which meant the need to call upon more imports to replace lost production grew. North American supplies once again tightened, and prices responded higher.



Estimated production losses due to Hurricane Ida downtime		
	Number of tons	Actual pounds of N
NH3	300,000	492,000,000
UAN	200,000	328,000,000
Urea	150,000	246,000,000
Total N losses	650,000	1,066,000,000

Summer 2021 – A Return to Normal Following Covid-19 Means Widespread Nitrogen Plant Outages for Repairs

For many around the world, the summer of 2021 meant the return of a somewhat normal life after the pandemic. Many began returning to offices, eating in restaurants, and shopping in person at stores. A six-foot social distance became a thing of the past.

This return to “normal” also meant big changes in nitrogen production around the world.

Nitrogen production facilities use very high pressures and high temperatures, creating a lot of wear and tear on equipment that must be repaired. Plant management puts into place scheduled “turnarounds” where the plants are taken offline, repairs are made, and the plant is restarted. If these turnarounds are not scheduled, the plant will eventually break, and the repair will take more time and cost more money.

During Covid-19 restrictions, many nitrogen plants around the world should have gone offline for this process, but they did not. Not only was it difficult to acquire equipment and parts for the repairs, but workers were also not allowed to work in proximity, making the turnaround extremely difficult to manage. Plant managers had no choice but to delay the event until the world returned to normal.

During the summer of 2021, when Covid-19 restrictions eased, many nitrogen plants around the world went offline during the same period to make repairs. By delaying the normal schedule, they knew the plants’ chances of breaking were rising each day and had no choice but to hurry and take them down.

Following a solid spring demand cycle for the northern hemisphere, which wiped out excess nitrogen inventories and a hurricane which hampered production at one of the largest production plants in the world, these turnarounds were unfortunately ill-timed. However, nothing could be done to change it, and global supply and demand became even tighter.

August 2021 – CF Industries Files Countervailing/Anti-Dumping Case vs. Russian & Trinidad-Produced UAN

Over the years, Russia and Trinidad tonnages have accounted for large portions of North American UAN imports. These imports created competition for North American producers. Following Mosaic's successful phosphate counter vailing duty case, CF Industries (North America's largest nitrogen producer) filed a countervailing and anti-dumping duty case against UAN produced in Russia and Trinidad & Tobago. Once the case proceeded past preliminary votes, this case was largely seen as concluding with a yes vote due to the similarities to Mosaic's case. The phosphate case was seen as setting the precedence for a yes vote. Many believed it was just a matter of when the final determination yes vote would be announced.

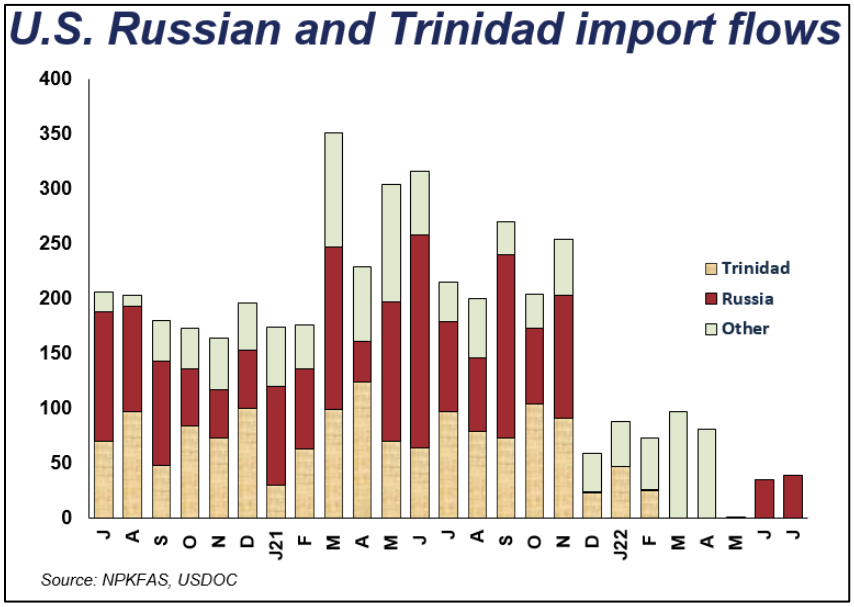
The risk to Russian and Trinidad producers of eventually having to pay these duties would largely block UAN imports from North America. Europe continued to struggle with production issues, creating an intense need to raise import volumes. These producers were pushed out of the North American market while having adequate demand in Europe, and trade flows quickly shifted away from North America.

CF's Counter Vailing/Anti-Dump Preliminary Duties			
	CVD	A-D	Combined
Trinidad	1.83%	111.60%	113.43%
Acron (Russia)	9.66%	9.15%	18.81%
Eurochem (Russia)	9.84%	23.98%	33.82%

The lack of imports would go on to reduce UAN supplies across Canada as most imported tonnages came from the U.S. This allowed UAN values across the continent to rally and hold high price levels, even as other nitrogen products saw price volatility. In summary, the few North American UAN producers were able to keep prices high without the threat of import competition.

When the final determination vote was held, the market was shocked to hear that the U.S. International Trade Commission (ITC) had voted against the case, meaning that the case would close with no duties imposed upon Russian and Trinidad-produced UAN imports. Competition in the North American market would resume - or so the market believed.

Unfortunately for Canadian farmers, the European production cuts would eventually far outweigh any other narrative in the marketplace.



September 2021 – European Shutdowns

As markets moved into fall 2021, global marketplaces quickly understood that energy markets would take center stage, and this was particularly true in Europe. As shown earlier, European gas prices started to move higher during the fall of 2021 as tensions with Russia over the Nord Stream 2 pipeline began to escalate. Although high natural gas prices forced some European fertilizer plants to idle, higher fertilizer prices allowed most of the industry to continue to operate. Prices spiked immediately following the Russian invasion of Ukraine but quickly settled back to pre-conflict levels. The war was not going well for Russians by mid-summer, and Russia further curtailed natural gas shipments to Europe, claiming maintenance issues on several pipelines serving Europe. Natural gas prices spiked again and hit a record high at the end of August. The net impact was another round of plant closures with the industry operating rate reportedly dropping to 35% - 40%. The plants left running appeared to be those with a strong industrial market base.

Since then, natural gas prices have been steadily moving lower with recent spot markets and nearby futures markets dropping into the mid-$30 per MMBtu range. Considering that the breakeven natural gas price at current ammonia prices is around $30 per MMBtu, most of the idled capacity is still off-line. When and how much capacity can or will come back on-line is and will remain highly uncertain.

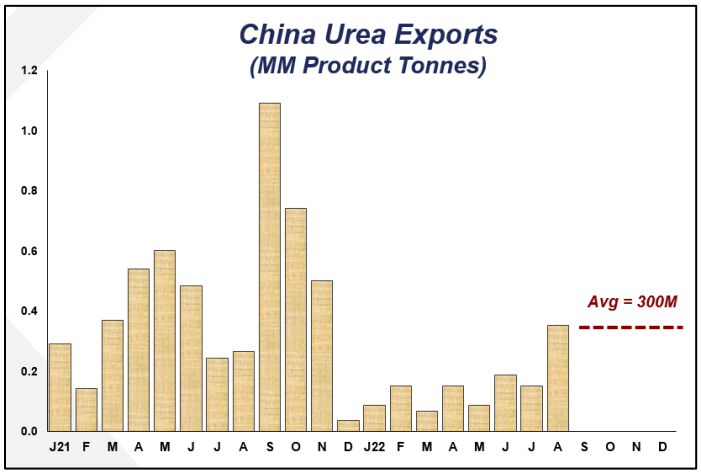
November 2021 – China Bans Exports

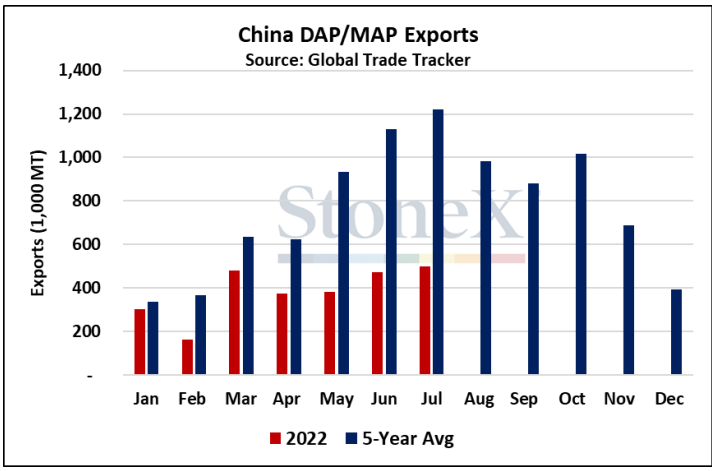
The Chinese government's announcement of an export ban further disrupted global fertilizer supplies. China is the largest producer of phosphate in the world and accounts for approximately a quarter of global DAP/MAP trade. It is also the largest urea producer and one of the largest exporters at approximately 5.5M tons per year, or 10% of global urea trade. The abrupt removal of these supplies sent prices careening higher.

Although not specifically stated by the government, the reason for the ban appeared to be twofold:

- Ensure adequate supplies to the domestic market. The government concern was that domestic producers would react to the high global prices and ship excessive volumes offshore. At the time of the announcement, fertilizer production was already below target due to rolling power outages throughout the country
- Keep domestic fertilizer prices low. Low priced inputs, including both fertilizers and chemicals, have been a key policy goal of the government to improve income conditions in the rural areas. Following the ban, domestic urea prices began to moderate and with a differential to the global being as much as $300 per ton.

Many speculated that this announcement was little more than blustery talk by Chinese officials looking to appease their people. However, the trade data quickly showed the ban was real, with export volumes dropping substantially, and with only industrial urea used in diesel exhaust fluid (DEF) and other chemical production allowed to be shipped. Although the Chinese government recently eased the ban, they have stated it will likely be reimposed at the beginning of 2023.





February 2022 – Russia's Invasion of Ukraine Creates Uncertainty in Global Fertilizer Markets

There had been plenty of speculation in the weeks and months before February surrounding the uncertainty regarding Russia's threats to invade Ukraine. Many around the world chalked it up to blustery threats. However, those threats came to fruition when Russia launched a full-scale invasion of Ukraine on 2/24/2022.

This unprecedented attack on Ukraine was met with a global response. Governments around the world took to podiums to condemn the invasion. Political threats and eventual sanctions were imposed, removal of Russia's Most Favored Nation (MFN) status, including Canada's threat to impose duties on Russian fertilizers. In another unexpected twist, the world saw companies stepping up to punish Russia for its actions. Large companies like Starbucks and McDonald's closed their stores. Banks around the world refused to lend money to companies doing business with Russia.

For all intents and purposes, it appeared that Russia barred from the world market. Many believed this would include fertilizers, as companies who would normally ship Russian product around the world were threatened to have their credit lines revoked if they continued.

The fear of losing Russian fertilizer exports caused world supplies to tighten significantly and global values to rally.

Shortly after this event, politics started to play a larger part in the markets. The Chinese government, seeing global supply tightness and rallying prices, banned the export of nitrogen and phosphate fertilizers, explaining that their first duty was to Chinese farmers. Banning exports would ensure adequate supplies while lowering domestic values, both wins for Chinese farmers. Other governments started to watch/regulate their exports for similar reasons.

2022 Urea Capacity by Region

Region	Capacity (000 Product Tons)	Market Share
China	65,413	29.1%
South Asia	40,972	18.2%
Arab Gulf	24,722	11.0%
East Asia (ex China)	17,046	7.6%
Russia	12,624	5.6%
U.S.	12,557	5.6%
Europe	11,270	5.0%
North Africa	11,265	5.0%
E. Europe/C. Asia	9,433	4.2%
Latin America	8,054	3.6%
Nigeria	5,778	2.6%
Canada	4,143	1.8%
Oceania	574	0.3%
Other	663	0.3%
World Total	224,513	100%

2022 UAN Capacity by Region

Region	Capacity (000 Product Tons)	Market Share
U.S.	14,320	40.0%
Canada	1,630	5.0%
Trinidad	1,420	4.0%
Russia	3,070	9.0%
Europe	7,290	21.0%
E. Europe/C. Asia	3,530	10.0%
North Africa	1,060	3.0%
China	2,600	7.0%
Other	54	2.0%
World Total	35,460	100%

2022 Potash Capacity by Region

Region	Capacity (000 Product Tons)	Market Share
Canada	36,650	36.0%
Russia	19,000	19.0%
Belarus	15,410	15.0%
China	2,995	9.0%
Other	20,385	20.0%
World Total	100,440	100%

2022 DAP/MAP Capacity by Region

Region	Capacity (000 P2O5 Tons)	Market Share
China	15,785	38.0%
U.S.	5,804	14.0%
Morocco	4,710	11.0%
India	3,840	9.0%
Saudi Arabia	3,060	7.0%
Russia	2,609	6.0%
Brazil	788	2.0%
Other	5,309	13.0%
World Total	41,905	100%

This created a fertilizer market driven as much by fundamentals as it was by world politics. Tight supplies would eventually push nitrogen and potash values to all-time highs, and phosphates values very near the highs set in 2008.

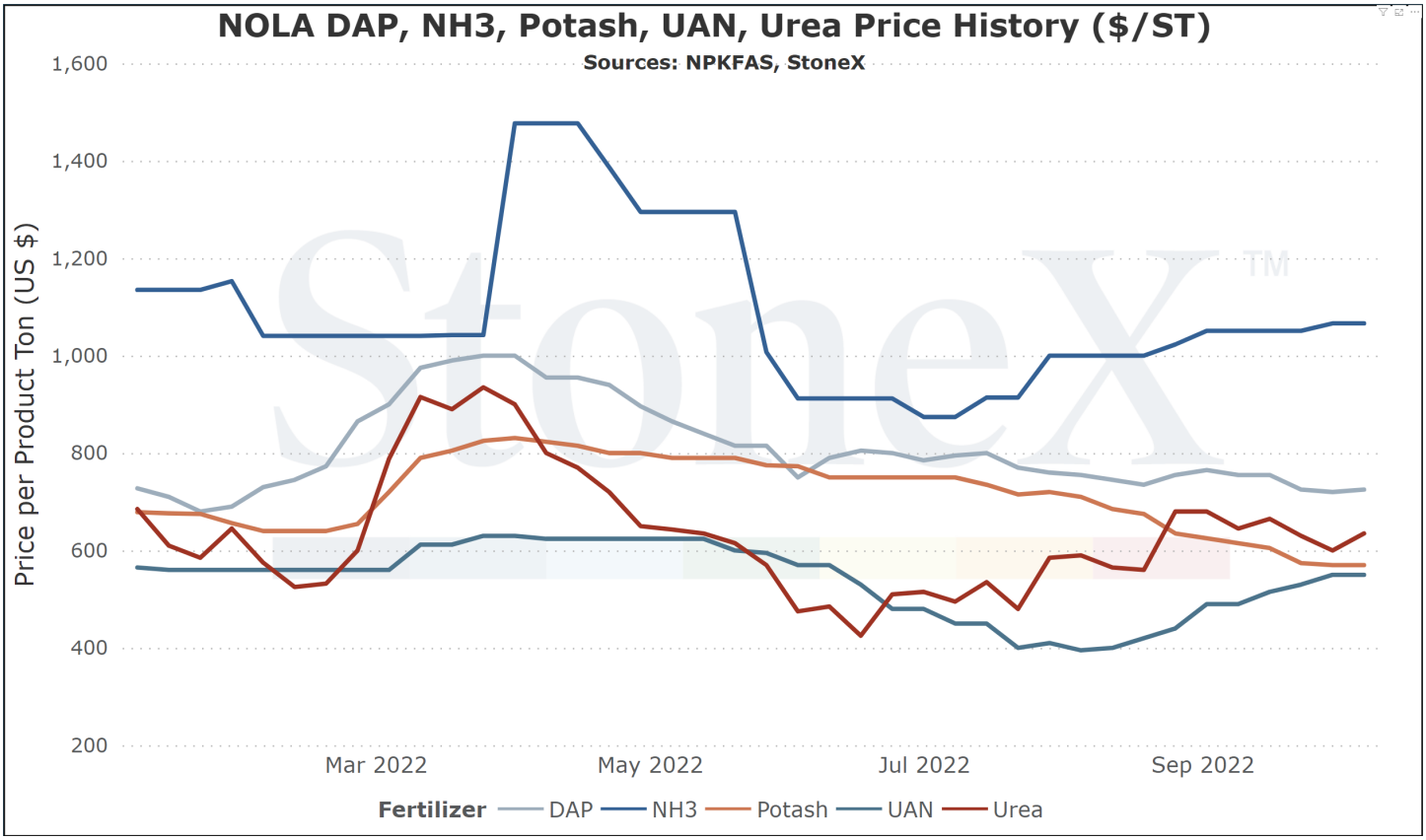
March/April/May 2022 – Global Fertilizer Markets Surprisingly Move Lower

In one of the few feel-good surprises for North American fertilizer buyers, values of all major fertilizer products topped out in late March/early April and began to decline through the summer, though prices paid by farmers remain higher than historical levels.

