



**Hamm Institute
for American Energy**

OKLAHOMA STATE UNIVERSITY

The Strategic Role of Fertilizer in US Economic Security: Future Scenarios, Risks, and Policy Opportunities

September 2026

Robert J. Johnston, Hamm Institute Fellow and Director, Energy and Natural Resources, University of Calgary School of Public Policy & Kruthika Anastasia Bala, Principal, Resources Now



Hamm Institute for American Energy

OKLAHOMA STATE UNIVERSITY

OUR MISSION

Energy security for America and our allies.

CONTACT US



Hamminstitute.org



info@hamminstitute.org



300 NE 9th St, Oklahoma City



Table of Contents

Introduction.....	1
Background: Fertilizer Production and the Evolution of US Policy	2
Part A: The Structural Realities of US Fertilizer Exposure	3
Nitrogen: Domestic Production and Global Energy Exposure	3
Phosphate: Sulfur, Processing, and Concentrated Supply.....	6
Potash: Strategic Dependence and the Limits of Import Ratios	9
Bulk Logistics: When Transportation Becomes Supply	11
The Role and Limits of Strategic Stockpiling	13
Part B: The 2026 Crisis and the Limits of Emergency Intervention	16
How Commercial Markets Adjusted	19
Federal Intervention: Trade Access, Distribution Flexibility, and Future Capacity.....	22
Findings from the 2026 Stress Test	25
Part C: Future Scenarios, Risks, and Strategic Opportunities	26
Scenario 1: Prolonged Hormuz Disruption.....	27
Scenario 2: A Tighter US Natural Gas Balance	29
Scenario 3: Cross-Sector Competition for Sulfur and Phosphate Processing	30
Scenario 4: Compound Domestic Fertilizer Logistics Disruptions.....	32
Strategic Opportunities	33
Opportunity 1: From Critical-Mineral Designation to Operating Capacity	34
Opportunity 2: Securing Critical Fertilizer Corridors.....	35
Opportunity 3: Preserving Multiple Supply Options	36
Opportunity 4: Expanding Strategic Industries Without Creating New Input Bottlenecks	36
Opportunity 5: Improving Fertilizer Use Efficiency.....	37
Conclusion	38
Limitations	39
Author Bios	40

Introduction

The 2026 conflict in the Persian Gulf exposed a vulnerability in the global fertilizer system with direct implications for United States (US) and global agriculture. Before the conflict, about one-third of globally traded urea, a major nitrogen fertilizer, and nearly half of seaborne sulfur moved through the Strait of Hormuz. Sulfur is used to produce sulfuric acid and is a key input in phosphate fertilizer production. The near closure of the waterway sharply reduced both those flows. World Trade Organization (WTO) data show fertilizer-related shipments through the Strait falling close to zero after fighting began, while international urea prices more than doubled before retreating as prospects for restored shipping improved.^{1 2} Simultaneously, China tightened controls on most fertilizer exports and increased customs inspections to enforce those restrictions.³ A regional security crisis therefore affected nitrogen fertilizer supply, sulfur availability for phosphate production, alternative sources of global supply, and the prices facing agricultural producers far beyond the Gulf. For the US fertilizer system, the broader vulnerability was that several of the mechanisms through which fertilizer markets normally adjust to disruption were constrained at the same time.

The crisis occurred as fertilizer was already becoming more critical for the US economic security agenda. The conditions governing fertilizer availability connect agriculture with energy, mineral supply, industrial processing, trade policy, and bulk transportation. Nitrogen production depends heavily on natural gas. Phosphate fertilizer requires sulfur and chemical processing in addition to phosphate rock. Potash supply is highly concentrated outside the US. All three depend on transportation systems capable of moving large volumes at relatively low cost.

Federal policy has increasingly recognized parts of this wider system. Since 2025, the administration has placed greater emphasis on domestic energy and mineral production and on the processing capacity associated with critical materials.⁴ Phosphate and potash were added to the 2025 US Critical Minerals List. In 2026⁵, the United States Department of Agriculture (USDA) launched the \$500 million Fertilizer Investment and Expansion for Long-term Domestic Supply (FIELDS) program to support additional domestic fertilizer manufacturing capacity and associated infrastructure.⁶ Federal responsibility nevertheless remains distributed across agriculture, energy, trade, minerals, transportation, and industrial policy rather than organized around fertilizer as a single strategic supply system.

