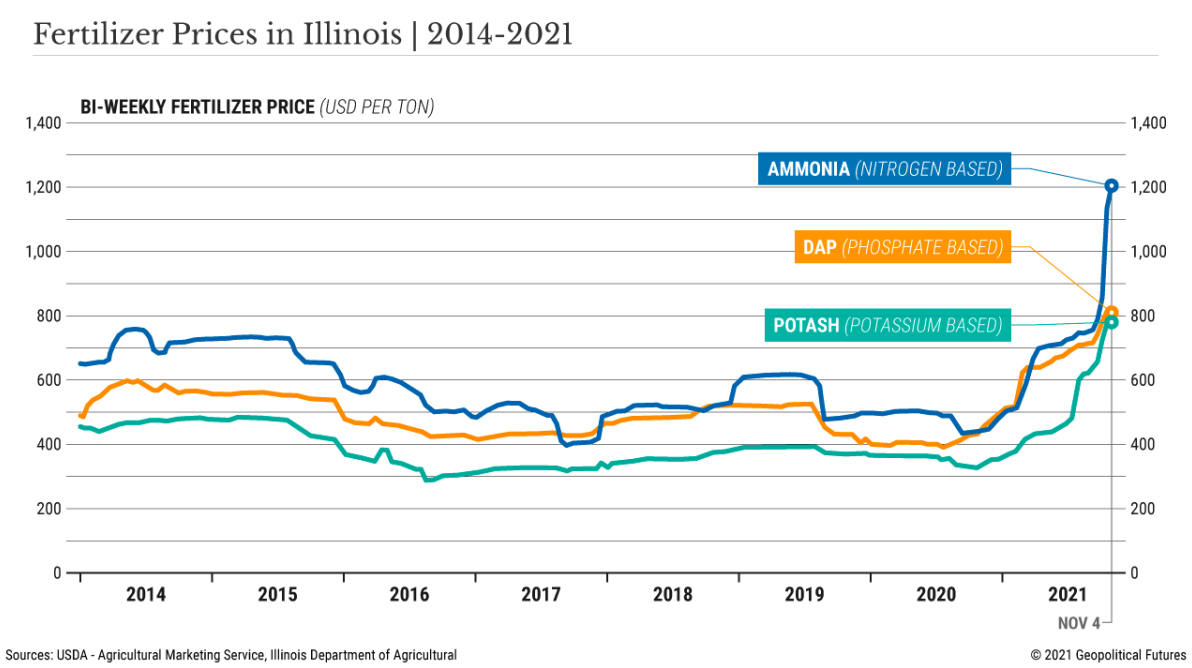
Fertilizers and Food Insecurity

by Allison Fedirka - November 16, 2021

Next week is Thanksgiving, a U.S. holiday that celebrates, and is celebrated with, food. This year, however, Americans are reckoning with rising food prices. The news abounds with stories of long lines at food banks, poultry shortages and more-expensive-than-anticipated dairy products. High energy costs and transportation disruptions are fairly well documented too. Less attention has been given to the rising price of fertilizers, a critical input to food supply that threatens to keep food prices high well through 2022.

High fertilizer prices (not to mention potential shortages) are concerning for a few reasons. For one, fertilizer is ubiquitous; half the world's food crops are grown with mineral fertilizers. For another, supply is extremely time-sensitive. Crops generally benefit more from fertilizer treatments in the early phases of the planting season and their initial growth period. Delayed or missed application during the cycle will almost certainly result in lower yields, which tightens food supply and drives prices up. Length of time is also a factor. For many grains and oilseeds, the time from planting season to harvest can last four to six months, after which the soil needs time to recover or be prepared for the next round of crops. All told, it can take months to have another opportunity to replenish food crops. This also means that recovery time for any imbalances in the supply and demand of fertilizers takes a minimum of two to three years to even out.