The first major driver from the global point of view was Russian exports. After the invasion of Ukraine, many believed that Russian fertilizer exports would drop substantially as many governments and companies around the world condemned the move and took steps to break normal relations. However, by spring, trade data began to be released, and global fertilizer markets were surprised by the quantity of exports occurring. Not only were exports flowing out, but Russia was also building political bridges with countries such as Brazil and India, both major fertilizer importers, by offering guaranteed supplies at discounted prices.

The second was overall spring demand. While farmers around the world had warned that record-high prices would cause them to change their application/planting practices, many in the fertilizer market believed it to be just that: talk. However, as spring season continued throughout the northern hemisphere, fertilizer producers, suppliers, and traders quickly realized that farmer talk evolved into actuality. Demand was much lower than anticipated and as a result, inventories were high coming out of spring and into the summer period, which acted as an anchor on global values.

It was likely that markets would have continued to decline into the first part of summer--if not for the next event.



August 2022 – European Natural Gas Prices Skyrocket, Turning Off Western/Central European Nitrogen Production in the Process

Throughout 2022, European natural gas values had been elevated due to strained relations with Russia, which has been the main provider of natural gas supplies to countries throughout Europe via the Nord Stream pipeline. Russia's invasion, followed by Europe's support of Ukraine, further strained those relations, and reduced the chance that normal flows would return. These strained relations finally broke, with Russia taking the ultimate step of completely shutting down gas flows. Various reasons were given, and subsequently debunked, for the stoppage.

Regardless of the reason for the stoppage, the result was the same. Dutch TTF, the natural gas market we track most often for price trends, values eventually topped $100 MMBtu (vs a "normal" price range of $5 - $7 MMBtu).

This spike proved too costly for nitrogen production facilities throughout western and central Europe. Once again, global politics were threatening global fertilizer supplies.

Production curtailment and/or shutdown announcements came quickly and often. As the dust settled, European operating rates were reduced to 15 – 30% of normal, removing a tremendous amount of supply from the global market. Not only were the supply losses large, but the market also gained that demand as farmers/retailers looked to replace tons that would normally be produced nearby.

This single event was enough to stop the lower price trend that had been seen since late March/early April, and as long as it occurs, it is likely to continue to push global nitrogen price ideas higher which will threaten global food production.

2022 Urea Capacity by Region

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China	65,413	29.1%
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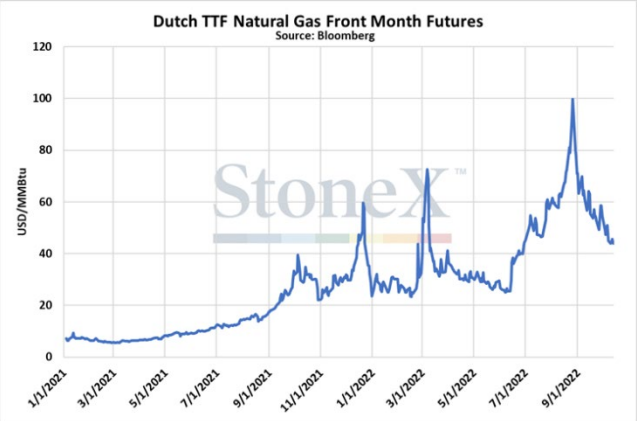

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E. Europe/C. Asia	3,530	10.0%
North Africa	1,060	3.0%
China	2,600	7.0%
Other	54	2.0%
World Total	35,460	100%

2022 NH3 Capacity by Region

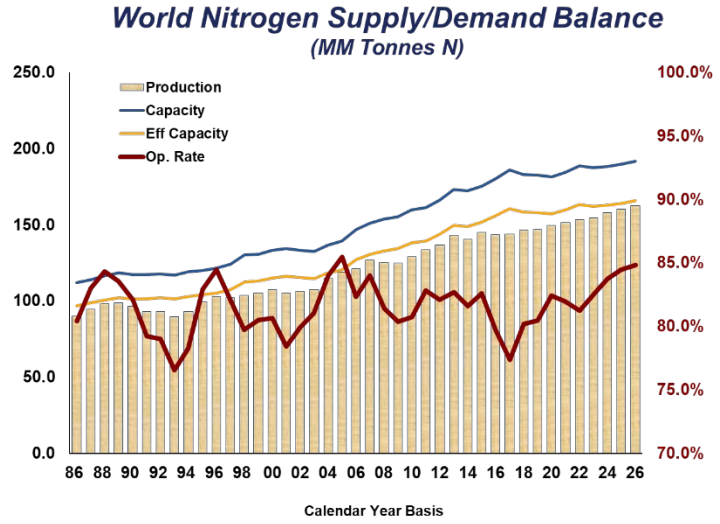
Region	Capacity (000 Product Tons)	Market Share
East Asia	82,507	35.6%
E. Europe/C. Asia	32,526	14.0%
South Asia	25,694	11.1%
North America	22,733	9.8%
West Asia	21,930	9.5%
Europe	19,224	8.3%
Africa	13,557	5.8%
Latin America	11,423	4.9%
Oceania	2,281	1.0%
World Total	231,875	100%

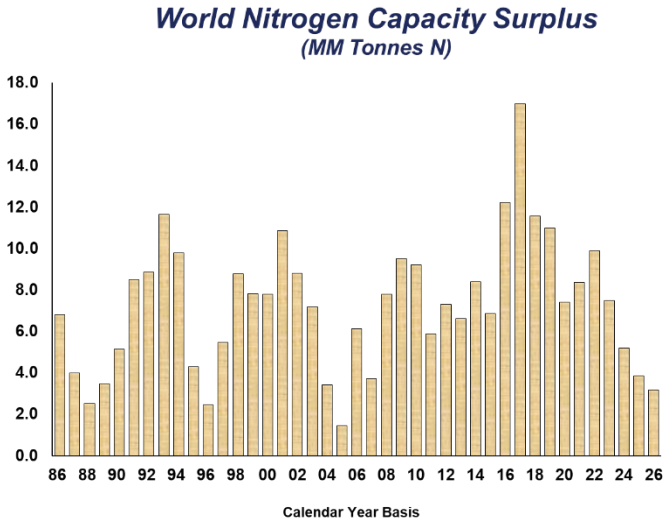
Global Nitrogen Market Outlook

Global Nitrogen Market Overview

The global nitrogen market has been and is expected to remain a highly volatile industry. Down cycle periods will include relatively low prices, nitrogen production margins remaining depressed, global inventories being oversupplied, and global nitrogen production capacity rationalized. These periods should be followed by up-cycle periods complete with higher-than-average pricing, nitrogen production profitability surpassing expectations, tight global supplies and capacity expansions. The last major downturn occurred in the late 1990s when the high-cost producers in the U.S. and Western Europe were forced to close roughly 40% of their total nitrogen capacity permanently.

The latest cycle appears to have bottomed in 2017-18, with world nitrogen operating rates, the level of nameplate capacity at which plants are running (shown by the red line below), dropping to 76% of capacity. The global "Maximum Effective Capacity," shown by the yellow line in the graphic below, for world production is 86.5% of maximum capacity. Nitrogen production is a very high pressure, high temperature process that is incredibly hard on equipment. Plants typically cannot run at 100% capacity for long periods. Scheduled repair periods must be taken, or plant breakages stop production until repairs are complete and restarts are made. Global production rates dropping to 76% of capacity left a surplus capacity of approximately 14 million tons of nitrogen per year.



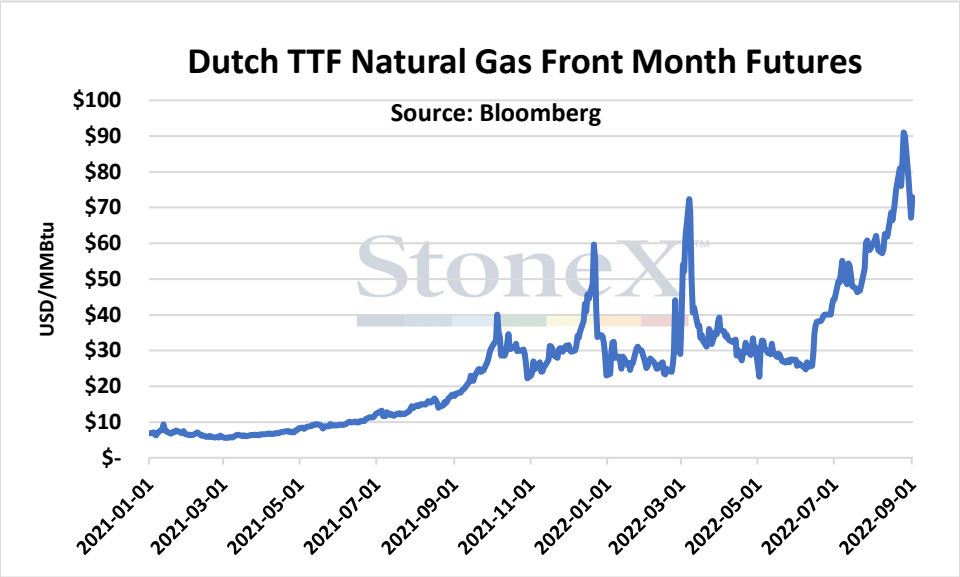


Since then, demand growth for nitrogen has exceeded production capacity gains (i.e., not enough new production built to keep up with growing world demand). This pattern has continued through to today. Looking at 2021 data, this concerning trend stood out as global operating rates improved to 83% of nameplate (maximum production) capacity while the global surplus dropped to 6 million tons.

It was widely anticipated that this trend would continue past 2021. However, the Black Swan events, including the Russian invasion of Ukraine, the stoppage of Russian natural gas flows to Europe, which effectively shut down production in the region, the slowdown in world economic growth, and many others added considerable uncertainty to both the supply and demand sides of world nitrogen balance.

Global Nitrogen Supplies

The most significant area of uncertainty today focuses on European natural gas values. As seen in the accompanying, the sharp rise in pricing has pushed producers' cost of production well above global market prices. This has forced approximately 70% of nitrogen production capacity in western and central Europe to curtail or idle. This equates to roughly 16.3M tons of actual nitrogen not being produced per year (7.9M tons of urea, 5.1M tons of UAN, and 13.5M tons of NH3) when looking at the big three nitrogen products.



Given Europe's recent path toward green energy, the question surrounding European nitrogen production and the uncertainty of Russia as a trusted supplier in the future, is not when production recovers, but if it does at all.

If these plants restart, it will depend on the European energy balance and the direction of natural gas markets. "Typical" Dutch TTF natural gas values are in the single digits on a MMBtu equivalent. When Russia completely stopped shipments via the Nordstream pipeline in August, values skyrocketed to just over $100 per MMBtu. Since then, ahead-of-schedule storage being filled, lowered industrial demand, and increased global shipments have allowed values to drop to approximately $50 per MMBtu. This is still well above the breakeven price for European nitrogen producers, estimated to be approximately $30 per MMBtu (based on current fertilizer market values). We estimate that not only will plants need to see natural gas values drop below break-even economics, but they also need confidence that values will stay low. Another complication in the recommencing conversation is a plant's offline duration. The longer a plant remains offline, the more difficult and costly it becomes to restart it. Additionally, cold temperatures make a hard process much harder, and we are entering another winter season.

It is difficult to predict how these factors proceed and their impact on the nitrogen markets. Markets based solely on supply and demand fundamentals are difficult enough to call. The current nitrogen markets have not only fundamental factors to ponder but also the added layer of global political movements.

Yet, the long-term underlying fundamentals for global nitrogen products have remained mostly unchanged. Growth in demand is expected to continue to exceed capacity, which will lower available supplies and make market reactions to demand spikes/production hiccups much more severe. This situation will worsen if idled European capacity is permanently closed (not expected in current supply and demand) or major exporting countries such as China continue to take a conservative approach to exporting. Any situations that result in additional loss of supply will result in further tightening of the global supply and demand balance, which will accelerate the upswing in the current nitrogen cycle.

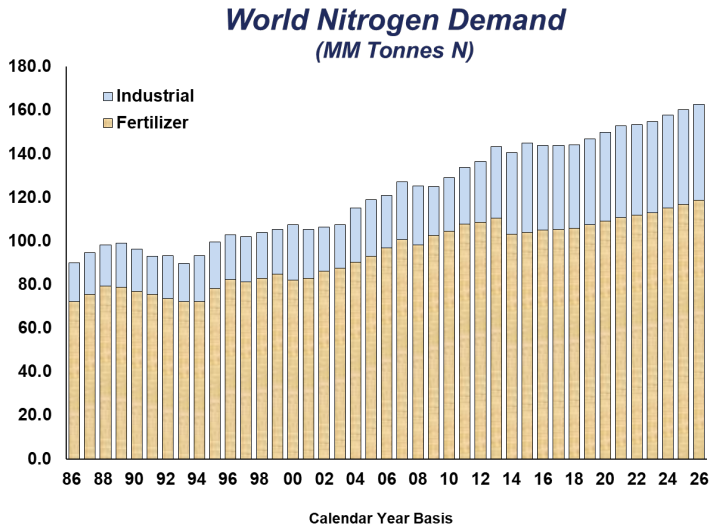
Global Nitrogen Demand

Globally, nitrogen is considered the most important fertilizer nutrient. It is necessary in the photosynthetic process and is therefore tied directly to crop yields and overall food production. According to the FAO, commercial fertilizer (particularly nitrogen) accounts for roughly 60% of world food production.

Unlike phosphate and potash, nitrogen cannot be retained in the soil. This means after being applied, the nitrogen is either utilized by the crop (soaked up to produce more grains/crops), leached deep into the soil (beyond the reach of plant roots), or volatilized into the air. As a result, nitrogen must be applied each year to maintain crop production. While phosphate and potash demand are somewhat flexible to increases and decreases in grain values, nitrogen demand is relatively flat regardless of grain price. For example, prices for all fertilizer products in 2007/08 jumped to record levels. The net nitrogen demand only declined 4.1% from the average compared to a decline of 34% and 30% for phosphate and potash, respectively.

World nitrogen demand grew rapidly during the 1970's and 1980's due to:

- Growth in fertilizer consumption particularly in developing countries such as China and India.
- Growing demand in the industrial sector for use in the production of other chemicals and products (e.g. – caprolactam, urea resins/glues, scrubbers for emissions control, DEF, etc.).



Although demand dropped during the first half of the 1990's, which was due almost entirely to the breakup of the former Soviet Union, the trend returned to a growth mode through the early 2000's.

Over the past decade, growth in world demand has slowed considerably due to several factors, which include:

- Demand growth in developed countries slowing as levels of diminishing marginal returns are approached.
- Improved agronomic practices, including a global emphasis on adopting of the 4R nutrient stewardship principles.
- Government financial assistance for improving nitrogen efficiency and reducing excess nitrogen leaching.

Globally, China and India are currently the largest nitrogen fertilizer demand markets and account for approximately 22% and 18% of global demand, respectively, followed by North America at 14%, Europe at 10% and Latin America at 9%. The African region is the fastest-growing demand market in the world. It is largely considered to be in the adoption curve, which will help accelerate its demand growth in the coming years.

On a product basis, urea is the most widely used nitrogen product. It accounts for approximately half the total world nitrogen fertilizer consumption. The remaining 50% is split between various nitrogen types such as ammonium sulfate (AS – 21% N), ammonium nitrate (AN – 34% N), calcium ammonium nitrate (CAN – 27% N), and nitrogen solutions (28% and 32% UAN).

Urea has many physical characteristics that help its popularity. Because of its high nitrogen content (46% N) relative to other fertilizers, urea is efficient and relatively cheap per unit of nitrogen to transport. It is also easier to handle and store than some of its counterparts and is more efficient in its application to the fields. It is particularly popular in developing

countries with little to no infrastructure to handle and/or apply liquid products. With urea being dry, it can be sealed in a bag and then applied by hand.