Fertilizer security depends on the reliability of the full supply system. Three distinctions shape the analysis. First, policy can improve access to existing supply much faster than it can expand the underlying supply base. Second, market reallocation can preserve continuity during a short disruption, but it cannot substitute for missing production, critical industrial inputs, or transportation capacity when disruption persists. Third, aggregate import dependence is an incomplete measure of

¹ <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

² https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

³ <https://www.reuters.com/world/asia-pacific/china-tightens-border-inspections-fertilizer-exports-sources-say-2026-04-28/>

⁴ <https://www.whitehouse.gov/presidential-actions/2025/01/unleashing-american-energy/>

⁵ <https://www.usgs.gov/news/science-snippet/interior-department-releases-final-2025-list-critical-minerals>

⁶ <https://www.rd.usda.gov/programs-services/business-programs/fertilizer-investment-expansion-long-term-domestic-supply>

exposure: product-level reliance, supplier concentration, upstream input dependencies, and logistics can create vulnerabilities that national nutrient balances do not reveal. Domestic production remains important, but its strategic value depends on access to competitively priced energy and industrial inputs, sufficient processing capacity, secure external suppliers where imports remain necessary, and transportation networks able to move bulk nutrients to agricultural markets.

In 2026, the US fertilizer system has demonstrated an ability to adjust to severe disruption through prices, trade, inventories, rerouting, and targeted emergency measures, but principally by reallocating supply and capacity that already exist. That adjustment becomes more difficult when disruption persists, constrains critical inputs, or requires productive and transportation capacity that cannot be expanded within an agricultural season. The sources of exposure also differ across nitrogen, phosphate, and potash, limiting the value of any single measure such as domestic production or import dependence.

We examine those differences in three stages. Part A identifies the structural sources of US fertilizer exposure, including energy, industrial inputs, supplier concentration, transportation, and inventories. Part B uses the 2026 crisis to assess how commercial markets and federal policy responded when several of those pressures occurred together. Part C examines how these vulnerabilities could develop under prolonged geopolitical disruption, a tighter US natural gas balance, cross-sector competition for sulfur and phosphate processing, and compound domestic logistics disruption, before considering where US policy can strengthen productive capacity, supply options, logistics, and the industrial inputs supporting fertilizer production planning.

Background: Fertilizer Production and the Evolution of US Policy

The three primary fertilizer nutrients follow different production pathways. These different pathways create different exposures to energy, industrial inputs, mineral resources, foreign suppliers, and transportation.

- Nitrogen fertilizer is produced through ammonia, conventionally using natural gas as both a feedstock and energy source; ammonia is then used directly or converted into products such as urea.
- Phosphate production begins with phosphate rock, which is processed using sulfuric acid to produce phosphoric acid and then converted into finished phosphate fertilizers, often with ammonia.
- Potash supplies potassium and is produced principally through mining and processing mineral deposits.

Russia's invasion of Ukraine intensified fertilizer and energy price pressures that had already developed during the pandemic. Trade restrictions, sanctions, transportation interruptions, and uncertainty over Black Sea access affected fertilizer markets even where productive capacity remained physically available. USDA noted that the invasion contributed to further trade restrictions and additional transportation disruption, while subsequent easing of restrictions and the partial reopening of trade routes helped markets adjust.⁷ The episode demonstrated the capacity of

⁷ <https://www.ers.usda.gov/amber-waves/2023/september/global-fertilizer-market-challenged-by-russia-s-invasion-of-ukraine>

international markets to redirect supply, but it also showed how quickly fertilizer availability and prices could become exposed to geopolitical decisions, energy costs, finance, and transportation conditions outside the agricultural sector. The US response began to shift accordingly. In 2022, USDA established the Fertilizer Production Expansion Program to increase domestic capacity and competition, showing that federal policy had already begun moving beyond management of farm-level price effects toward the structure of fertilizer supply.⁸

The 2026 crisis subjected that evolving approach to a more demanding test. The Hormuz disruption constrained internationally traded urea and sulfur at the same time that Chinese export controls reduced an important source of replacement fertilizer supply. Sulfur is an industrial input largely produced through oil refining and natural gas processing, with supply disruptions that not only impacted phosphate fertilizer production but also mineral-processing industries. Commercial markets responded through higher prices, alternative sourcing, redirected trade, and inventory adjustment, but replacement supply still depended on available production and transportation capacity. Washington also intervened more directly. On June 29, the President declared an emergency and temporarily suspended specified duties on Moroccan phosphate fertilizer, citing persistent threats to global fertilizer supply and the need to diversify foreign sources.⁹ Days later, USDA opened FIELDS to support additional domestic fertilizer process-manufacturing capacity.¹⁰