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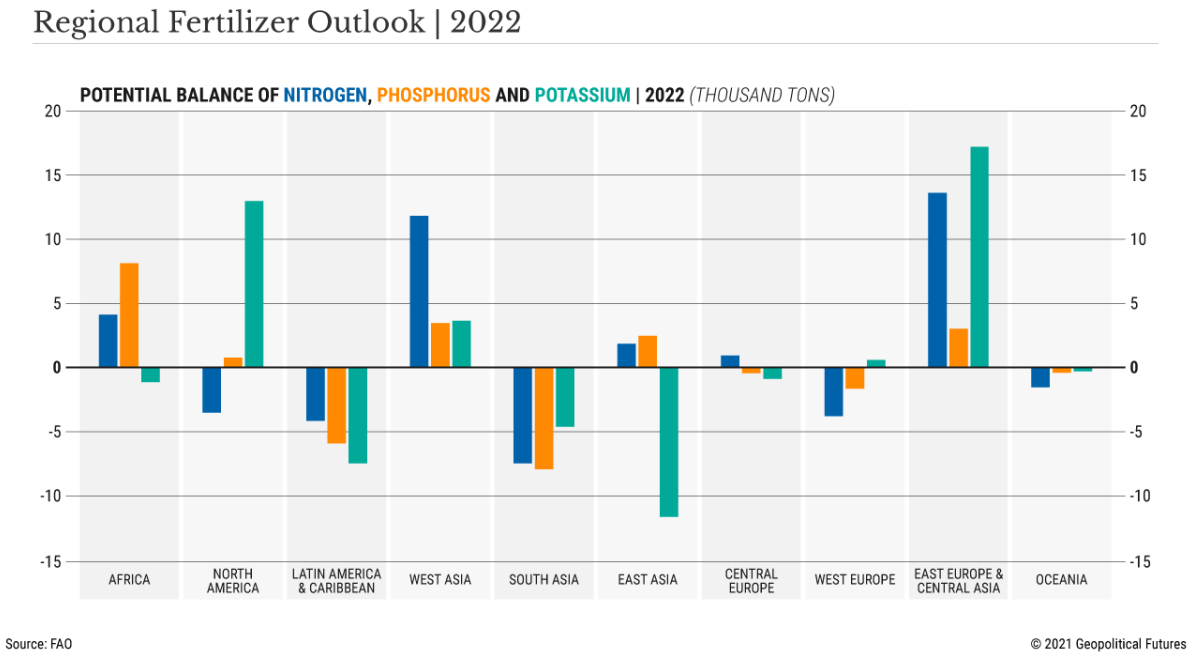
How much fertilizer prices affect food prices depends on a few variables. First, the amount of fertilizer needed depends on the crop. Some grains like corn cost more per acre to fertilize than wheat or oilseeds like soybeans. The second is the type of fertilizer being used. Fertilizers can be broken down into three general categories based on a plant's macronutrient needs – nitrogen, phosphate and potassium. Global fertilizer used during the 2020-21 season totaled 198.2 metric tons; nitrogen accounted for approximately 55 percent, while phosphate and potassium accounted for 25 percent and 20 percent, respectively. Of these, nitrogen is the most critical. Its price tends to be more volatile because of its direct link to natural gas prices and is an all but unavoidable cost for farmers. A new batch of nitrogen fertilizer must be applied at the start of each crop season since it doesn't linger in the soil. Phosphate and potassium prices, however, move independently of other commodities like natural gas. Farmers also have greater flexibility when using these two fertilizer types because unused portions of these macronutrients can remain in the soil from season to season.

Fertilizer markets entered this year in a tight position that has grown only tighter. In 2019, the Food and Agriculture Organization published a report detailing the outlook of fertilizer supply and demand through 2022. According to its estimates, total global supply would be marginally above demand, and shortages would occur in select regions. These estimates, however, did not account for "unforeseeable factors" such as logistical problems or a pandemic. One immediate consequence in

2020, the first year of the COVID-19 pandemic, was the reduction of fertilizer inventories and pipelines. Fertilizer-producing factories shut down to contain the virus and then struggled to resume full capacity due to other shortages and logistical challenges. Farmers, propped up by emergency government measures, continued to produce and, therefore, demand fertilizer.