The use of ammonia (NH3) as a direct application fertilizer is limited primarily to the North America marketplace. This is due to the specialized equipment required to store, handle, and apply the product into the soil. Similarly, the UAN market is limited primarily to North America, Western Europe, Latin America, and Western Australia. Outside these areas, the infrastructure needed to store, haul, and apply the product is limited.

Across North America, the nitrogen fertilizer market is dominated by urea, UAN, and ammonia (NH3). These three products account for approximately 90% of total nitrogen fertilizer demand annually. While percentages vary year-to-year, depending primarily on weather/soil conditions and relative cost of the products, urea and UAN account for just over 30% of the market share each while ammonia/NH3 accounts for just under 30%. The remaining 10% of North American nitrogen usage includes ammoniated phosphates, ammonium sulfate and, to a lesser extent, ammonium nitrate.

Near-term, fertilizer demand is expected to decline marginally, with most of the decline occurring in the industrial sector due to slowing economic growth. In the case of Europe, reduced activity in downstream industries due to cutbacks in natural gas availability will result in high natural gas values. However, demand is expected to begin recovering in 2024 and return to a longer-term trend rate of 1.5% - 2.0% per year and mirror world population/food demand growth. As mentioned earlier, nitrogen is relatively price inelastic. Farmers in two of the largest world markets, China, and India, are largely insulated from high world nitrogen prices due to government interventions through direct subsidies in the case of India and, in the case of China, export restrictions to ensure adequate domestic supplies and lower domestic values.

Potential Global Nitrogen Production Growth

Historically, most supply cyclicality in the nitrogen sector stems from the difficulty in building new facilities. Many factors that are considered before breaking ground on a new facility, but the leading factors are:

- **Plant size** – to capture economies of scale, nitrogen facilities are very large complexes that add a significant volume of product into the market at one time. Not only must considerations be made for where hundreds of thousands of newly produced tons of nitrogen will be destined, but also significant logistical considerations must be made.
- **Construction time** – based on recent projects, a typical world-scale ammonia/urea complex will take approximately 4 – 5 years to complete, between deciding to proceed with construction and actual production commencement.
- **Highly capital intensive** - costs can vary considerably depending on site location, access to infrastructure (rail, barge, port facilities, etc.), and many other factors. The capital expenditure (CAPEX) of a typical greenfield, 1.0 MM tons per year ammonia/1.6 MM tons per year urea complex can cost USD $4 - $5 billion.

These factors, combined with the inherent volatility in the nitrogen sector for both output (product pricing) and input (energy costs) of the business, new plant construction is typically delayed until investors can be assured that the market is on an upswing and can generate adequate cash flow to support high capital expenditure. The result is that new capacity typically comes in large "chunks," followed by periods of low price and low profitability. This downcycle results in potential plant closures and low-capacity additions while global demand grows. Eventually, the cycle restarts.

World ammonia and urea capacity are shown in the table below. Since it takes four-plus years to construct a world-scale facility, near-term capacity is, for the most part, a known factor outside of debottlenecks/minor expansions. Over the next few years, a limited number of projects under construction are expected to come on-line with a total capacity change over the next four years of 7.8 MM product tons for ammonia and 7.4 MM tons for urea. That compares to growth in demand of 11.8 MM and 13.9 MM, respectively.

World Ammonia and Urea Capacity
(000 Product Tonnes)

	Ammonia					Urea				
	2022	2023	2024	2025	2026	2022	2023	2024	2025	2026
West Europe	12,140	12,140	12,140	12,140	12,140	7,022	7,022	7,022	7,022	7,022
Central Europe	7,084	7,184	7,233	7,233	7,282	4,248	4,248	4,248	4,248	4,248
E. Europe & C. Asia	32,527	33,684	34,800	35,049	35,209	21,254	24,398	24,663	24,854	25,052
North America	22,733	22,818	22,818	24,146	24,146	16,850	17,000	17,065	17,152	17,152
Latin America	11,423	11,423	11,423	11,441	11,441	7,659	7,659	8,154	8,154	8,154
Africa	13,557	13,999	13,999	13,999	13,999	15,095	15,476	15,476	15,623	15,623
West Asia	21,930	21,930	21,930	21,930	21,930	25,426	25,967	25,967	25,967	25,967
South Asia	25,694	25,694	26,618	26,618	27,348	39,628	40,898	42,526	43,796	43,796
East Asia	82,506	82,640	82,640	82,640	82,361	82,604	81,574	81,787	81,787	81,557
Oceania	2,285	1,984	1,990	1,990	1,990	567	270	270	270	1,270
World	231,880	233,498	235,593	237,188	237,846	220,353	224,510	227,178	228,873	229,841
Change	6,556	1,617	2,095	1,595	659	7,318	4,157	2,667	1,696	967
Cumulative		1,617	3,712	5,307	5,966		4,157	6,824	8,520	9,487

The one major area of uncertainty is potential plant closures, particularly in the case of Europe. As discussed earlier, approximately 15 million tons of European nitrogen capacity is currently facing high natural gas prices, resulting in high production costs. How much, if any, of this capacity could be permanently closed is going to depend on how long European industry remains underwater and the how long the plants remain idled. Based on current fertilizer market prices (week ending 10/14/22), the current break-even Dutch TTF is estimated at $30 per MMBtu. While natural gas prices have dropped dramatically over the last month, the Dutch TTF is still $14-$15 above the estimated break-even price. With respect to the idled plants, the longer a plant stays idled, the more difficult it is to bring that plant on-line and requires an increasing amount of capital expenditure.

Major Nitrogen Capacity Developments: 2023 - 2026, excluding China

Start-up Year	Country	Company	Plant / Location	Ammonia Capacity (kt product)	Urea Capacity (kt product)
2023	Russia	EuroChem	Kingisepp		1,320
2023	Russia	Shchekinoazot	Shchekino	525	705
2023	Russia	TogliattiAzot	Togliatti		730
2023	Mexico	Pemex	Coatzacoalcos VII	480	
2023	Egypt	EBIC	Ain Sukhna	90	
2023	Egypt	NCIC	Ain Sukhna	440	380
2023	Turkey	Yilfert Gemlik Gübre	Gemlik		540
2024	Russia	EuroChem	Kingisepp	1000	
2024	Mexico	Pro Agroindustria	Coatzacoalcos II		500
2024	Bangladesh	BCIC	Ghorasal & Polash	-330	-565
2024	Bangladesh	Ghorasal Polash	Narsingdi	530	925
2024	India	Talcher Fertilizers	Talcher	730	1,270
2025	USA	Gulf Coast Ammonia	Texas City	1300	
2025	India	Brahmaputra Valley	Namrup IV	730	1,270
2026	Spain	Fertiberia	Aviles	210	
2026	Spain	Fertiberia	Sagunto	245	
2026	Saudi Arabia	Helios Green Fuels	Neom	1155	
2026	Indonesia	Pusri	Pusri III-IV	-730	-1,140
2026	Indonesia	Pusri	Pusri III-B	910	450
2026	Australia	Neurizer	Leigh Creek	570	1,000
Total 23-26				7855	7385

Source: IFA

There's also a question mark surrounding the Ukrainian industry which includes just under 4.0 MM product tons of ammonia and 3.5 MM tons or urea. There are currently no reports indicating that any of this capacity has been damaged.

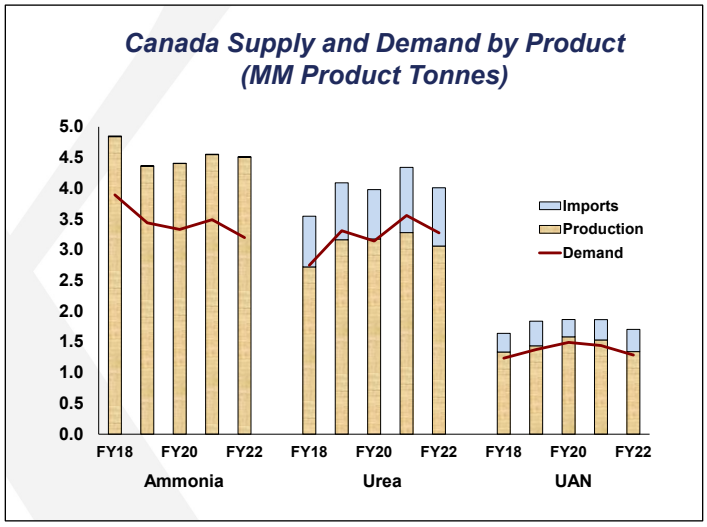
Canadian Nitrogen Market

The Canadian nitrogen industry has remained relatively stable over the last ten years, with production averaging around 4.5 mm product tons of ammonia, 3.1 mm tons of urea and 1.4 mm tons of UAN. Like the U.S., approximately 80% of Canadian ammonia production is upgraded on-site to other nitrogen products or exported with the remaining being used in the industrial sector.

Production sites are largely situated in western Canada, closer to natural gas reserves and pipelines. Currently, Nutrien is the dominant producer in Canada, followed by CF Industries and, to a lesser extent, Yara, Koch, and Sherritt International.

Canadian Nitrogen Capacity
(000 Tonnes of Product)

		Ammonia		Urea		UAN	
Canada		Capacity	%	Capacity	%	Capacity	%
Nutrien							
Carseland	AB	540	10%	800	19%		
Ft. Saskatchce	AB	450	8%	425	10%		
Joffre	AB	490	9%				
Redwater	AB	925	17%	715	17%	312	
Nutrien Total		2,405	45%	1940	46%	312	19%
CF Industries							
Courtright	ON	455	8%	257	6%	412	
Medicine Hat	AB	1,116	21%	735	17%		
CF Total		1,571	29%	992	23%	412	25%
Koch	MB	548	10%	217	5%	650	40%
Sherritt Int.	AB	161	3%				
Yara	SK	705	13%	1076	25%	254	16%
Total Canada		5,390	100%	4225	100%	1,628	100%
Western Canada		4,935	92%	3,968	94%	1,216	75%
Eastern Canada		455	8%	257	6%	412	25%



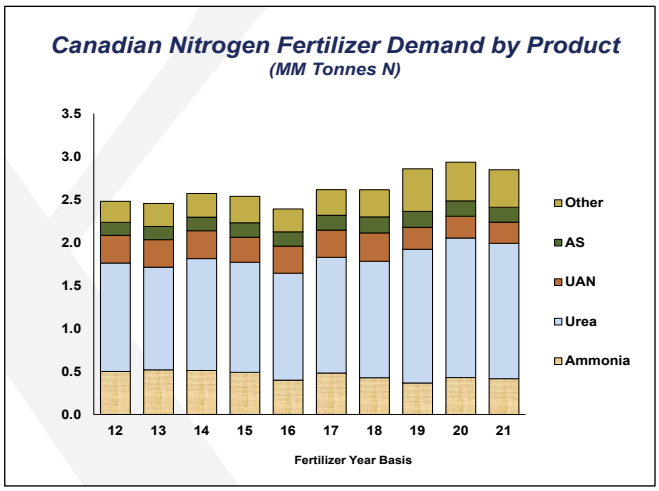
There are currently no projects under development or planned for additional capacity in Canada. However, CF has previously discussed the possibility of converting their second ammonia unit at Medicine Hat, AB to urea due mainly to increasing rail regulations and higher shipping costs. That could add 800,000 to 1,000,000 tons of urea supply to the balance. However, it would reduce merchant ammonia supply by roughly 500,000 tons.

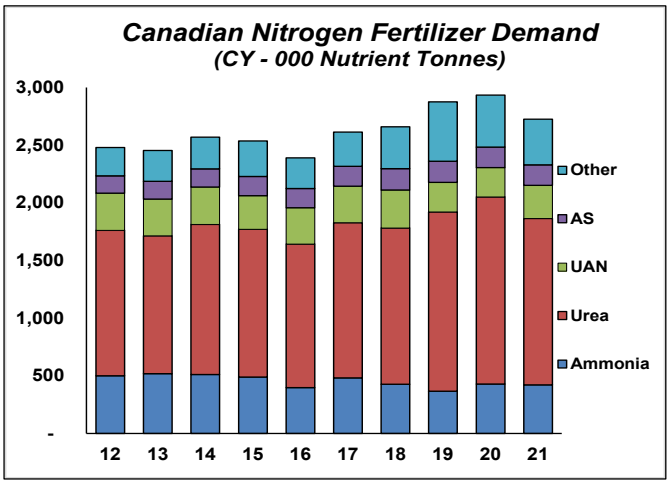
As can be seen in the accompanying chart, imports account for approximately 30% of Canada's apparent urea and UAN consumption while Canada is effectively self-sufficient in ammonia.

Demand

Nitrogen demand in Canada is somewhat volatile largely due to weather. But has been growing over the last 10 years by an average of approximately 1.7% per year. Urea is by far the dominant product accounting for just over 50% of total demand followed by direct application ammonia at 15% and UAN solutions at 11%.

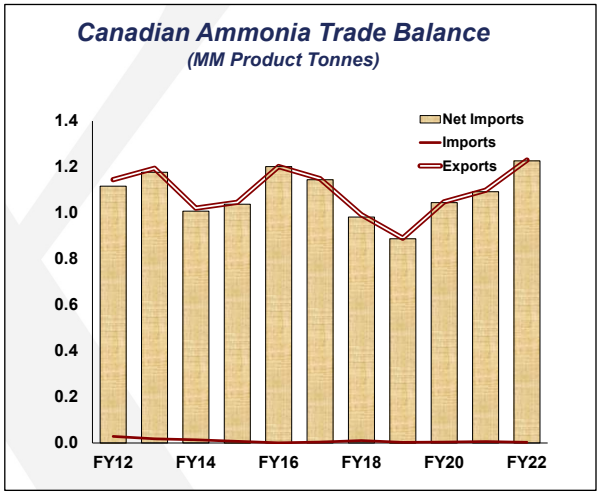
On a crop basis, wheat accounts for approximately 33% of total nitrogen demand, corn and other cereal crops account for 23%, and oilseed crops (canola, soybeans) 36%. Demand near-term is expected to grow, but at a slightly slower rate as application rates trend marginally higher. No major shifts are expected in either the planted area or crop mix.





Trade

Ammonia – Canada typically exports around 1.0-1.2 million tons with virtually all those tons shipped to the U.S. upper Midwest. Although exports have increased in the last few years, mostly due to poor weather and reduced demand in the U.S. northern markets. However, part of the increase was also the result of reduced availability from the Dakota Gas facility in North Dakota following the conversion of their ammonia unit from merchant ammonia to urea. Shipments from western to eastern Canada are typically limited due to high freight rates and better netback prices for producers to the U.S. upper Midwest.



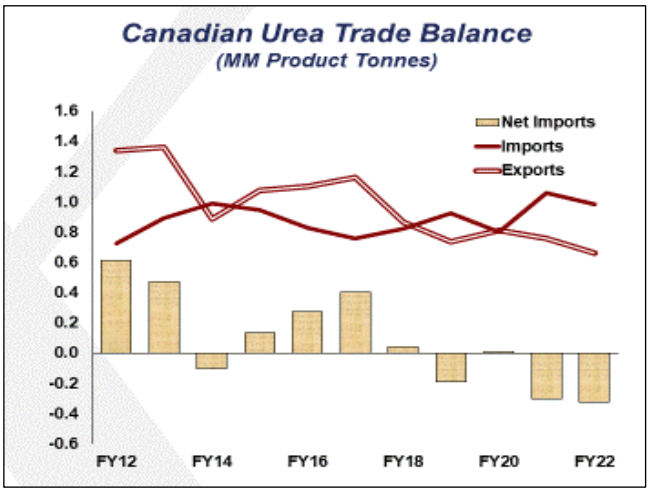
Urea – The Canadian urea trade market can be split on an east / west basis. Most of the production in the west is either used in the western Canadian market or exported to the U.S. upper Midwest with a relatively small volume being shipped to Eastern Canada. Outside of the production from CF's Courtright, ON plant, most of the supply in the East has been met through imports.