Part A: The Structural Realities of US Fertilizer Exposure

Nitrogen: Domestic Production and Global Energy Exposure

The US has a large national nitrogen fertilizer production base. Domestic nitrogen production increased substantially over the past two decades as the expansion of US shale gas production improved access to relatively low-cost natural gas, the principal feedstock and energy input for conventional ammonia manufacturing. USDA estimates that domestic production supplied about 89% of aggregate US nitrogen fertilizer demand in 2022, up from 63% in 2006, implying net import dependence of roughly 11% at the aggregate level. Over the same period, US nitrogen fertilizer production increased by 67.5%.¹¹ These gains reduced US dependence on imported nitrogen and strengthened the country's ability to meet agricultural demand from domestic production.

The 89% figure should be read as a measure of aggregate supply exposure rather than as a measure of complete self-sufficiency. USDA calculates it across several nitrogen products, including ammonia, ammonium nitrate, ammonium sulfate, calcium ammonium nitrate, and urea.¹² Production and trade conditions differ among these products, and imports continue to supplement domestic supply. The policy significance of the figure lies in the scale of the US production base: the US enters a global fertilizer disruption from a materially stronger physical position than a country that

⁸ <https://www.usda.gov/about-usda/news/press-releases/2022/09/27/biden-harris-administration-makes-500-million-available-increase-innovative-american-made-fertilizer>

⁹ <https://www.whitehouse.gov/presidential-actions/2026/06/declaration-of-emergency-and-authorization-for-temporary-duty-free-importation-of-phosphate-fertilizer-morocco/>

¹⁰ <https://www.rd.usda.gov/programs-services/business-programs/fertilizer-investment-expansion-long-term-domestic-supply>

¹¹ <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>

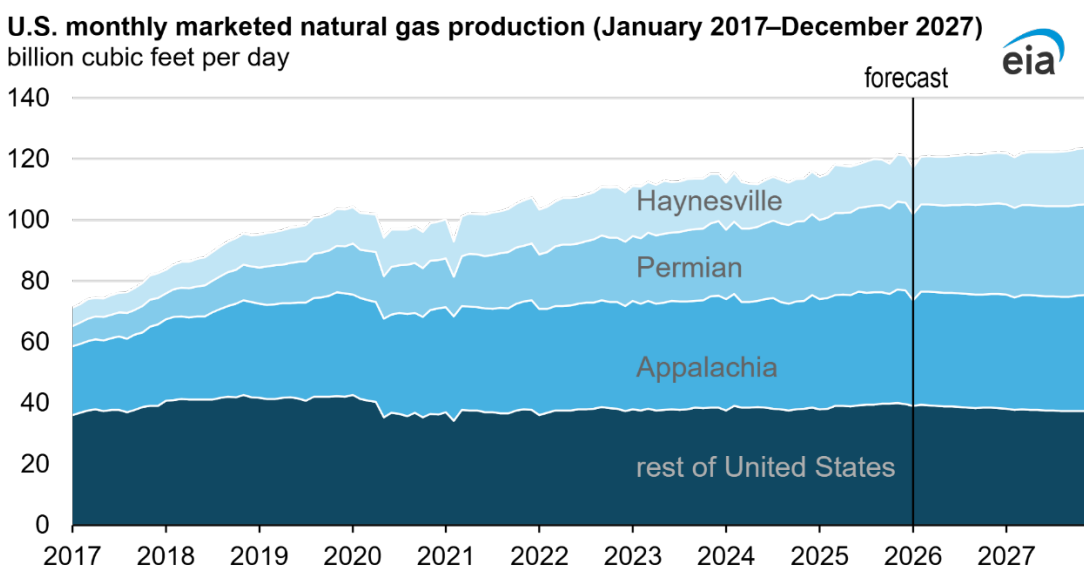
¹² <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>

depends principally on imported nitrogen. That strength does not remove the commercial links connecting US fertilizer markets to international supply.