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This year, the trickle-down effects of supply chain problems and recovering demand put upward pressure on fertilizer prices. Trade wars, congested ports, unavailable input chemicals and high freight costs made fertilizer harder to produce and deliver. Meanwhile, other factors lowered fertilizer production. Nitrogen fertilizer production in the Mississippi Delta, for example, was temporarily offline because of a hurricane. Chinese production was interrupted in 2021 due to rolling electrical outages at factories. When China's economy started to kick back into gear, it caused a spike in its energy consumption that in concert with some other things led to higher natural gas prices. The ensuing operation costs were so high that some European fertilizer plants temporarily closed down. Given that the plants in the Northern Hemisphere are entering the winter season and energy consumption will remain high, it's unlikely natural gas prices – and therefore nitrogen fertilizer prices – will recover before spring planting season.

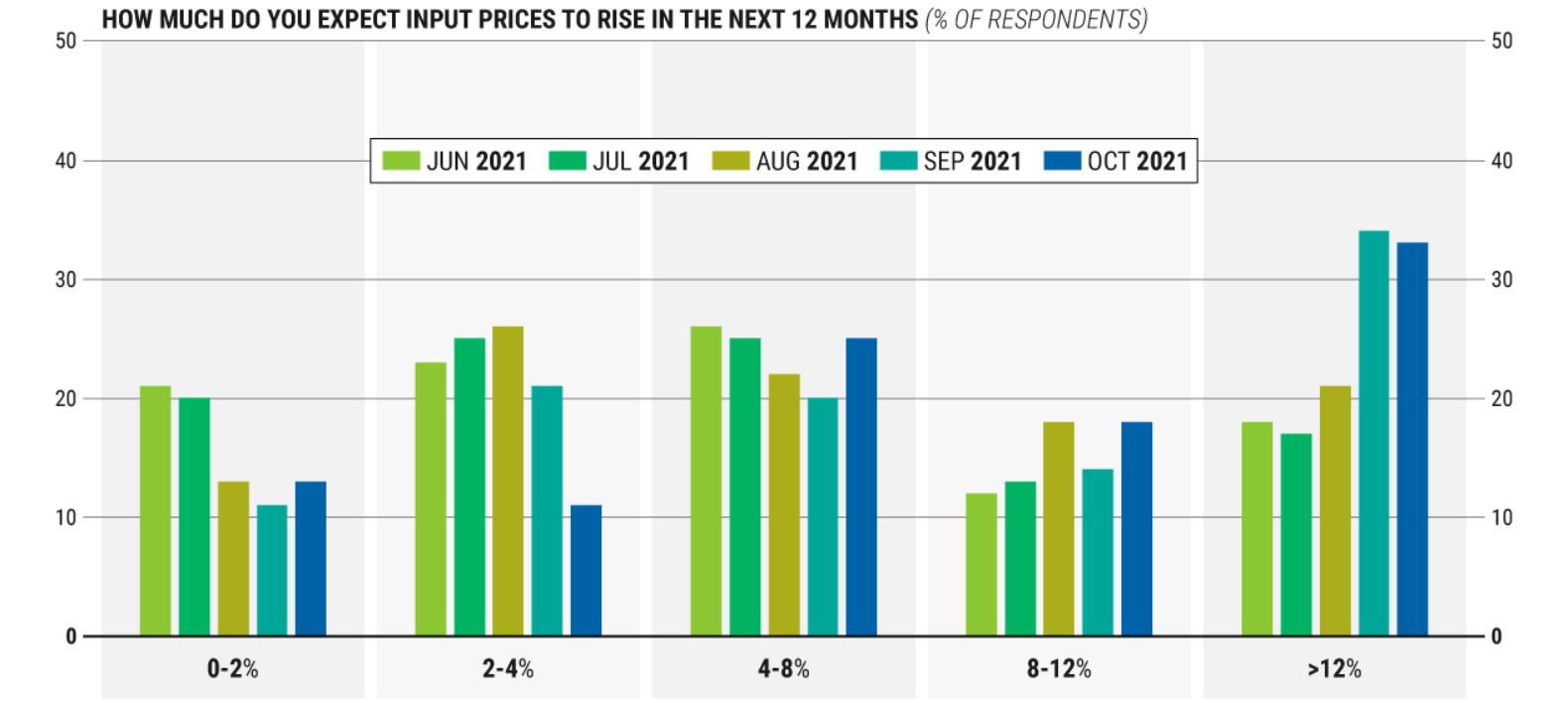
Government intervention has also played a role. Russia (the second-largest exporter of nitrogen fertilizer and third-largest exporter of potassium fertilizer) and China (the world's leading exporter of