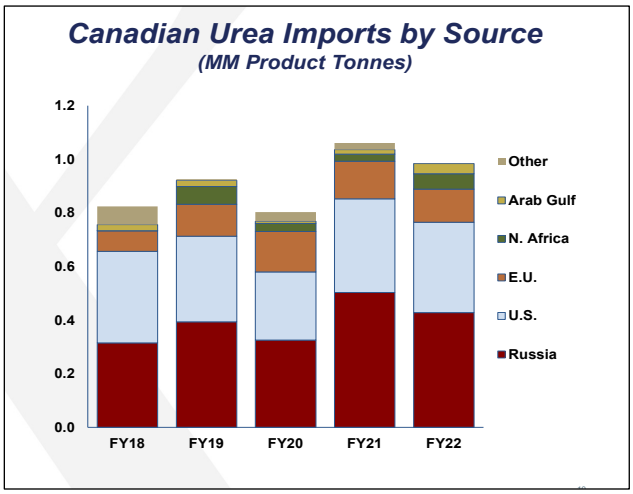
As can be seen in the "Canadian Urea Trade Balance" chart below, Canada has historically been a net exporter of urea. In the last few years, however, a gradual decline in exports has shifted Canada's urea trade position from a net exporter to a net importer. The drop in exports can be attributed primarily to two key factors:

- Increased supply availability in the U.S. Upper Midwest due to CF's expansion at Port Neal, IA and the conversion of the Dakota Gas facility in Beulah, ND from merchant ammonia to urea.
- Increased demand in the western Canadian markets.

Outside of limited sales to the EU, virtually all Canadian exports of urea head to the U.S. Upper Midwest. On the import side, Russia has been the largest supplier to the eastern Canadian markets accounting for 47% of total imports in the fertilizer year 2022, followed by the U.S. at 33%, and the EU at 12%, with a small number of additional tons coming from the Arab Gulf.

What the trade balance will look like in the fertilizer year 2023 is highly uncertain. Since the 35% import tax on Russian product was implemented, imports from Russia have completely dried up. Similarly, imports from the EU have also gone to zero given the spike in natural gas prices and the shutdown of most of the EU production capacity. Russia and the E.U. account for roughly 60% of total Canadian imports. On the export side, shipments to the U.S. are expected to drop due mostly to high downstream inventory coming into fertilizer year 2023 and, to a lesser extent, an expected increase in demand in the western provinces.

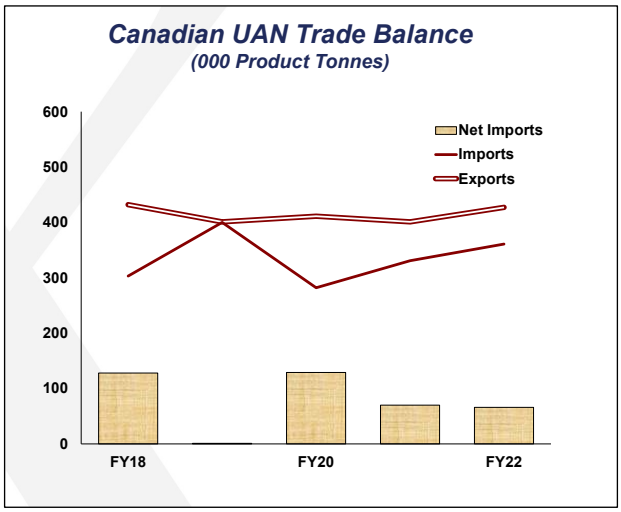


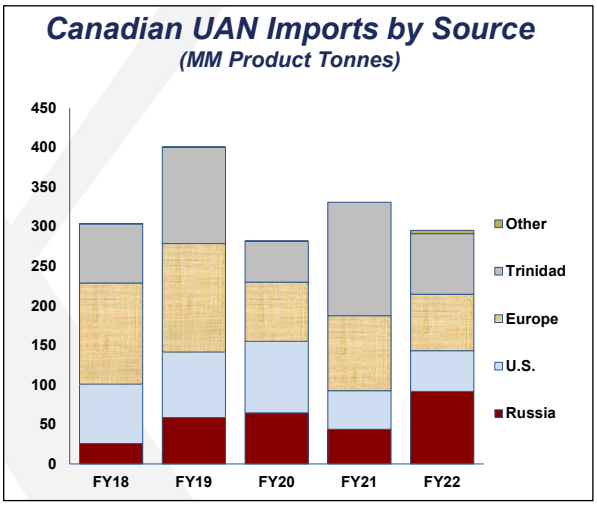


UAN – Canada is a relatively small net exporter of UAN, but from a production/demand perspective, it is basically self-sufficient. Virtually all Canadian exports are cross-border with the U.S. Like urea, imports are primarily offloaded on the east coast with some small rail and truck shipments for the U.S. into the western provinces.

Europe, Trinidad, and the U.S. have historically been the largest supplier of UAN to the Canadian market with some additional tons from Russia. In FY22, imports from Russia jumped due in part to the U.S. anti-dumping/countervailing duty case filed by CF. Although trans-shipments of Russian product would be subject to potential duties under U.S. trade law, it is likely that some of the Russian imports into Canada were likely either diverted to and/or exchanged by suppliers and ended up being considered Canadian exports.

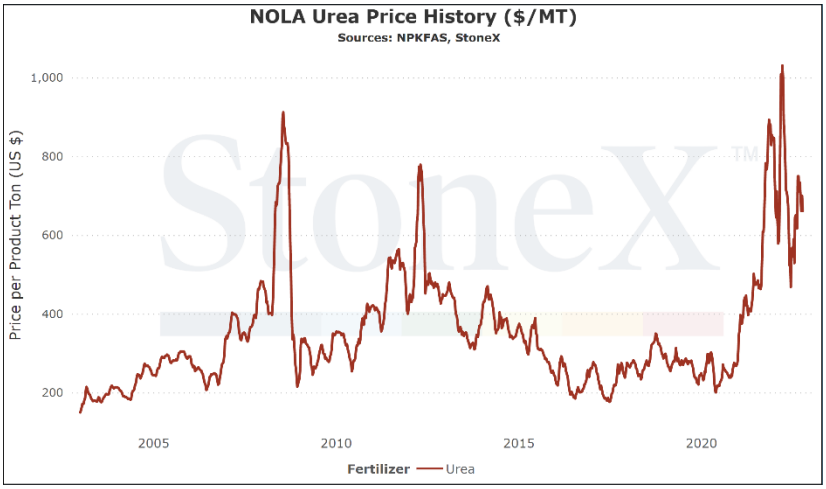
Like urea, Canada's net trade balance is highly uncertain, given the high natural gas costs, European production shutdowns, and the 35% import tax on Russian product. In the fertilizer year 2022, the two combined accounted for slightly more than half of Canadian imports.


Canadian UAN Trade Balance
(000 Product Tonnes)
600
500
400
300
200
100
0
Net Imports
Imports
Exports
FY18
FY20
FY22


Canadian UAN Imports by Source
(MM Product Tonnes)
450
400
350
300
250
200
150
100
50
0
Other
Trinidad
Europe
U.S.
Russia
FY18
FY19
FY20
FY21
FY22

Nitrogen Product Market Outlook

Urea Market History/Recap



Over the past two years, global urea markets have experienced price volatility unlike anything in its history.

2008 and 2012 saw price ideas climb massively in a very short amount of time. In 2008, NOLA (New Orleans, Louisiana) prices in April were approximately $400 and climbed to a then all-time high in July of $850 before dropping back to $200 by December. In 2012, values were approximately $400 in January, climbed to $700 by April and fell to $400 by June. **Both periods were largely demand-driven.** By this, we mean that market conditions presented themselves in a way where market demand seemingly ran over market supplies for a short period. However, once buyers were done, the market found that more than adequate supplies remained, and values dropped.

The current cycle has been longer, with NOLA values starting in May 2020 at sub-$200, eventually setting a new all-time high price in late March/early April of nearly $950 and continuing to trade in the low $600s. While there has been significant price volatility throughout this cycle, the overall trend has been higher. A large reason for the continued support has been that unlike the previous two cycles, this cycle has had a slight but significant difference: **this is a supply-driven marketplace.**

When markets are presented as demand-driven, it does not mean price movement is not justified. A perfect series of events (such as lower than normal fertilizer pricing, higher than normal grain values, jump in farm balance sheets, etc.) occur, which brings most of the market demand forward at the same time. This surge of demand is enough to rally market price ideas but not enough to run inventories low enough to justify a scare. When buyers fill their needs, and the market is left quiet in its wake, remaining inventories struggle to find homes, suppliers become desperate for sales destinations, and prices naturally trend lower. Depending on how desperate position holders are, this price slippage can occur quickly.

A supply-driven marketplace can look very similar to a demand-driven one at the beginning when price ideas are rallying. However, the difference lies when demand goes away. In a supply drive market, prices do not need to fall as position holders/suppliers are aware of the tight supply situation. Rather than chasing sales at ever lower values, they can hold their price ideas and wait for the next round of buying.

This is largely what this recent cycle has been about. Never in the history of the urea market has it had to deal with this many production issues, which have included: a hurricane battering one of the largest nitrogen production facilities in the world, the Chinese government shutting down exports, European production rates dropping to 30%, multiple exporting countries governments enacting export restrictions on quantities, etc.

Unfortunately, this cycle is now entering its third year, and the trend continues. As we look forward to this fall/winter/spring, production issues continue with fear that the Chinese government will again stop all exports. European production is looking more likely to remain offline at least through winter, and overall world demand is still high. In fact, our long-term production/demand forecast paints a picture of a global N market whose existing/new production will fail to keep up with world demand gains. Supply-driven price volatility has been in the urea market for two years now. Unfortunately, it looks to continue for at least the next couple of years.

Canadian Urea Outlook

The outlook for urea shows that prices will remain elevated as production gains continue to struggle to keep pace with demand growth, and global politics continue to affect normal production and exports.

In the short term, a large amount of focus will need to be trained on European production rates and Chinese exports.

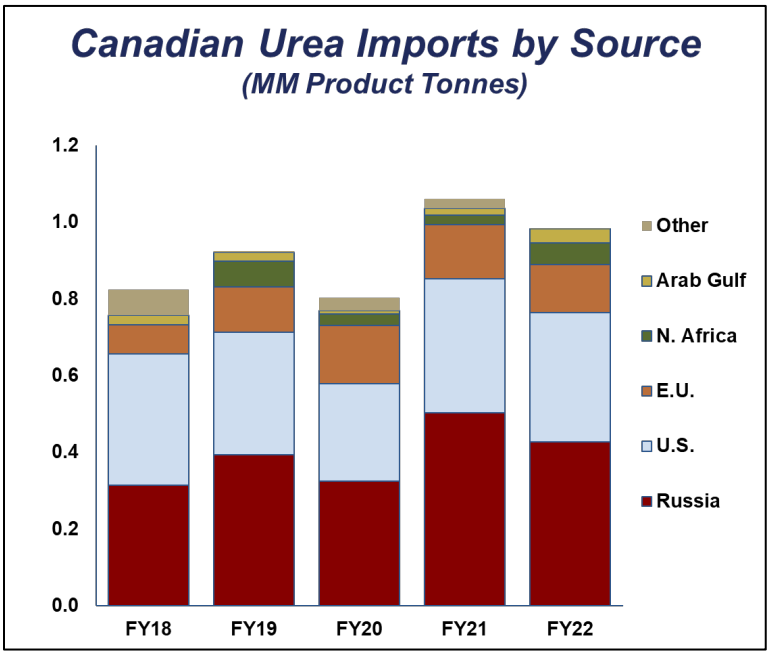
Europe continues its support of Ukraine, which has caused Russia to block the shipment of natural gas which is imperative for nitrogen fertilizer production. Many around the world have been extremely surprised at Ukraine's resilience in the conflict which means any quick conclusion is unlikely. The lack of natural gas shipments was made worse by the sabotage of the Nord Stream pipelines in the Black Sea. While theories abound, many point to Russia as the culprit to ensure that shipment returns are not possible and to inflict more pain on European citizens.

While very recent export totals of urea from China were higher than expected, they are still far below normal. For some time, China has been the largest urea producer and one of the leading exporters, accounting for approximately 10% of global export totals. We continue to believe that the Chinese government will take steps to further block any exports at the start of 2023 to ensure adequate supplies for Chinese farmers. This loss of exports, combined with a lack of European production and continued global demand should support values going forward.

Longer term, global production capacity needs to grow at a faster pace. While we do not believe that there will be any shortages of urea at the current rate, it does raise fears of volatility. In times of tight supply, any production or supply hiccup results in a faster and more violent reaction by the marketplace. Given what has been happening around the world for the past two years and continued speculation that certain countries are just beginning to weaponize food supplies, this fear is not completely unfounded.

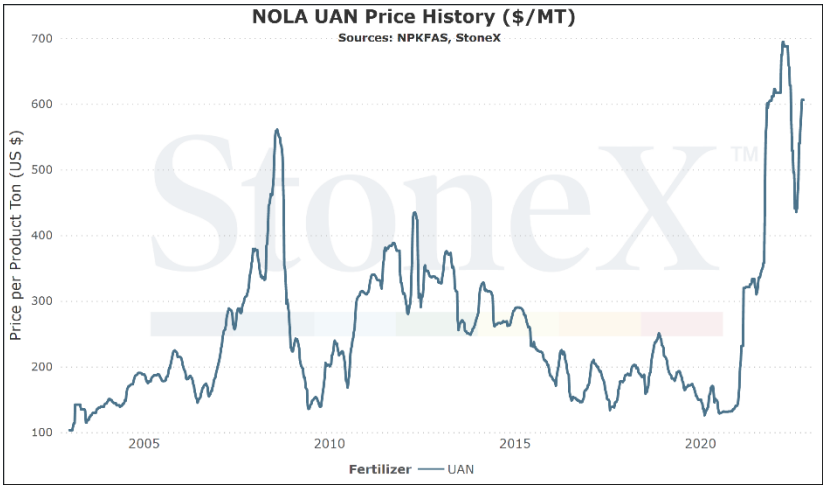
In an added difficulty for Canadian markets, past reliance on urea imports from Russia, which is now effectively blocked due to the 35% duty, means looking for a new supplier. This situation will be made more difficult as other global buyers (U.S. / India / Brazil / Europe / etc.) compete for supplies.

Ultimately, there currently appears to be little risk of values dropping back to price levels seen in the first half of 2020. Canadian farmers will have to continue to face higher-than-average values and tighter than average supplies. For many, the industry was already difficult to operate in before the last two years.



UAN market history/recap

For buyers, global nitrogen markets have been very difficult to navigate with intense price volatility, suspect product availability, and significantly higher values than years past becoming the norm.



Nitrogen products such as urea and NH3 are produced in a multitude of countries around the world. Global urea production is currently estimated at 225mmt, while NH3 is estimated at 232mmt. Having so many different producers across different regions around the world equates to a market with plenty of competition.

For farmers in Canada, UAN is an important product to fulfill nitrogen input needs. However, when looking at UAN from a global perspective, there is only approximately 35mmt produced yearly across a much smaller footprint. Fewer tons produced by fewer producers equate to a more controlled market.

Global UAN markets have had to navigate both supply-driven and politically driven environments since 2020.

From the supply perspective, two events stand out: February 2021 North American arctic blast and February 2022, Russia shutting down natural gas shipments to Europe.

In February 2021, an arctic blast sent days-long freezing temperatures as far south as the U.S. - Mexico border. Residential demand for natural gas skyrocketed, which caused natural gas values to spike. North American nitrogen fertilizer producers took the opportunity to stop production at their plants to sell low-price natural gas contracts back to the market at sizeable increases in profit. The lost time in production would cause already tight inventories to grow tighter just before the start of the spring season.