Natural gas is the principal source of that strength and one of its main sources of exposure. Conventional nitrogen production begins with ammonia, and natural gas supplies both the hydrogen and much of the energy required for the production process. The expansion of US gas production during the shale era improved the economics of domestic ammonia production and supported investment in additional fertilizer capacity. The historical relationship also runs in the opposite direction. USDA notes that high US natural gas prices between 2000 and 2006 contributed to declining ammonia capacity and rising imports. Ammonia production capacity fell by 35% over that period, while ammonia imports increased sharply. The subsequent increase in domestic gas availability helped reverse part of that earlier loss of competitiveness.¹³

US nitrogen security therefore remains closely connected to conditions in the domestic gas market. The US currently has a large and growing gas production base. EIA expects US natural gas production to reach record levels in 2026 and rise again in 2027 (Chart 1), providing a strong resource foundation for domestic fertilizer manufacturing.¹⁴ At the same time, the uses competing for US gas are expanding. LNG exports are increasing as new liquefaction capacity enters service, while electricity generation and industrial consumption remain major sources of domestic demand. EIA expects LNG exports to grow by about 9% in 2026 and 11% in 2027 (Chart 2) under its current short-term outlook.¹⁵

Chart 1:



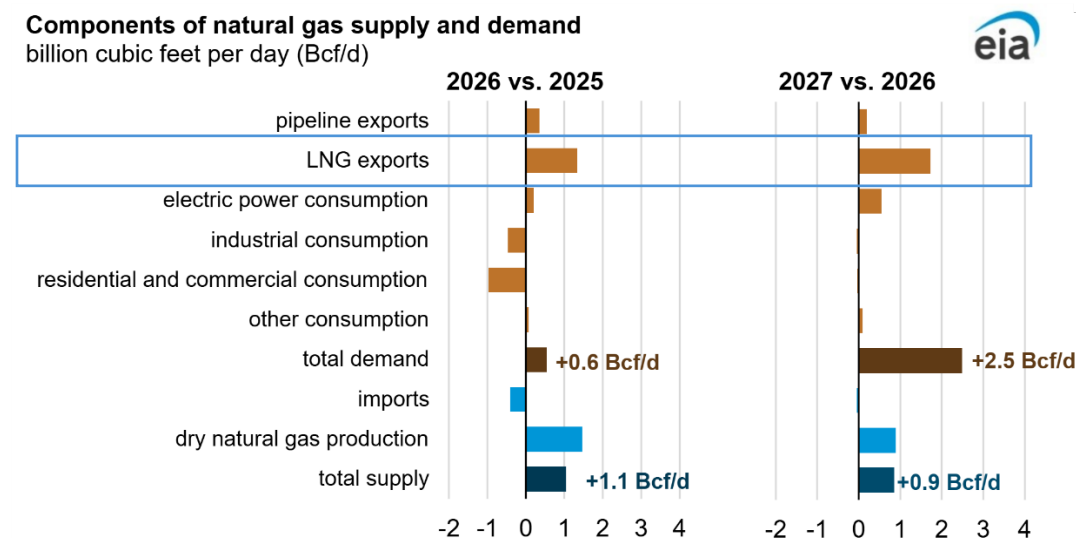
Source: [EIA](#)

¹³ <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>

¹⁴ <https://www.eia.gov/todayinenergy/detail.php?id=67166>

¹⁵ <https://www.eia.gov/todayinenergy/detail.php?id=67004>

Chart 2:



Source: [EIA](#)

These developments do not imply that LNG exports or other forms of gas demand will necessarily undermine fertilizer production. US gas supply can respond to stronger demand, and current EIA forecasts anticipate continued production growth. They do show that the economic advantage enjoyed by US nitrogen producers depends partly on the balance between gas supply, infrastructure, storage, and competing demand. A domestic fertilizer plant can protect US agriculture from the complete loss of an imported cargo while remaining exposed to higher feedstock costs if the domestic gas market tightens. The degree of protection provided by domestic production therefore changes with conditions in the energy system.