nitrogen and phosphate fertilizers) both announced measures to ban or restrict fertilizer exports through June 2022 – well past the spring planting season. EU sanctions on Belarus, the second-largest potash exporter, are also expected to reduce supply. Decreased availability on the export market will cause the price of all fertilizers, no matter the source, to go up as companies and countries bid against one another for what remains on the market.

This is certainly true in the United States, which doesn't rely on Russia and China for its fertilizers but is one of the world's leading producers and consumers of ammonia. Natural gas discoveries in the U.S. made it economical for companies to upgrade existing ammonia plants and construct new nitrogen facilities. This has cut down the country's net import reliance on nitrogen-ammonia as a percentage of apparent consumption from 27 percent in 2016 to only 10 percent in 2020, according to calculations made by the U.S. Geological Survey. The U.S. has a similar net import reliance percent with phosphate rock. Five companies in the U.S. mined phosphate rock ore at 10 different locations and processed an estimated 24 million tons of marketable product. Nearly all of this was used to manufacture phosphoric acids needed for fertilizers, animal feed supplements and pesticides. The U.S. imports about 90 percent of its potash and potassium supplies, however, most of which come from Canada.

U.S. farmers, then, have few good options ahead of the spring planting season. Not having enough fertilizer, or simply not being able to afford what they need, will force them to determine how much area to cultivate and which crops to plant. With nitrogen fertilizer, farmers can either use less fertilizer over the same surface area or reduce the surface area of planted crops and keep the amount of fertilizer at fuller levels. Both options would result in lower yields, though the quality of the crop would likely fare better in the second scenario. Those with residual levels of potassium and phosphate in their soil may reduce or forego purchases for a single season.