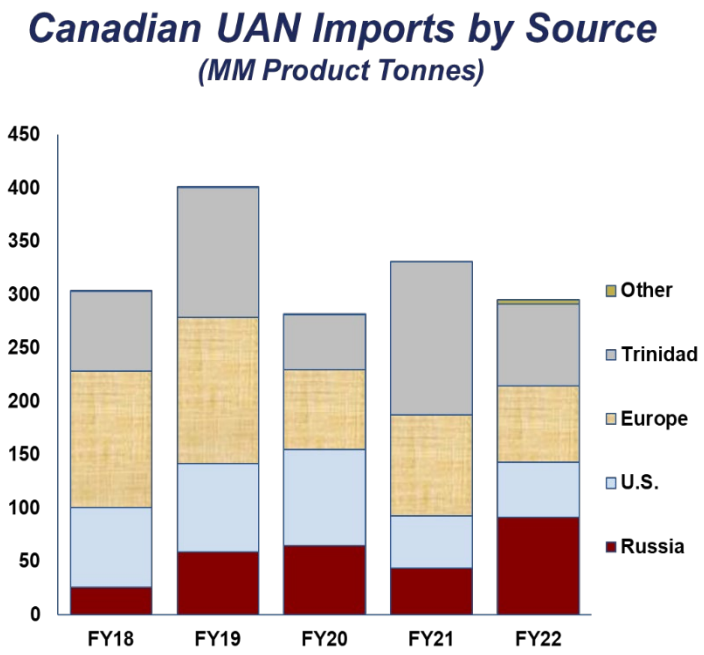
In February 2022, Russia shocked the world after weeks and months of threats and invaded Ukraine. Many around the world, including most European nations, stood against the invasion and assisted Ukraine in its fight for freedom. Knowing it was the primary provider of natural gas to Europe through its Nordstream pipeline, Russia sought revenge by slowing and eventually stopping all gas shipments. European natural gas markets skyrocketed in response to levels high enough to eventually cause nitrogen production to drop to 30% of normal. This has equated to millions of tons of nitrogen not being produced.

From the political perspective, CF Industries filed for a counter vailing and anti-dumping duty case against Trinidad and Russian-produced UAN in August 2021. This effectively cut imports from both nations while the case was ongoing. As 2 of the largest importers of UAN, available supplies were reduced and provided more negotiation power to North American producers. While this case was held in the U.S., the effects were felt by Canadian farmers as both markets typically move together. While CF would eventually lose the case, the damage was done for the spring 2022 application period and raised concerns regarding Canadian reliance on U.S. supplies.

Today, the lack of European production and global supplies failing to keep pace with growing world demand point to a forward market that will continue to see tight supplies and higher-than-average values.

Canadian UAN outlook

Short term, the global UAN market is going to suffer and be price supported by the loss of European production. Accounting for approximately 21% of globally produced UAN and running at a current 30% operating rate, this equates to roughly 5.1mmt annually versus a global footprint of 35.5mmt NOT being produced. With the Russian invasion of Ukraine ongoing and European support of Ukraine, it appears that European - Russian relations will remain strained, which will keep natural gas shipments to Europe from Russia at a minimum. This will keep natural gas prices at an elevated level and operating rates at nitrogen facilities low.



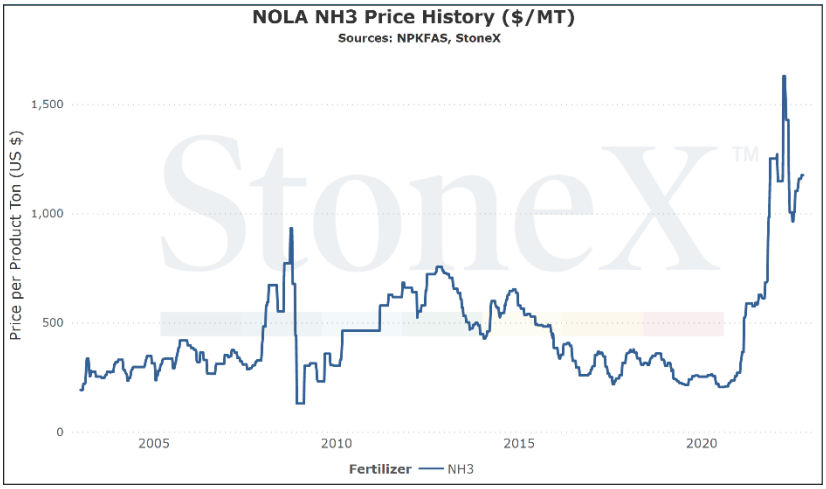
Canadian UAN markets must also deal with the short-term ramifications of a world losing European production and the current 35% duty rate against Russian fertilizers. Aside from fertilizer year 2021, Russia had become an increasingly larger part of Canadian import flows. We must assume that these flows will drop to zero and force the Canadian UAN market to look for other global suppliers. This will be done at a time when European nations also become unprecedented buyers.

Longer term, current production expansions and new production capabilities continue to struggle to keep pace with growing global demand. Given the sizeable capital investment to expand or build new production, the time frame to bring production online, and uncertainty about where to place this production, it seems this situation will struggle back to a balanced supply and demand.

China and Russia dominate today's UAN market. China accounts for 7% of global production, Russia produces approximately 9% of global production and has shipped natural gas, which supported west/central Europe, which accounts for 21% of global production. This combines for 37% of global UAN production being controlling directly or indirectly by countries who have been theorized to weaponize global food supplies. This creates an extremely uncertain outlook and is likely to continue to see elevated price levels for years to come.

NH3 Market History/Recap

From a direct application perspective, anhydrous ammonia/NH3 is the least important from a global perspective of the three major nitrogen products. However, it is very important for Canadian/North American farmers who do direct application. It is also the base product used to produce all other nitrogen fertilizer forms and used in various industrial perspectives. With approximately 232mmt produced annually in almost every region on earth, it remains the most fundamentally important nitrogen product.



NH3's reliance on multiple demand points has meant that it has had a rockier road since 2020.

Like urea and UAN, global NH3 saw significant price jumps in 2008 and then again in 2012 due to an unexpected surge in demand. Both price jumps eventually would falter and see values drop to "normal" levels.

However, since 2020, the price of NH3 has rallied by a significantly higher percentage than both urea and UAN and has proven to hold the new high price better than the alternatives.

Agriculture demand was the first driver for higher prices during the summer of 2020. Following the Derecho event in August 2020, which rallied grain prices, coupled with Covid Relief Checks arriving for U.S. farmers, demand for fall application NH3 went through the roof and prices with it. From that point until the summer of 2022, price ideas grew.

The second major event came from industrial demand. As the world learned to begin operating in a post-Covid-19 environment, industrial sectors began to awake and, with it, demand. As economies around the world began to restart, industrial demand picked up and gave yet another boost to global NH3 values which continues today.

More recently, the third major event has come in the form of global production issues that have resulted in much lower supply availability than "normal." While there have been hiccups across North America (February 2020 arctic blast and Hurricane Ida), these have paled in comparison to production lost in Europe due to the lack of Russian shipments of natural gas.

Today's NH3 marketplace remains very tightly supplied with more than adequate demand, which combines to be supportive of ongoing values.

Canadian NH3 Outlook

Like other nitrogen products, while price volatility is expected, the general trend will be supportive as demand continues to outpace production while global politics and conflicts continue to muddy the waters on expected production outlooks.

Today, the largest looming issue for global NH3 markets remains the loss of European production. Western and central Europe account for approximately 8.3% of the global operating rate and currently produces approximately 30% of the normal. This equates to roughly 13.5mmt/year being offline until the natural gas situation improves. Given the current outlook and fears surrounding the Russian invasion of Ukraine and continued European support of Ukraine, this does not appear to be coming to a quick conclusion.

Longer term, uncertainty surrounding new production globally will be an issue. While the high price cycle should incentivize further production expansion, the question remains who and where. Companies not already in the fertilizer production sector will have to clear the high hurdle of capital expenditure. Those already producing nitrogen likely see little reason to expand production as increased supplies will add new supplies, which could lower price ideas. Even if the decision was made to expand existing production or build new, it becomes a question of where to expand or build. With more developed nations with adequate natural gas supplies unwilling to support further nitrogen production and developing countries being risky from an investment perspective, the decision is not simple.

There is hope in that many facilities tagged as green are being discussed, though it is far too early to know if these plants will ever be built, or what their cost efficiency would be once they are online. If new technology fails and new “older” production plants fail to be built, global demand will continue to surpass global production.

This will give even more leverage to certain countries around the world who seek to weaponize food supplies and have found an avenue to control fertilizer production/exports/etc.

Global Phosphate Market Outlook

Global Phosphate Supply/Demand

The global phosphate market has changed significantly over the last two decades in terms of both concentration and major suppliers.

- While the industry had historically been competitive, weak market conditions and low profitability resulted in many mergers, acquisitions, and plant closures. This was particularly true in the U.S., where there were more than 20 producers in the 1990s to basically only three producers today – Mosaic, Nutrien, and J.R. Simplot – with Mosaic accounting for approximately 60% of total phosphoric acid capacity and 76% of DAP/MAP capacity.
- The U.S. was historically the dominant supplier, producer, and exporter to the global market. However, the decline of U.S. capacity and the emergence of China, Morocco, Russia and, more recently, Saudi Arabia as major suppliers has shifted the dynamics of both the world production and world trade balance, with China now the dominant exporter to the world market followed by Morocco and Russia.

North American Phosphate Capacity
(PA - 000 Tonnes P205, DAP/MAP 000 Product Tonnes)

			Phos. Acid	DAP/MAP
Nutrien	Aurora	NC	1,200	800
	White Springs	FL	540	765
	Sub-Total		1,740	1,565
J.R. Sim	Pocatello	ID	450	365
	Rock Springs	WY	470	375
	Sub-Total		920	740
Mosaic	Bartow	FL	950	2,077
	New Wales	FL	1,740	3,346
	Tampa	FL	900	1,577
	Unclce Sam	LA	780	
	Faustina	LA		1,615
	Plant City	FL	Closed	
	Sub-Total		4,370	8,615
Itafos	Conda	ID	349	313
	Total Capacity		7,379	11,233

- Another significant change in the global market is the growing government intervention in the markets, including but not limited to the use of export controls (e.g. China, Russia), government subsidies (e.g. India – "Maximum Retail Price") and government trade actions (e.g. U.S. anti-dumping duties against Russia and Morocco).

Net impact - the global and regional phosphate markets will not always follow basic supply/demand fundamentals. This has been particularly apparent this year with the China DAP/MAP export ban, which significantly tightened the global DAP/MAP supply and demand balance. The U.S. anti-dumping case against Russia and Morocco also significantly impacted the markets and started the run-up in market prices.

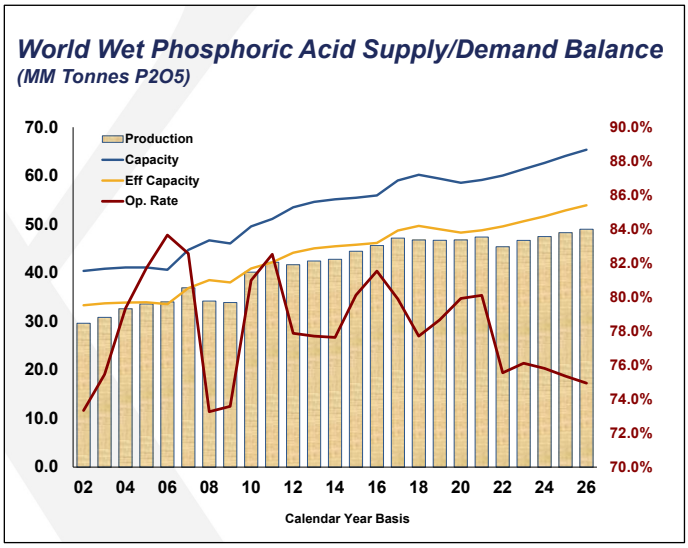
Supply/Demand Balance

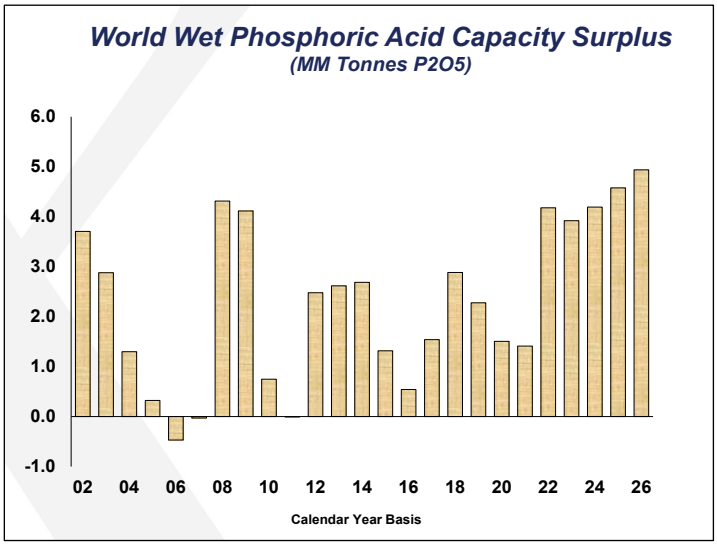
The world phosphate supply is based primarily on wet-process phosphoric acid which accounts for approximately 80% of the total world phosphate supply. Non-acid-based phosphate comes mostly from ground phosphate rock and is used mostly in the production of fertilizers, including single superphosphate (SSP), normal superphosphate (NSP), and triple superphosphate (TSP) as well as being used as an input into compound fertilizers that contain different combinations of the three major nutrients (NP, NPK, PK). Wet process acid production is used primarily in the production of phosphate fertilizers, including DAP/MAP, which consumes approximately 70% of the wet acid production. The remaining 30% is used mostly in the industrial sector (20-25%) and in the production of liquid fertilizers such as 10-34-0.

Globally, DAP and MAP are the leading phosphate fertilizer products accounting for just over 50% of total world fertilizer demand. This varies considerably by region/country, however, due to differences in farm size, cultural practices, supply availability and local production, among other factors. In Europe, for example, NP (nitrogen & phosphorous) and NPK (nitrogen, phosphorous, and potassium) compounds are the dominant products consumed, accounting for 50% of total demand, followed by DAP/MAP at 35%. Conversely, in North America, DAP/MAP is the dominant product accounting for over 90% of total demand.

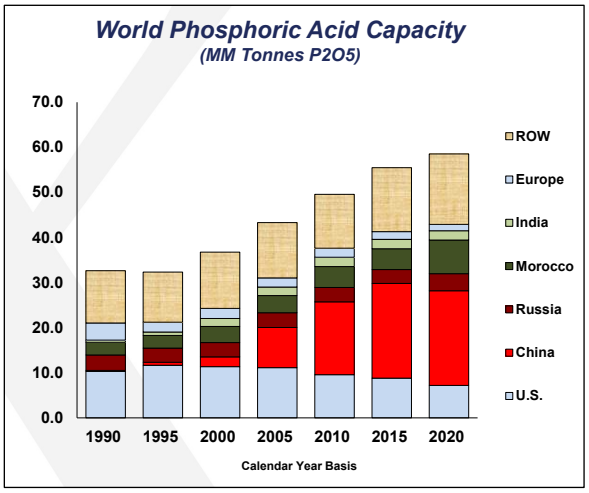
The world phosphate balance has been and is expected to continue to be plagued by excess capacity. As can be seen in the phosphoric acid charts below, the world's wet acid balance is currently operating at just over 75% of capacity. Considering an effective operating rate of 82.5% (maximum rate on a sustainable basis), that leaves a global capacity

surplus of close to 4.0 MM tons P2O5. That surplus is expected to grow over the next five years as capacity expansions outweigh growth in demand. By 2026, the world P2O5 surplus is projected to grow to just under 5.0 million tons.





Supply



Over the last two decades, world capacity has expanded rapidly, with most of the increase coming from China, Morocco, Russia, and Saudi Arabia. While China was a large net importer of DAP/MAP in the 1980s, China is now the largest producer and exporter.

Over the next five years, capacity is expected to continue to expand by approximately 10% adding 6.2 million tons of wet acid capacity and 5.8 million tons of DAP/MAP capacity.

Demand

In contrast to nitrogen, phosphates are relatively stable in the soil and don't leach or volatilize. This gives farmers the option to reduce or cut application rates and "mine the soil" during periods of low crop profitability and/or high fertilizer prices. As a result, phosphate fertilizers are considerably more price elastic than nitrogen. That price sensitivity was certainly the case in 2007/2008 when fertilizer prices hit record highs. The net impact was a 14% drop in world phosphate fertilizer demand and a 34% drop in North American demand.

As can be seen in the "World Phosphoric Acid Capacity" chart in the section above, world phosphate fertilizer demand grew rapidly during the 1990s and 2000s due primarily to developing countries moving up the "adoption curve." Since 2010 the growth in demand has slowed to an average annual rate of approximately 1.6 percent. Again, most of the growth was in the developing countries, with demand in North America and Europe showing a growth of less than 1.0%. Although "hard" data is not yet available, demand in calendar year 2022 is estimated to have declined by approximately 8% due mostly to the impact of Covid-19 and the rapid escalation in world phosphate prices. Declines are expected in most areas. However, government intervention and lower market prices will lead to stable demand in the two largest consuming countries, India ("Maximum Retail Price") and China (export ban).