International market conditions create a second source of US nitrogen exposure. USDA finds that since 2010 nitrogen fertilizer prices have become more closely associated with international natural gas prices as fertilizer production and trade have become more globally integrated. Natural gas remains a major cost input, but changes in gas prices reach US fertilizer markets alongside shifts in global production, crop demand, inventories, freight costs, export restrictions, and disruptions in major producing countries.¹⁶ A gas price increase therefore has its largest effect when it coincides with tighter fertilizer supply or stronger agricultural demand; additional production, inventories, or redirected trade can moderate the same cost pressure. US nitrogen prices consequently reflect the interaction between domestic gas economics and conditions in the wider fertilizer market rather than domestic feedstock costs alone.¹⁷

The 2022 shock showed how this exposure operates. Russia's invasion of Ukraine drove European gas prices sharply higher, reduced the competitiveness of gas-intensive European fertilizer production, and tightened internationally traded nitrogen supply. US producers retained the advantage of comparatively abundant domestic gas and substantial domestic capacity, but US farmers still faced higher fertilizer prices as global supply tightened and trade adjusted. Domestic

¹⁶ <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>

¹⁷ <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>

production therefore reduced the risk of physical shortage more effectively than it insulated US agriculture from an international price shock.¹⁸

For US policy, nitrogen therefore presents a relatively strong domestic supply position with a continuing external pricing exposure. The production gains of the past decade have reduced import vulnerability and given the US an important economic security asset. Preserving that advantage depends less on pursuing a numerical target for nitrogen self-sufficiency than on maintaining competitive domestic gas supply, viable fertilizer production capacity, access to international markets where imports remain useful, and the infrastructure required to move nitrogen products to agricultural regions. Future pressure on US gas markets could alter the cost of that position even if physical production capacity remains intact. Part C returns to that question under a scenario of stronger LNG, electricity, and industrial competition for US natural gas.

Phosphate: Sulfur, Processing, and Concentrated Supply

US phosphate exposure in 2026 demonstrates why domestic mineral resources and installed industrial capacity provide only a partial measure of fertilizer security. The US remains a major phosphate rock producer. The United States Geological Survey (USGS) estimates that ten mines in Florida, Idaho, North Carolina, and Utah produced about 20 million metric tons of marketable phosphate rock in 2025.¹⁹ Yet current operating conditions show that access to phosphate rock does not by itself determine the availability of finished fertilizer. During 2026, higher raw-material costs and constrained access to key processing inputs contributed to production curtailments at major US phosphate facilities.²⁰

Mosaic provides the clearest current example. The company reduced US phosphate production in May 2026 and implemented further curtailments in July. By early August 2026 (as of this writing), its Faustina facility in Louisiana was fully idled and its Bartow operation in Florida was running at 40% of its targeted annual operating rate. Mosaic identified sulfur availability and affordability as major pressures on its phosphate business, alongside higher raw-material costs and lower production volumes. Its average sulfur cost reached \$522 per long ton in the second quarter. Third-quarter contracts for sulfur with US Gulf Coast refiners subsequently settled at \$705 per long ton, indicating that input pressure remained elevated into the second half of 2026.²¹ The experience of a major domestic producer shows how global input conditions can weaken the effective value of domestic resource and processing capacity.

Phosphate rock must be processed with sulfuric acid to produce phosphoric acid, which can then be combined with ammonia to manufacture major phosphate fertilizers. USDA identifies sulfur, ammonia, energy, processing capacity, and transportation as integral parts of the phosphate fertilizer system.²² Finished fertilizer therefore depends on several industrial inputs and capabilities operating

¹⁸ <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>

¹⁹ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026.pdf>

²⁰ <https://www.agriculture.com/partners-mosaic-withdraws-2026-phosphate-output-outlook-curtails-production-as-costs-soar-11971721>

²¹ https://s1.q4cdn.com/823038994/files/doc_financials/2026/q2/Press-Release-Q2-2026-Exhibit-99-1-Publish.pdf

²² <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>

together. Domestic mineral availability provides an important base, but output can still fall when processing inputs become scarce, expensive, or difficult to replace.

Sulfur is the most important upstream constraint in the current market. US sulfur production is largely recovered through petroleum refining and natural gas processing rather than produced independently in response to fertilizer demand. USGS identifies petroleum refineries and natural gas processing facilities as the principal sources of recovered elemental sulfur in the US.²³ Recent analysis from the Payne Institute at the Colorado School of Mines describes the same production structure as a source of strategic exposure because sulfur output is tied largely to activity in the hydrocarbon system rather than to conditions in the markets that consume sulfur.²⁴ Higher fertilizer demand can increase the value of sulfur, but it cannot quickly cause refineries or gas processing facilities to generate substantially more recovered supply. Additional availability comes from sulfur recovered at coking plants, byproduct sulfuric acid from nonferrous-metal smelters, reclamation of spent sulfuric acid, and imports of sulfur and sulfuric acid.²⁵ Over a longer horizon, USGS identifies additional sulfur resources in gypsum, anhydrite, coal, oil shale, organic-rich shale, and metal sulfides, although production from some of these sources would require lower-cost extraction methods.²⁶ Inventories, trade, changes in refinery activity, and new investment can expand availability over time, but short-run supply responds only slowly to a sudden increase in demand.