Farm Input Price Expectations



Sources: Purdue University, Ag Economy Barameter

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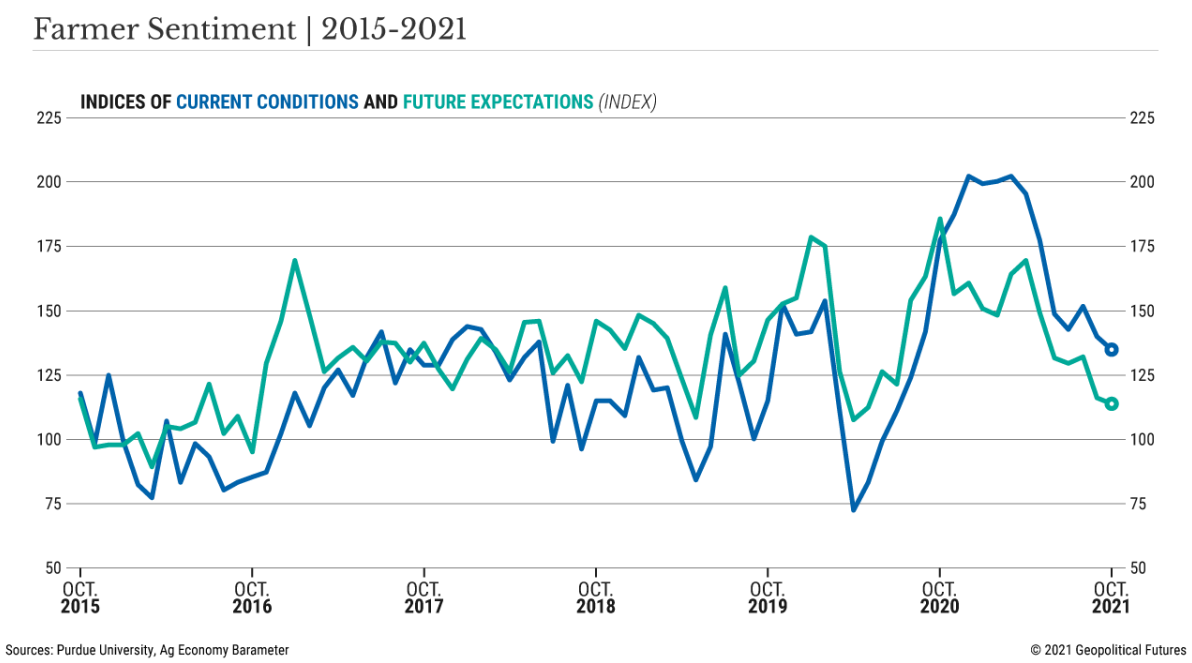
And yet the time to decide is fast approaching. Fertilizer retailers already warned farmers to test their soil early and plan for earlier fertilizer purchases since prices are so volatile. While sales have started to accelerate, it's unclear just how many farmers have started buying now. The prevailing sense among industry experts is that farmers will move up their purchases in the face of tighter supplies, continued logistic delays and sheer necessity. This raises the risk of bidding wars and hoarding among buyers, which only further drives up prices.

U.S. farmers appear pessimistic. Agricultural producer sentiment has started to decline in recent months. The sentiment for future conditions is now nearly as low as it was in the peak economic closure of the 2020 pandemic. Farmers have expressed concern over high input costs – i.e., fertilizer prices – weakening their operating margins. They have also indicated that they do not anticipate much relief in input prices in the year ahead.



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In addition to fertilizer costs, U.S. farmers have also identified additional domestic factors that will hurt production. Labor shortages, for example, persist in all points of the food supply chain. In particular, farmers have expressed concern over the shortage of federal food examiners whose seal of approval is needed for imports, exports and factory sales. Bottlenecks still exist at ports (the shortage of barges on the Mississippi River is the most concerning). There's also concern around the declining availability of pesticides like glyphosate and shortages of farming equipment. New farm equipment is at very low inventory, but more concerning is the growing scarcity of spare parts that have delayed machine repairs by months. Mechanical failure during harvest time is catastrophic for a farmer, so many are purchasing parts in advance for safekeeping.

Like all governments, Washington is sensitive to food insecurity but is constrained in how it can forestall them. It can't unilaterally fix global supply chain issues overnight, and it can't magically fix crop schedules, which do not align with government schedules. The solutions needed to address agriculture problems go beyond what's necessary to mitigate the impact on next season's crops.

The U.S. has adopted a two-track strategy to address the underlying causes of rising food prices. The first track addresses the big-picture issues that affect the entire U.S. economy – things like port delays, labor shortages, etc. The second track aims to address agriculture-specific needs in the short term, mainly through financing and funding for farmers, even as it continues to pump money into other areas of the agriculture industry. In June, the USDA announced $4 billion of planned

investments to strengthen the food system. Of this, $1 billion was allocated to support and expand emergency food assistance networks. The latest infrastructure bill also provides some direct debt relief to economically distressed farmers, though it focuses more on long-term investments for revitalizing rural communities. This strategy means much of the input costs will continue to be passed down to farmers, which will translate into higher food prices for consumers. Government funding will be used to prevent the farmers from going under and will provide assistance to those who get outpriced. It's a short-term solution with potentially high political costs.

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