Going forward, demand is expected to return to an average annual growth rate of approximately 1.5%. However, that forecast is going to be highly dependent on geopolitical issues and whether the markets can return to "normal." Again,

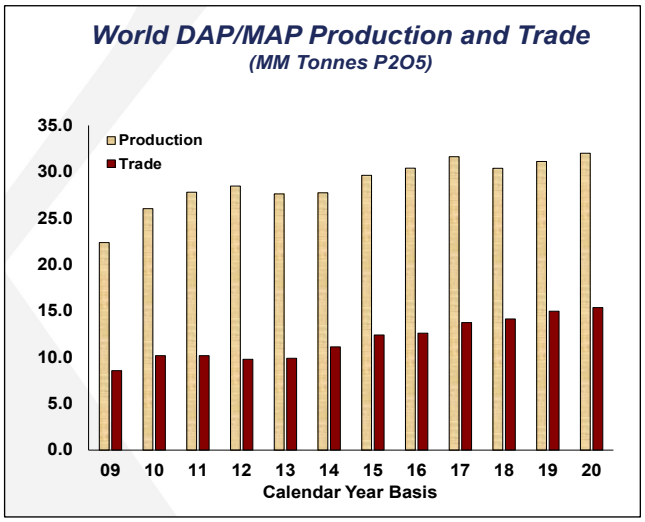
most of the growth is expected to be in the developing regions, particularly in Africa and Latin America, with a much slower growth forecast for North America, Europe, and central Asia.

On a product basis, most of the growth is expected to be in DAP/MAP due to its higher nutrient content and physical characteristics (size, hardness, etc.). Product such as SSP, TSP, and other low-analysis products are expected to decline gradually through the forecast period.

Trade

DAP and MAP are the most widely traded phosphate products due to:

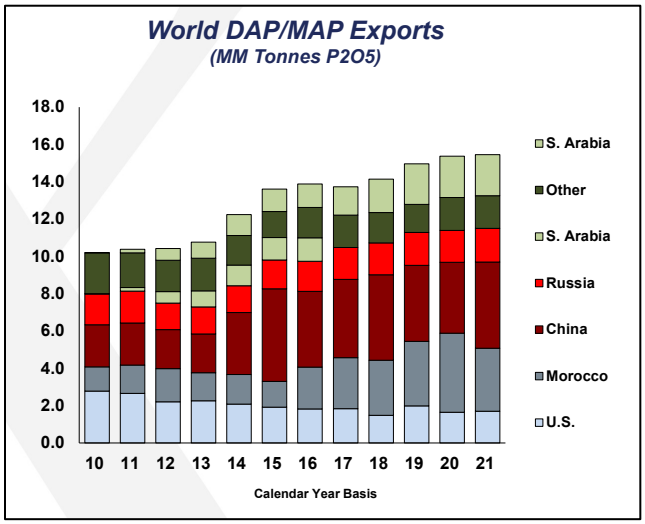
- High market share accounting for more than half of total world phosphate fertilizer demand.
- Most of the production is concentrated in only a handful of countries with low-cost phosphate rock reserves.



Some phosphoric acid is also traded but limited mostly to imports into India for DAP/MAP production and into Europe primarily for use in the production of NPK, NP compounds and, to a lesser extent, into the industrial markets.

As can be seen in the accompanying charts, the world trade balance has changed significantly over the last ten years, with China and Morocco becoming the world's largest exporters, followed by Russia and Saudi Arabia. U.S. exports have continued to trend lower due to a steady decline in production and a lack of competitiveness in the major export markets.

Full-year trade data is obviously not yet available. However, total world exports in calendar year 2022 are expected to drop to around 14.5 tons due to the expected drop in overall phosphate fertilizer demand. The following is an export recap for the major exporting countries.



- **China** - Most of the expected drop in trade will be out of China following the government export ban/restrictions implemented at the beginning of the year. On a year-to-date basis (January – August 2022), Chinese exports have dropped to 3.35 million tons of P2O5 compared to 7.9 million last year and 5.3 million in calendar year 2020. Although the Chinese government has eased restrictions through the rest of calendar year 2022, the government is expected to re-impose the ban after the first of the year to ensure adequate supplies for the domestic market and, also, to keep prices low to their domestic market. Over the last few years, the primary markets for China have been India, Latin America, East Asia, and Australia.
- **Morocco** – Moroccan exports are expected to be down marginally in calendar year 2022 following the overall drop in world exports. While the U.S. had been a major market for Morocco, exports to the U.S. fell to zero following the filing of the U.S. anti-dumping case against Morocco and Russia in July 2020. Since then, Morocco has targeted primarily Latin America and India and, to a lesser extent, Australia, and other South Asian markets.

- **Russia** – Russian exports are also expected to be down marginally in calendar year 2022 due to the government imposing export limitations on producers. Trade sanctions, besides the Canadian import tax, have had little impact on Russian exports.
- **U.S**. – U.S. exports have been steadily trending lower since hitting a peak in the early 2000s. The drop can be attributed to a lack of competitiveness combined with declining and lower-quality rock reserves. U.S. production and export volumes (primarily Latin America) are forecasted to remain relatively stable near-term but start to trend lower later in the decade as phosphate reserves begin to deplete and lower-cost production comes online in other parts of the world.

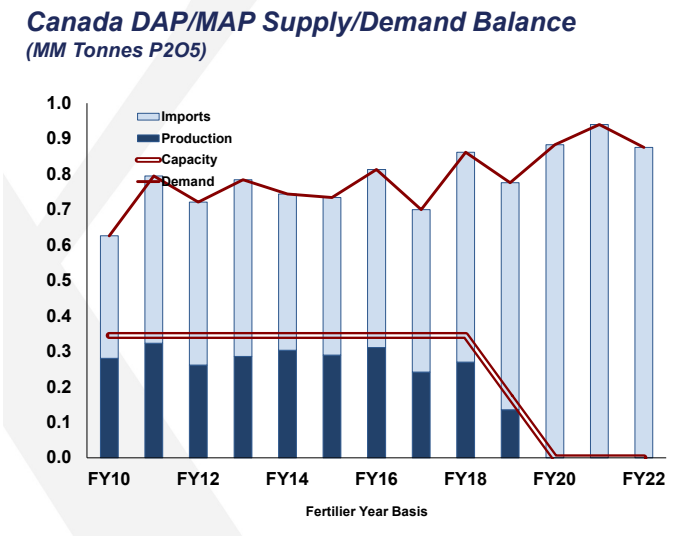
On the import side, the largest markets are in Latin America (Brazil) and India, followed by North America and East Asia. The Latin American market is expected to continue to be a growth market. India is forecasted to remain a major importer. However, growth in demand is expected to be more than offset as new capacity comes on-line.

Imports into North America dropped sharply following the implementation of the anti-dumping duties against Russia and Morocco. The decline, however, was offset partially by a rise in imports into Canada due to the closure of Canada's last phosphate facility in Redwater, AB.

Canadian Phosphate Market Overview

Supply

Canada initially had a wet acid capacity base of 345,000 tons, with all that production used for MAP production. Due to high production costs and poor profitability, the Canadian industry was forced to close all their production capacity with Nutrien's Redwater, AB phosphate facility the last to shut down in 2019. As a result, Canada has become 100% dependent on imports for its phosphate requirements.



Demand

Canadian phosphate demand over the last ten years has grown at an average annual rate of 3.4%. That's well above the relatively flat consumption in the U.S. Most of the growth appears to have been on winter wheat in the Western provinces.

MAP is by far the major product used in Canada accounting for approximately 75% of total P_2O_5 fertilizer demand. Most of the remaining 25% is primarily other nitrogen-phosphorous combination fertilizers (NP's) such as 10-34-0 (liquid ammonium phosphate).

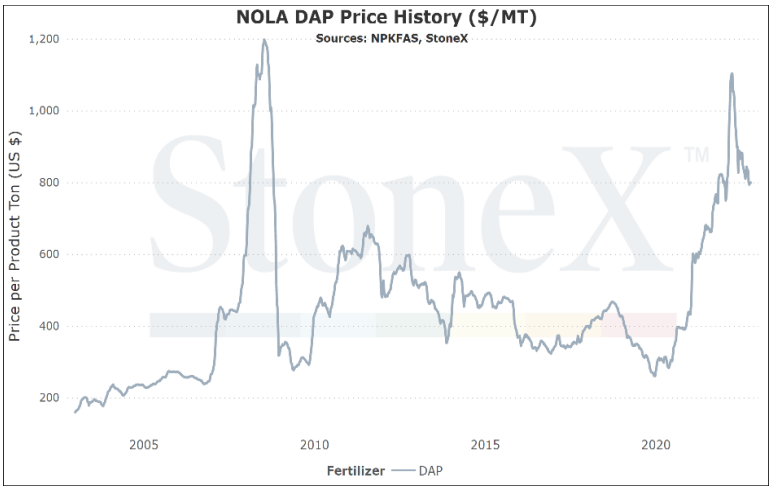
Imports

The U.S. continues to be Canada's most important supplier. Over the last few years, however, imports from Morocco and Russia have shot up in large part due to a combination of factors, including:

- Production problems and limited supply availability out of the U.S. to replace the shutdown of the Canadian capacity.
- Following the U.S. anti-dumping case against Morocco and Russia, both producers have been forced producers to look for alternative markets, including Canada.
- Canadian buyers are looking for an alternative supply source other than Mosaic.

Going forward, Canadian buyers will likely have to look increasingly to the offshore market. As global capacity continues to expand, the U.S. industry (as a high-cost producer) may be forced to further rationalize its production and capacity base. In addition, U.S. producers will no doubt look to export markets with higher netback returns, and that may or may not include Canada.

Phosphate Market History/Recap



Global phosphate markets have experienced marketplaces unlike anything it has seen in its history. Global demand surges overran global supplies. Political situations have caused normal global trade flows to be blocked and changed. Production costs have rallied higher than at any time in history. All these situations and more have combined to create one of the most uncertain times in phosphate history.

The start of the current North American phosphate market cycle can be tied to a singular date: June 26, 2020. This was the date that Mosaic filed countervailing paperwork to block both Moroccan and Russian-produced phosphates. The filing claimed unfair market practices by both nations and duties were requested to help keep Mosaic competitive. Eventually, Mosaic would win the case with substantial duty rates being placed against each country. These rates, along with duty rates already imposed against Chinese-produced tonnage, meant that a significant portion of global exports was blocked from coming to the U.S., which also meant those tons were blocked from arriving to Canadian farmers.

Not long after the case filing, the Derecho event, which caused grain prices to skyrocket, along with U.S. farmers receiving Covid-19 Relief payments, meant that phosphate demand jumped and with it, phosphate values.

During the fall of 2021, global phosphate markets were rocked by yet another market shift as the Chinese government banned the export of phosphate fertilizer through at least June 2022. As the world's largest producer and largest exporter of DAP/MAP, this caused global supplies to tighten even further.

Fortunately, values have been dropping since the conclusion of this spring as buyers cut back on their needs. However, the U.S. counter vailing duty rate still applies, and there are rumours that the Chinese government will once again block phosphate exports starting in 2023. It appears that volatility is here to stay, at least in the short term.

Canadian Phosphate Outlook

For the global phosphate market, demand and politics look to control price direction going forward.

In the short term, the U.S. duties against Chinese, Moroccan, and Russian-produced phosphate means that a significant portion of global exports has a high hurdle to clear before being sent to the U.S. The Canadian phosphate market, which is currently highly dependent on shipments from the U.S., is also effectively cut from the major global producers. Upcoming fall and spring demand will determine how prices react in the coming months. Many farmers continue to relay that adequate soil levels, combined with the continued high price of phosphate, mean that they will look to cut application rates once again to save input costs. However, this could be offset by rumours that the Chinese government is once again planning to fully ban phosphate exports at the start of the 2023 calendar year.

Longer term, the phosphate market is complicated. We do not anticipate China returning to its former size in terms of exports in the next few years. The Chinese government is now shifting to an approach that limits its energy exports which include phosphates. This means the continued loss of one of the largest exporters in the world.

However, we also anticipate production rate growth in plants in Morocco and Saudi Arabia, which will help offset the loss of China. We also anticipate that Africa, which has shown promising results regarding phosphate rock reserves in recent studies, could quickly grow into a leading exporter in the 3 – 5-year timeframe. Politics, conflicts, and economic worries keep outside investment money from flowing in, and other issues mean this is a hopeful but not highly confident event.

With phosphate demand being more elastic than nitrogen, when the price of phosphate rallies too much in relation to grain values, we will likely see prices pull lower, bringing demand back. This ebb and flow will continue to support ongoing price volatility and create a more difficult environment for Canadian farmers to operate in.

Global Potash Market Outlook

Global Potash Supply/Demand

Potash is one of the three basic nutrients needed in crop production and plays a key role in the growth and development of plants by enhancing photosynthesis, assisting in the activation of enzymes, aiding nitrogen uptake, and helping the plant withstand stress.

Approximately 85% of world potash production comes from deep underground mining, with the remainder being produced from natural brines in potassium-rich water bodies (e.g. Great Salt Lake). Most potash fertilizers are sold as "granular" or "standard" product. Granular potash is used mostly in the developed agricultural markets (North America, Brazil) since it is large and more uniform and can be easily bulk blended with solid nitrogen phosphate products, while standard product is used primarily in developing regions and applied as a single nutrient.

There are two overriding characteristics of the global potash market.

- **Concentration –** The global potash market is highly concentrated, with a handful of producers dominating world production and world trade.
- **Excess Capacity** – Since the rapid expansion in capacity in the early 2000s, the global potash market has been and is expected to continue to be plagued by overcapacity. As a result, producers have had to either idle capacity and/or curtail production to balance world supply with world demand.

Despite these characteristics, the global potash market over the last year experienced one of the sharpest run-ups in prices in history, with the market climbing to its highest level since the fall of 2008. The spike was caused primarily by a combination of supply factors which significantly reduced supply availability and dramatically tightened the global supply/demand balance, including:

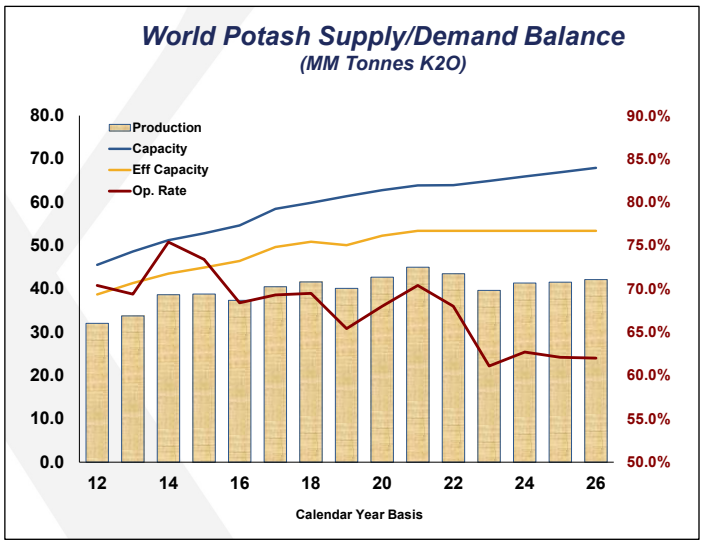
- Mosaic's closure of Canada's largest potash mine in Esterhazy, SK with a capacity of 5.6 million tons potassium chloride (KCl).
- Lithuanian ban on Belarussian potash, where the majority of Belaruskali's exports are shipped.
- The Russian invasion of Ukraine triggered economic sanctions and a temporary reduction in potash exports.

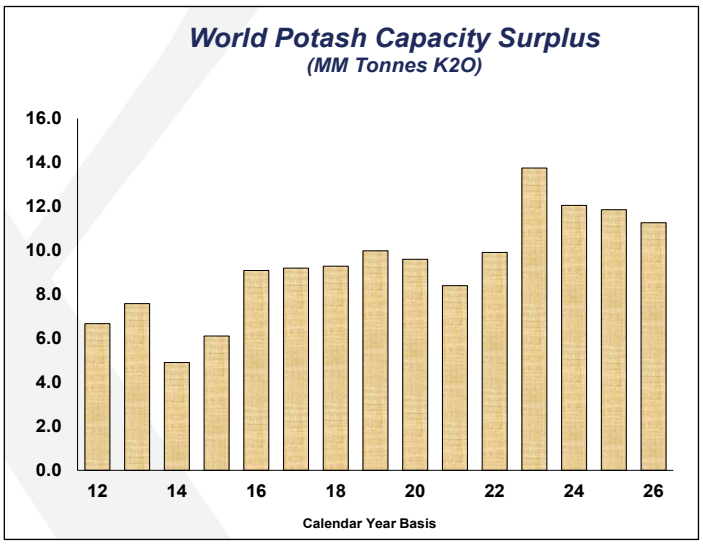
Since then, however, the market has been trending lower because of production adjustments (re-start of Colonsay, SK facility and a ramp-up of existing capacity) and price-impacted demand destruction.