The 2026 Hormuz crisis exposed that constraint at scale. Before the conflict, nearly half of internationally traded seaborne sulfur moved through the Strait of Hormuz. Only about 80,000 metric tons passed through during the three-and-a-half months of severe disruption, compared with roughly 640,000 tons in the period immediately following the June agreement that began restoring traffic.²⁷ The effects extended beyond Gulf producers because sulfur exported from the region supplies fertilizer and industrial processors across several major commodity-producing economies. A disruption to one maritime corridor therefore tightened an input used throughout the international phosphate production system.

The US experience also shows why domestic sourcing cannot be equated with insulation from international market conditions. USGS estimates US net import reliance for sulfur at about one-third of apparent consumption, implying that domestic sources account for roughly two-thirds of the US supply balance.²⁸ Mosaic purchases most of the elemental sulfur used at its North American phosphate operations from North American oil and natural gas refiners. Mosaic then converts that sulfur into sulfuric acid within its own phosphate complexes.²⁹ Yet the 2026 global shortage still raised sulfur prices charged by US Gulf Coast refiners and contributed to domestic phosphate production curtailments.³⁰ The exposure therefore operates through both physical availability and

²³ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026.pdf>

²⁴ <https://payneinstitute.mines.edu/how-institutional-failure-turned-sulfur-into-a-global-crisis/>

²⁵ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026-sulfur.pdf>

²⁶ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026-sulfur.pdf>

²⁷ <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

²⁸ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026.pdf>

²⁹ <https://www.sec.gov/Archives/edgar/data/1285785/000128578526000017/mos-20251231.htm>

³⁰ https://s1.q4cdn.com/823038994/files/doc_financials/2026/q2/Press-Release-Q2-2026-Exhibit-99-1-Publish.pdf

price. Domestic supply can moderate exposure to acute physical disruption while leaving producers exposed to a global market in which scarcity is transmitted through prices.

The sulfur shortage also raised costs for mineral processors outside agriculture. Sulfuric acid is used in several mineral-processing activities, including high-pressure acid leach nickel production in Indonesia. Reuters reported that constrained sulfur supply contributed to production cuts and higher operating costs in Indonesian nickel processing,³¹ while copper producers in Africa were also seeking replacement supply.³² Fertilizer producers and mineral processors were therefore competing for additional sulfur during the same disruption. The evidence establishes an immediate cross-sector exposure. A sustained increase in sulfur-intensive mineral processing could make that competition more consequential over time, a scenario examined in Part C.

International phosphate markets created an additional constraint in 2026. China remains a major phosphate producer and exporter, while Morocco is a major supplier of internationally traded phosphate fertilizer and holds the world's largest reported phosphate rock reserve base.³³ China tightened fertilizer export controls in March 2026, including restrictions affecting certain phosphate products, as authorities sought to protect domestic availability and prices.³⁴ Gulf sulfur supply was therefore disrupted while another important source of replacement fertilizer became less available. The combination reduced the capacity of international trade to compensate for pressure on domestic and foreign production.

The June 29 US emergency proclamation reflected the same concern at the federal policy level. It stated that current US phosphate fertilizer production was insufficient to support domestic agricultural demand after accounting for exports and that additional domestic manufacturing capacity would take time to become available.³⁵ The immediate response therefore included greater access to Moroccan phosphate fertilizer, while USDA opened FIELDS days later to support new or expanded domestic fertilizer manufacturing capacity. FIELDS contribution remains prospective: application is still open as of mid-August 2026, and its eventual effect will depend on which projects receive funding and reach operation.³⁶ The episode does not indicate that the US lacks phosphate resources or an established phosphate industry. It shows that those assets provide less protection when the inputs required to operate them become costly, constrained, or difficult to replace.