Supply/Demand Balance

As previously mentioned, the world potash balance has been and is expected to continue to face a significant volume of excess capacity, with the surplus forecast to move higher as capacity expansion over the next five years more than offsets the growth in demand. Most of the additional capacity is expected to come more from recently opened new mines continuing to ramp-up. As a result of the growing surplus in capacity, producers will continue to be forced to idle capacity and/or ratchet back production.

Near-term, the market has already and will continue to adjust to the recent supply disruptions. In Canada, the closure of the Esterhazy mine was quickly followed by Mosaic's re-opening of its Colonsay mine and Nutrien announcing that it was ramping up its existing capacity. Although the sanctions against Russia had an immediate impact, Russian exports have returned to "normal" as exporters found a way around them and countries like Brazil and India stepped up to buy discounted Russian product. Although the Lithuanian cutoff of Belarussian exports continues to impact production and exports, Belarus has been increasing rail shipments to East Asia and shipping more tons through Russian ports.





Capacity

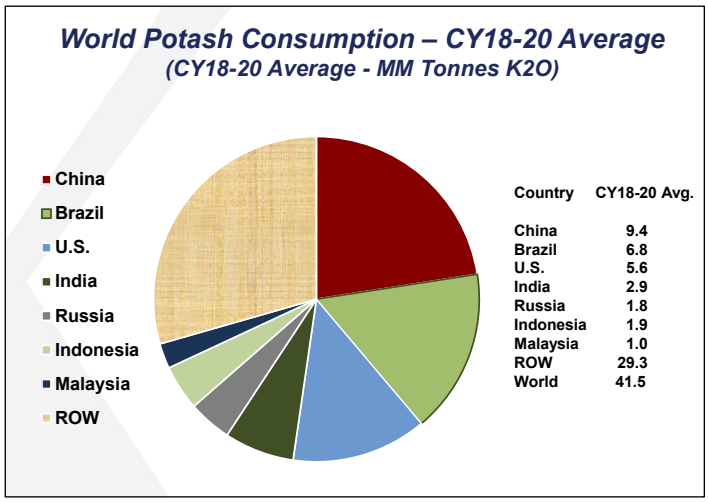
World potash capacity is currently dominated by a handful of producers in Canada (Mosaic, Nutrien, K&S), Belarus (Belaruskali) and Russia (Uralkali, Eurochem), which combined account for just over 70% of total world potash capacity. The remaining capacity is located primarily in Germany (K&S) and the Middle East (Jordan, Israel) with some additional small-scale operations located in various locations in Latin America and Central and East Asia. China is also a relatively large potash producer, with an annual production of 4.5 mm tons consumed by the domestic market.

Potash capacity, which grew significantly in the early 2000s, is expected expand further near-term as new existing mines continue to ramp-up. By 2026, world potash capacity is forecasted to reach 67.5 mm tons K20 – up roughly 3.3 million tons from the 64.2 mm tons currently in place. The table below summarizes the current projects/expansions. As can be seen, most of the increase is expected in Russia with the continued ramp-up of Urlakali's Ust Yayvinsky mine and the second phase of Eurochem's Usolskiy mine. The BHP proposed Jansen mine in Saskatchewan with an initial capacity of 4.3 million tons KCL was not included in the list since it's not expected to move forward until after the forecast period.

Major MOP Capacity Developments: 2022 – 2026				
Start- Up Year	Country	Company	Plant / Location	Increment Capacity Change (kt MOP)
2022	Russia	Uralkali	Solikamsk III	500
2022	Israel	ICL	Dead Sea Works	200
2022	China	Zangge Potash	Ge'ermu	200
2022	Canada	Mosaic	Esterhazy	800
2022/26	Canada	K+S	Bethune	400
2023	Russia	Uralkali	Ust Yayvinsky	2,000
2023	Laos	Lao Kaiyaun	Ganmeng	500
2024	Russia	Uralkali	Solikamsk II	900
2026	Russia	Eurochem	Usolskiy II	1,500

Demand

Over the last ten years, world potash demand has grown at an average annual rate of approximately 2.7% per year. Most of the growth has been in the developing countries in Latin America (Brazil), Asia (India, China), Africa and Southeast Asia. However, the International Fertilizer Association (IFA) forecasts demand over the next two years to drop by estimated 3.4% and 8.8%, respectively. The decline is expected to be mostly the result of high potash prices, an anticipated weakening in crop economics, and a slowdown in world economic growth. For calendar year 2024 and beyond, demand is forecasted to recover and return to an average annual growth of 2.0 - 2.5%.



The major consuming countries are shown in the accompanying pie chart. China and Brazil combined account for almost 40% of total world demand, with the top five countries (China, Brazil, U.S., India, and Russia) accounting for two-thirds of total world demand. Indonesia and Malaysia are also major markets due to heavy use and high application rates on plantation crops.

Going forward, most of the growth is expected to be in developing countries, while demand in the developed markets (North America, Europe, Australia) is forecasted to grow at a relatively slow rate.

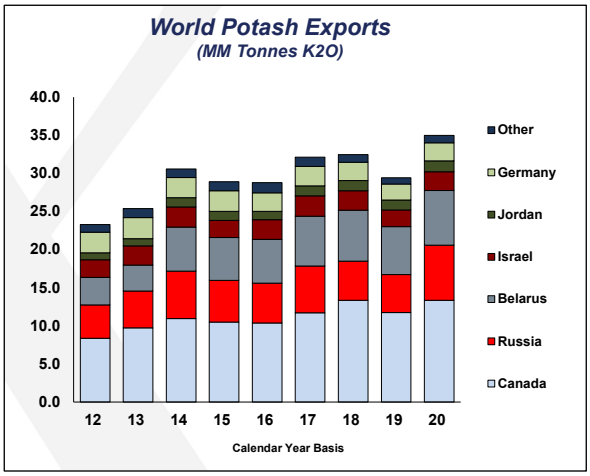
Trade

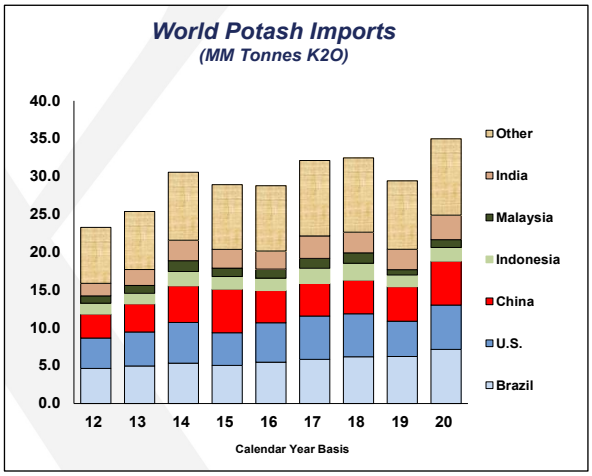
Since potash production is concentrated in only a handful of countries, potash is a highly traded product accounting for almost 70% of total world demand. The largest exporters are also the largest producers led by Canada, Belarus, and Russia. The three countries account for almost 80% of total world exports.

On the import side, Brazil is the largest potash import market followed by China, the U.S., India, and Indonesia/Malaysia.

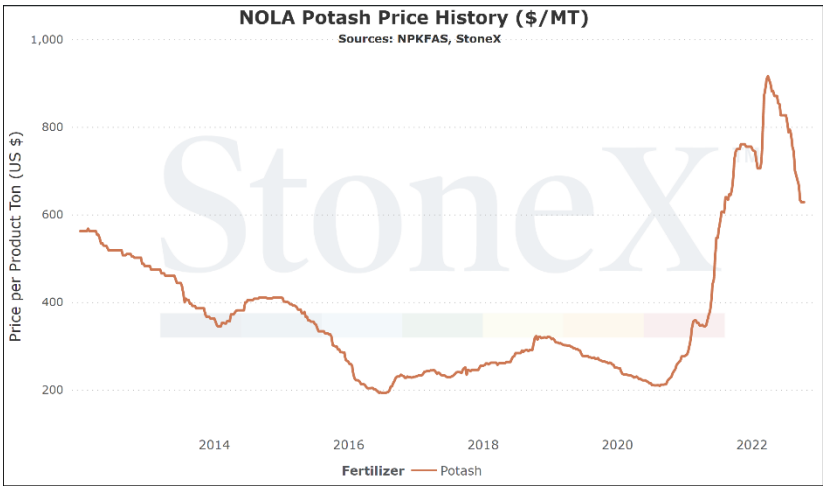
- **Brazil** – Brazil has been one of the fastest-growing import countries. The growth has been largely driven by a combination of a major expansion in corn and soybean acreage combined with higher application rates. Canada is the largest exporter to Brazil, accounting for 32.6% of their total potash imports in 2021.

- **China** - Although China produces approximately 4.5 million tons per year, China's consumption is close to 10 million. The growth has been due mostly to a government push toward balanced fertilization and rebuilding potash reserves in the soil. China imports from all three major producing countries, with most of its trade based on annual contracts.
- **U.S.** – Potash consumption in the U.S. has been relatively flat over the last ten years, with import demand for the most mirroring changes in corn and soybean acreage. The U.S., over the last ten years has imported just over 85% of its potash requirements from Canada, with the remaining tons split between Russia and Belarus and, to a lesser extent, Israel, and Germany. Near-term, the loss of Belarus tons will shift those imports back to Canada.
- **India** – Similar to China, India secures potash imports primarily through annual contracts with major exporters. Canada is typically the largest supplier to India, with imports typically averaging around 1.4 million tons, followed by Belarus and Russia at roughly 700,000 tons and Israeli and Lithuania at close to 500,000 tons. Last year, however, import demand dropped from 5.1 to 3.2 million tons, with Russia taking the brunt of the decline.
- **Indonesia/Malaysia** – The two countries import roughly 4.5 to 5.5 million tons annually. Canada has historically been the largest exporter to the region, accounting for close to 40% of their total import requirements, with the remaining volumes split among the other major exporting locations.





Potash Market History/Recap



For Canadian farmers, potash is an input that is likely seen as little concern. With Canada being the world's number one producing and exporting country, supply availability is not a concern.

However, that does not mean that price volatility has not been something that has plagued farming operations across the country.

Like other fertilizer inputs, potash markets were affected by the August 2020 Derecho event in the U.S., which caused a demand surge in fertilizer not seen in its history. While supply concerns were not near as prevalent in potash as in other fertilizer markets, the surge in demand caused potash values to more than quadruple by the time new all-time high prices were set.

Along the way, production issues occurred. In June 2021, Mosaic was forced to stop production at one of its largest potash mines in Esterhazy, SK. Water flowing into the mines had always been a problem but pumping efforts had allowed Mosaic to continue operating. By June, the water flow surpassed expectations and pumping efforts and Mosaic was forced to abandon the shaft, which meant losing needed tonnage.

The next major supply loss for the potash markets revolved around Belarus's support of Russia in its invasion of Ukraine. Belarus has historically been the third-largest exporter of potash in the world. During normal times/relations, due to being landlocked, Belarus would have to ship their potash through neighboring countries to reach the sea and hit the global market. Given their support of Russia, it was no longer viable to ship potash south…through Ukraine. Lithuania, which sits to the north, banned the flow of all Belarus materials through its territory in February as retribution for its support of Russia. Because of their Russian ties and the resulting fallout, the world lost approximately 20% of its yearly exports.

Since late March/early April 2022, potash values worldwide have been falling. A combination of increasing production rates and lower-than-expected demand have allowed price ideas to dip and continue to do so today. As we look ahead, with ramped-up production expected in Canada, new mines being opened in Russia, and eventually Belarus finding an export option, global potash markets should become oversupplied and, with it, lower values.

Canadian Potash Outlook

We continue to expect a more than adequately supplied potash market in the years ahead. Canadian producers have committed to expanding their operations to make up for lost production at Esterhazy and take advantage of higher-priced potash markets. We continue to expect announced Russian mines/production to come online, which will push them as a larger supplier of exports to world demand. Lastly, while Belarus is currently struggling with few export options as the routes north and south have banned them, we expect that they and Russia will partner to build infrastructure that will allow them to ship product east and out to sea via Russian ports.

While the timelines are a bit fuzzy, as is typical with these types of situations, when these projects come to fruition, the added global supply should be enough to outpace global demand growth. More supplies than demand typically mean lower prices for Canadian farmers. Out of all the major fertilizer markets, potash is the only one that we can confidently say that better values are ahead!

Canadian Strategies

While this is far from a comprehensive and exhaustive study of all strategies that the Canadian government could use to help ensure adequate fertilizer supplies and as a result, more reliable food production, this section should shed light on higher-level topics.

Today's world continues to be filled with danger and uncertainty. We can no longer proceed while assuming everything will work out for the best. Rather, we should take steps to prepare for an uncertain tomorrow. At worst, if these strategies are adopted, and global supplies return to normal, Canadian farmers will be more competitive than before. At best, Canadian farmers will be at a maximum advantage to feed the country and the world.

Short Term Strategies

(Present to 2-year approach)

Build Relationships with Key Fertilizer-Producing Countries Around the Globe

In today's world, countries such as Russia are being seen building relationships and playing politics with their fertilizer exports. Countries such as Brazil and India, lured by adequate supplies and discounted prices, have stepped forward to purchase from Russian producers. Relationships between these countries have grown stronger with this approach.

The Canadian government could look to establish stronger relationships with other key fertilizer-producing and exporting countries around the world. There are relationships that can be built upon that also respects Canada's Most Favoured Nations list.

Urea - Middle Eastern Countries

Middle Eastern region countries are widely seen as some of the world's lowest-cost nitrogen fertilizer producers due to their ample and cheap natural gas reserves from their oil production.

Four out of the top ten urea exporters in the world reside in this region and each are a part of the Canadian Most Favoured Nations list: Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

The global urea export market annually totals approximately 55Mmt. These four nations alone accounted for just over 17Mmt or approximately 31% of all urea traded worldwide.

Global Urea Exporters		
2021 Rank	**Country**	**2021 Exports (MT)**
1	Russia	6,999,814
2	Oman	5,781,518
3	Qatar	5,327,710
4	China	5,299,064
5	Egypt	4,608,777
6	Saudi Arabia	3,952,570
7	Algeria	3,117,788
8	United Arab Emirates	2,075,205
9	Indonesia	2,034,592
10	Malaysia	1,824,535

Phosphates - Saudi Arabia and Morocco

In the last decade, Saudi Arabia quickly became one of the top global phosphate exporters and closed 2021 at number three on the list. They also remained the only country in the top four that was not subjected to some form of U.S. restrictions. Chinese-produced phosphates had tariffs imposed back in 2018, while Russian and Moroccan-produced phosphates were named and later approved in Mosaic's countervailing duty case filed in June 2020.

Saudi Arabian product continues to flow freely to North America, and given Mosaic's 25% ownership in the plant, it isn't likely that these tons will be restricted in the short term.

Morocco is the world's second-leading phosphate exporter, and their volumes continue to climb. Morocco has tremendous amounts of phosphate reserves and a government that is more than happy to allow production and export in exchange for added revenue. We continue to see Morocco leading the way as the Chinese government looks to restrict phosphate export flows and would be a strong phosphate partner in the years to come.

Global Phosphate Exporters		
2021 Rank	**Country**	**2021 Exports (MT)**
1	China	10,042,280
2	Morocco	6,960,451
3	Saudi Arabia	4,122,892
4	Russia	4,048,082
5	United States	2,557,114
6	Jordan	792,114
7	Australia	482,503
8	Mexico	328,525

Canada remains the largest producing country of potash in the world, so little attention needs to be given to those supplies. However, as will be stated in the coming pages, domestic logistical upgrades could ensure easier movement and access for Canadian farmers.

Ultimately, Canadian political leaders can make large strides quickly by building relationships with these key fertilizer export players. As food supplies and production continue to be at the forefront of the world's minds, this step could alleviate a lot of future pain.

Assess the Possibility of Emergency/Strategic Reserves

In a perfect, free market world, market fundamentals ensure that adequate supplies will be available to those in most need. Government interventions, some of which were forced due to Covid-19, have not allowed free market fundamentals to work in the last couple years.

In the fall of 2021, the Chinese government, sensing global supply tightness and the corresponding price rally, took steps to ban the export of nitrogen and phosphate fertilizers. This government intervention was followed by the Russian government putting into place export caps. Exports were allowed to a point at which exports would cease, and the government would determine if further exports would restrict Russian farmers' access to supplies and decisions made. Quickly, other fertilizer export countries followed suit.

Free markets quickly became not-so-free.

During these uncertain times, the Canadian government could consider an emergency or strategic reserve. Many factors would need to be determined, of course:

- Size of the reserves
- Location of said reserves
- The process by which these reserves are to be tapped
- If they are tapped, how are they distributed
- How to ensure that the fertilizers are refreshed to keep product from breaking down

These and many more questions would need to be considered, but like many nations' strategic oil reserves, these could be kept as a fallback option if further government restrictions are put into place, which would make finding adequate and timely supplies more difficult than normal.

Study Canadian Supply Chain Logistical Concerns

Canadian fertilizer flows mostly north-south while east-west moves are largely limited compared to the scale of the marketplace. To date, these moves have never been in question as the U.S. provided a large portion of fertilizer needs by allowing free global trade flows to support and fill the system.

Unfortunately, in recent years, restrictions on free trade have reduced the number of global fertilizer producers that can import to North America to create competition with domestic producers. Organizations in the U.S. successfully implemented duties against some countries, which ultimately restricts competition necessary for a competitive supply market.

The Canadian government should consider addressing potential supply chain logistical concerns to bypass some current and possibly future hiccups. This can come in many forms, including:

- **Assisting in expanding port and inland storage** – this cannot be considered without at least some thought as to how to increase logistical capabilities, but increased logistical capabilities are nothing if there is not enough storage. Many ports and rail unloading facilities throughout Canada have room at their locations to increase storage. At inland facilities, this means more tons can be placed well ahead of the season and used for just-in-time demand. At port facilities, increased storage means taking more ships and moving product throughout the country. While bigger is not always better, bigger can be better and, in this case, could be extremely valuable in having more product on hand when it is needed in season.
- **Assist in increasing offload capabilities at port and inland warehouse facilities** – all bulk commodities are constantly looking for more efficient means to load and unload product. This could be a huge boost for warehouse facilities attempting to service tens of thousands of tons during a very tight seasonal application window. The ability to unload railcars or vessels more quickly and load railcars and trucks more efficiently allows more acres to be covered daily.
- **Research the feasibility of more efficient east-west rail shipments to quicken shipments and lower costs** – Canadian west-east rail shipments are somewhat limited and prove very costly. This is a large reason why so much western Canadian-produced fertilizer flows south into the U.S. while eastern Canada is largely serviced by U.S. tons being shipped north. Looking into ways to increase east-west rail traffic as well as lower cost would help keep Canadian-produced fertilizer in Canada.
- **Relax truck restrictions that would not only move more product but also bring new truckers into the industry** – truckers are the lifeblood of most economies around the world. This rings true in Canada, and it rings especially true regarding Canadian fertilizer movements. For many years, the industry has been losing an enormous number of bulk-load haulers. This is partly due to drivers opting for short routes with companies like Amazon, FedEx, etc., where the driver is home each night. However, strict government regulations on truckers and trucking firms have pushed many drivers into other careers. Considerations should be made to loosen or modify tight government restrictions that keep more from entering the trucking field.

This is a short list of logistical considerations that, if implemented, could provide short-term relief to fertilizer suppliers, retailers and farmers across Canada.

Address the U.N. and Similar Bodies Regarding the Weaponization of Fertilizer Supplies

In recent years, certain countries around the world have begun playing politics with their fertilizer exports. Russia, for example, has used their fertilizer exports to strengthen bonds with India and Brazil, which enjoy guaranteed supply and lower prices. Some have even gone so far as to accuse countries of weaponizing fertilizer supplies with the goal of destabilizing food supplies around the world to advance their own geopolitical agendas.

Officials should consider addressing organizations such as the United Nations on similar topics to discourage these attempts as well as bring attention to this issue.

Remove the 35% Tariff Against Russian Fertilizers

Many nations around the world condemned Russia for its unprecedented invasion and attack on Ukraine. They gave bold speeches against the action and threatened those economic consequences were coming that would include most anything being exported from Russia. However, when most of these nations realized the importance of Russian energy exports (including fertilizer), sanctions fell short of including fertilizers.

However, the Canadian government removed Russia from the Most Favoured Nation status and as a consequence a 35% tariff was placed on all Russian imports, including fertilizer.

Historically, Russia has been one of the larger providers of needed fertilizer imports to Canadian farmers, and with that tariff, a major supply chain was broken.

Removing this tariff would be a step toward normalizing typical efficient fertilizer trade flows, which would help lower input costs for farmers across the country.

Look For Additional Avenues with the U.S. to Improve Fertilizer Trade Flows Between Countries

The relationship between Canada and the U.S. is already solid, with many trade agreements in place. However, like most things, improvements could be made to make a good relationship better.

One avenue to consider is easing restrictions on trucking material across the border. Both countries boast high standards and expectations for truckers. However, differences in regulations can create logjams at border crossings which impede traffic and the ability to move product. By adopting the same standards and making border crossings more efficient and less time-consuming, more material will be able to flow.

Canada could also work with the U.S. to set up more duty-free origins for direct shipments into Canada. Rather than processing tons in the U.S. before reaching Canada, more avenues could be created to ship directly to inland locations which would lower costs and improve shipping efficiencies. Today, even though the Canadian government had no say in Mosaic's counter vailing duty case against Russian and Moroccan-produced phosphate imports, the effect is felt across the country. Without substantial direct access to global producers, Canadian farmers are forced to pay the premium that resulted from the U.S. import ban.

Creating more direct access would reduce the reliance on U.S. political effects.

Assist in Creating Additional Fertilizer Storage Space in Eastern Canada

Mostly due to the large size of farming operations and local domestic production facilities, western Canadian provinces have a slight advantage in ease of access to fertilizer supplies and storage. However, eastern Canadian operations are different. The region is located much farther away from domestically produced fertilizers. Average farming operations are smaller in size, which means storage facilities are also smaller. This puts more pressure on supply chains as the market is more dependent on just-in-time inventories which are riskier and more costly.

Canadian officials could consider options to assist in the creation of added storage space for fertilizers. This additional storage capacity would accomplish a couple of important goals:

- **Reduce the reliance of just-in-time inventories** – just-in-time inventory approaches can work when a season plays out normally, and adequate logistical capacities are in place. However, any hiccup in anything from the weather to equipment can derail the best-laid plans. The stress of just-in-time inventories also typically means higher costs. Moving away from this method could help alleviate a lot of issues.
- **Allow the market to take advantage of "out of season" seasonal lows** – markets can never be called correctly 100% of the time. However, without storage in place, when an opportunity presents itself out of season when producers/suppliers are looking to offload product, they must be passed. By assisting in creating of more fertilizer storage, these opportunities can be seized upon to help increase margins and lower risk.

This could be a short-term solution that helps alleviate price pressure while providing opportunities for retailers and farmers alike to take advantage of out-of-season situations.

Fertilizer Subsidies

The Canadian government could research, consider, and implement a weighted fertilizer subsidy program whose assistance ebbs and flows with farm economics.

This is not to suggest a program which provides subsidies to all farmers all the time, and rather, this would be activated on a “when needed” basis. Countries like Poland have recently implemented similar programs due to the loss of Russian imports and corresponding price rallies in domestic fertilizer prices. Once economic conditions normalize, these programs are designed to be paused until further need arises.

A committee could be created to develop a fertilizer affordability index that looks at the cost of fertilizer and considers grain values. When the ratio thresholds are breached (such as when it costs more than 70 bushels of wheat per 1 ton of urea), the government would provide any number of financial assistance programs. These could include direct payments, low-interest loans to farming operations, deferred payment loans, etc.

Business education programs to target those in the agricultural sector could also be designed, such as programs that help to offer alternative points of view of market opportunities, how to mitigate market volatility, etc.

While subsidizing all farmers all the time should never be the program’s goal, giving help when and where it is needed would be key.

Long Term Strategies

(2 – 5-year approach)

Continue to Work with Railroads to Increase East-West Shipment Capacity

In the short-term strategies section above, we mentioned working with Canadian railroads to increase east/west shipment capacity. Longer term, the government could assist with larger-scope improvements:

- **New technologies to further improve shipment abilities** – railroads already do a phenomenal job optimizing shipment capacities. However, as new technologies (better computer optimization programs, more powerful locomotives to pull larger trains, etc.) become available, assistance could help speed the adoption and improve shipment capabilities.
- **Additional rail lines** – current railways are doing everything they can to maximize shipments using the rail lines at their disposal. Shipments could be increased significantly with the addition of expanded rail. This would be a monumental task that the rail lines may not be able to do themselves on their own. However, with the assistance of the government, improvements and additions could be made which would increase the capacity of east/west movements that could eventually help lower shipment rates.

Open and honest discussions with rail officials would likely lead to much wider topics that could be extremely beneficial for the Canadian agricultural industry and all industries reliant on Canadian railways.

For Canada, rail shipments remain the lifeblood of bulk transit and logistics. All current and future strategies and technologies that could be adapted to increase shipment capacity should be considered to avoid falling behind a growing population.

Focus on Increasing Trucking Capacity

While rail might be the lifeblood of Canadian bulk logistics, trucking capacity will continue to be extremely important in servicing the country.

In the long term, several strategies could be adopted to help increase shipment capacity and build the next generation of truckers.

- **Government assistance programs for training/licensing** –going through training and obtaining a license to operate a semi can be long and expensive. Government programs could be developed to assist newcomers to the field.
- **Government loan programs for starting truckers** – many in Canada must operate under large corporations due to the lack of funding to purchase and operate their own trucks. To help incentivize growth, federal loan programs could be developed focusing on the trucking field.
- **Decreased regulations to allow for longer shipping hours in times of need** – safety is and should be at the forefront of everyone's mind. However, there are times during the year when an increase in hauling capabilities is needed which could be met with short-term decreased regulations (more hours driven per day, for example).

Continued work with leaders in the trucking field would likely help find even more avenues to improve trucking capabilities in the years to come. Canada will always rely on timely and reliable truck deliveries and focusing on this area could yield enormous gains in the future.

Incentivize Existing Canadian Nitrogen Producers to Upgrade NH3

Earlier in this report, we showed that approximately 1M tons of NH3 are exported into the U.S. marketplace annually. At the same time, upgraded nitrogen products such as urea and UAN are imported into Canada.

Rather than continuing this import/export flow, multiple incentives could be proposed to encourage existing nitrogen production facilities to upgrade NH3 into other nitrogen products delivered to Canadian farmers. These debottleneck and upgrade procedures have been discussed by current nitrogen production facilities in the past, but actions have not been taken to proceed.

With various forms of support from the Canadian government and current nitrogen market economics, these ideas may be more feasible than in the past. If acted upon, more Canadian-produced NH3 would remain in the country to be upgraded to other nitrogen products, reducing the need for imports.

This simple step/support could make Canada become more self-sufficient and less reliant upon a more risky and volatile global nitrogen marketplace.

Support/Invest in New Greenfield Domestic Nitrogen Production

As mentioned earlier in this report, Canada remains a country with substantial natural gas reserves at its disposal. Access ease to these supplies puts Canada in a strong position to increase the amount of nitrogen production, placing farmers in a more competitive position than the global market.

In terms of locations, we would suggest looking at Canada as two regions:

- **Western Canada** – this region's proximity to west coast ocean ports (export possibilities), large farming operations (significant domestic demand), and location to target northwestern U.S. territories equate to a solid location for additional large-scale production increases in western Canada. This could be accomplished either by brownfield expansions (additional production capabilities at existing nitrogen production plants) or greenfield expansions (brand new nitrogen production facilities) which would increase available supplies and theoretically increase production if built by a business newcomer.
- **Eastern Canada** – throughout the history of nitrogen production, larger production plants equated to more efficient production economics (i.e., lower production cost). However, given the size of the plant, the quantity of product produced which must be sold and transported, and the enormous capital expenditure, it becomes a very difficult barrier to entry. In recent years, new technologies, including green approaches, have helped to make smaller-scale plants more viable and competitive. Eastern Canada boasts smaller farm operations which would be a perfect fit for smaller-scale plants. Financial support and research into these facilities could allow investments to be made, creating more supplies, further competition, and lower values for farmers.

While direct Canadian government investments in these facilities are generally frowned upon, steps could be taken to help speed the process:

- **Loan guarantees for greenfield production plants** – as mentioned above, one of the largest barriers to entry for nitrogen production remains sufficient cash flows. To help expand production and increase competition in the sector, loan guarantees could be offered to approved projects that fit the guidelines.
- **Direct grants to speed process** – rather than flow grants and loans through banking and financial institutions, which typically slow the process, provide direct grants to approved companies to help speed the process of projection completion.
- **Federal/provincial tax breaks** – another incentive the federal and provincial governments could offer is tax breaks for greenfield projects.
- **Streamlined permitting processes** – rather than a lengthy legal process to obtain permit approvals for expanded or new production facilities, steps could be taken to streamline the process, which would help quicken the completion date of the facility.
- **Remove barriers to entry** – today, like many countries around the world, there are government barriers. Research could be done to find ways to make the process more efficient and remove unnecessary barriers.

Ultimately, many more steps could be made to help increase nitrogen production in Canada, which would alleviate the high cost of one of the most important inputs for farmers.

Explore Domestic/Global Phosphate Production Investments

A significant long-term strategy discussed above is increasing the amount of nitrogen fertilizer production within Canada to take advantage of adequate domestic natural gas reserves. This strategy would help reduce the Canadian agriculture market's reliance on imports to meet yearly demand.

Unfortunately, to increase domestic phosphate production, adequate phosphate rock reserves must be located and deemed sufficient to support the decades-long production of finished phosphate fertilizers.

Rather than waiting and hoping that exploratory measures stumble upon large domestic phosphate rock reserves, Canadian officials can, directly or indirectly, through financial support to Canadian companies, invest in new global production to secure guaranteed supplies. An example is how Mosaic (Tampa, FL based) took a 25% ownership layer in phosphate producer Maaden which is based in Saudi Arabia.

Promising research throughout multiple African regions points to new phosphate reserves being located. Once confirmed, given the current high-priced phosphate markets, it is likely that companies will be formed to start mining phosphate rock and upgrading it to finished phosphate products. Canadian investments in these facilities could be negotiated with guaranteed phosphate supply shipments to Canadian customers/regions/etc.

A tremendous amount of research would need to be done to ascertain which regions and companies are trustworthy partners for the decades-long life of the facilities. However, with proper research and investments, guaranteed supply contracts could help reduce Canada's reliance on imported products.

Increase West Coast Import Capacity

Increasing fertilizer import capability capacity, which connects Canadian fertilizer users directly to world markets, could help lower input costs and improve direct relations with major global production regions.

One way to approach this strategy would be to increase the ability to import product via west coast ports. Several aspects would need to be considered:

- **Increased port storage** – while bulk vessels come in various storage sizes, most vessels transporting fertilizer typically fall in the 30,000 – 50,000-ton range. These ships typically charge large daily demurrage rates if not unloaded within 48 hours of arrival. When a port struggles to offload, these costs can quickly add up. This means adequate storage is necessary so that docks are not waiting on trucks or rail to move enough product to make the shipment fit. Increasing the amount of storage would allow some leniency when vessels arrive and allow for more reliable unload schedules.
- **Increase offload capabilities** – for most ports, speed and efficiencies are the keys to a successful operation. The faster a vessel can be received, offloaded, and released; the more ship turns the facility can make. Increases in offload capabilities come at a cost which the facilities may not be able to justify without assistance.
- **Improve and increase logistical capabilities** – increasing storage and unloading capabilities mean nothing if logistics cannot move the product. Western port improvements cannot be made without considering improving rail and truck capabilities in the long term.

It is possible that these longer-term improvements to port facilities would also help increase export capabilities for grains. Regardless, these improvements would help connect Canadian farmers to global markets more directly.

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