Phosphate therefore presents a different exposure profile from nitrogen. The US has significant domestic phosphate resources and established processing capacity, but the performance of that system depends on sulfur, ammonia, conversion economics, international supply, and transportation. The 2026 shock demonstrated how disruption in an industrial input produced largely

³¹ <https://www.reuters.com/commentary/reuters-open-interest/sulfur-squeeze-piles-more-pressure-indonesian-nickel-sector-2026-05-14/>

³² <https://www.reuters.com/markets/commodities/iran-wars-sulfurous-fallout-spreads-copper-nickel-2026-04-17/>

³³ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026.pdf>

³⁴ <https://www.reuters.com/world/asia-pacific/china-restricts-fertiliser-exports-further-crimping-war-tightened-supply-2026-03-19/>

³⁵ <https://www.whitehouse.gov/presidential-actions/2026/06/declaration-of-emergency-and-authorization-for-temporary-duty-free-importation-of-phosphate-fertilizer-morocco/>

³⁶ <https://www.usda.gov/about-usda/news/press-releases/2026/07/01/secretary-rollins-announces-500-million-fertilizer-investment-and-expansion-program-strengthen>

outside agriculture can constrain domestic fertilizer output even when phosphate rock availability is not the immediate limiting factor. US phosphate resilience therefore depends on the performance of the full production system that converts domestic resources into finished fertilizer and on access to external supply when that system comes under pressure.

Potash: Strategic Dependence and the Limits of Import Ratios

Potash presents the highest level of import dependence among the three major fertilizer nutrients used in US agriculture, albeit from neighboring Canada – until recently a relatively frictionless source of supply thanks to strong infrastructure links and the USMCA free trade agreement. USGS estimates that US production was about 500,000 metric tons of potassium oxide equivalent in 2025 against apparent consumption of about 5.9 million tons, leaving net import reliance at 92%.³⁷ Canada supplied 79% of US potash imports over 2021–24, followed by Russia at 12% and Israel at 3%.³⁸ The headline import ratio therefore identifies a substantial external dependence, but the strategic exposure also depends on how concentrated that supply is and how readily it could be replaced.

Canada changes the character of that dependence without removing it. Natural Resources Canada reports that Canada exported about 22.9 million metric tons of potash in 2024 and accounted for nearly 39% of global exports. The US was its largest market, receiving 53% of Canadian exports.³⁹ Geographic proximity and an established North American transport network reduce some of the exposure associated with long maritime supply chains. The same structure nonetheless leaves most US imports dependent on production and transport capacity in one foreign country. Commercial interdependence provides strong incentives to preserve trade, but it does not diversify the US supply base.

USGS's 2025 critical-minerals assessment reinforces the significance of that concentration. Its methodology evaluated more than 1200 foreign-trade disruption scenarios across 84 mineral commodities, incorporating import reliance, production concentration, potential market adjustment, and economic effects.⁴⁰ Potash was added to the 2025 US Critical Minerals List, reflecting continuing concern about the economic consequences of concentrated external supply.⁴¹

⁴² The designation is notable because Canada supplies most US imports.

Geographic proximity and North American integration moderate some risks, but they do not remove the exposure created by high import dependence and supplier concentration particularly if the US-Canada free trade agreement deteriorates.

Current US-Canada trade relations add a further qualification to assumptions about supplier reliability. At the July 2026 USMCA joint review, the US did not agree to renew the agreement in its

³⁷ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026.pdf>

³⁸ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026.pdf>

³⁹ <https://natural-resources.canada.ca/minerals-mining/mining-data-statistics-analysis/minerals-metals-facts/potash-facts>

⁴⁰ <https://www.usgs.gov/publications/methodology-and-technical-input-2025-us-list-critical-minerals-assessing-potential>

⁴¹ <https://www.usgs.gov/news/science-snippet/interior-department-releases-final-2025-list-critical-minerals>

⁴² <https://www.usgs.gov/news/science-snippet/department-interior-releases-draft-2025-list-critical-minerals>

current form, although USMCA remains in force while negotiations continue.⁴³ Later that month, the US imposed additional tariffs on selected Canadian goods but explicitly exempted potash.⁴⁴ The exemption limited the immediate effect of those measures on fertilizer supply, while the wider dispute showed that deep economic integration can coexist with significant trade friction. Potash's exemption is also consistent with the constraints created by heavy US reliance on Canadian supply.

Canadian political leaders such as Ontario Premier Doug Ford have even called for curtailing or placing an export tax on Canadian potash exports to the US in response to US tariffs on Canadian auto parts, steel, aluminum, and lumber. So far as of this writing, the Canadian federal government has not pursued this option, but trade tensions continue to escalate.⁴⁵

Global supply is concentrated beyond the US-Canada relationship. In 2024, Canada, Russia, and Belarus accounted for almost 77% of global potash exports, with Canada alone accounting for 38.7%.⁴⁶ A disruption affecting one major exporter can therefore tighten the wider market even if Canadian shipments to the US continue. Replacement supply would have to come from a relatively small group of producers with available capacity and would still require transport infrastructure capable of redirecting large volumes into US agricultural markets.

New production cannot normally compensate for a major disruption quickly. BHP's Jansen project in Saskatchewan illustrates the capital and time required to expand supply. Stage 1 is now expected to cost \$8.4 billion, with first production scheduled for mid-2027 and planned capacity of about 4.15 million tons annually.⁴⁷ Stage 2 is expected to cost a further \$6.9 billion and deliver about 4.36 million tons annually, but first production is not expected until late FY2031.⁴⁸ The projects will materially expand global potash capacity, but their scale and development periods show why new mines cannot serve as short-run substitutes when existing supply is disrupted.

US efforts to expand domestic production face the same time constraint. In January 2025, the Department of Energy (DoE) announced a conditional loan guarantee of up to \$1.26 billion for the Michigan Potash project, designed to produce approximately 800,000 tons per year of fertilizer-grade muriate of potash.⁴⁹ The project would add an important new source of domestic supply if completed, particularly given its location near major agricultural markets. It would nevertheless diversify rather than eliminate US import dependence, and it cannot provide immediate protection against a near-term disruption while development and permitting continue.

Transport capacity is part of the same exposure. Nutrien reports that most of the potash it supplies to North American customers moves by rail, with significant additional volumes moving by truck and

⁴³ <https://ustr.gov/about/policy-offices/press-office/press-releases/2026/july/ambassador-greer-issues-statement-usmca-joint-review>

⁴⁴ <https://www.whitehouse.gov/fact-sheets/2026/07/fact-sheet-president-donald-j-trump-imposes-additional-tariffs-on-canada/>

⁴⁵ <https://ici.radio-canada.ca/rci/en/news/2270786/council-of-the-federation-meeting-prince-edward-island>

⁴⁶ <https://natural-resources.canada.ca/minerals-mining/mining-data-statistics-analysis/minerals-metals-facts/potash-facts>

⁴⁷ <https://www.bhp.com/news/media-centre/releases/2026/01/jansen-update>

⁴⁸ <https://www.bhp.com/news/media-centre/releases/2026/06/update---jansen-stage-2-potash-project>

⁴⁹ <https://www.energy.gov/edf/articles/lpo-announces-conditional-commitment-michigan-potash-produce-fertilizer-us-farmers>

barge. Its Saskatchewan production also uses rail connections to Thunder Bay for onward movement by lake vessel to Canadian and US storage facilities.⁵⁰ Canadian potash therefore reaches US agriculture through a broad distribution network rather than a single corridor, but the system remains dependent on high-capacity inland transport. Disruption to rail or other major distribution links could constrain delivery even when mine production itself remains available.

Potash therefore does not provide a simple case for either domestic self-sufficiency or confidence in concentrated import supply. Canada gives the US access to a large, geographically close production base and an established distribution system. At the same time, most US imports come from one country, global export supply is concentrated among three producers, new mine capacity requires years and large capital commitments, and domestic diversification remains gradual.

For US policy, import dependence should therefore be assessed alongside supplier concentration, source geography, transport capacity, political and trade conditions, alternative production, and the time required to bring new supply online. Potash shows that a close and integrated foreign supplier can moderate some risks without removing the strategic consequences of concentration. US fertilizer security cannot be inferred from the import ratio alone.

Bulk Logistics: When Transportation Becomes Supply

US fertilizer security depends on the capacity to move nutrients as well as the capacity to produce or import them. Fertilizer must travel from mines, manufacturing plants, import terminals, and storage facilities to agricultural regions in time for seasonal application. Supply available elsewhere in the system provides limited protection if transport capacity cannot redirect and distribute it when normal routes are constrained. The disruption of Black Sea trade following Russia's invasion of Ukraine in 2022 and the severe reduction in fertilizer flows through the Strait of Hormuz in 2026 demonstrated the same constraint at the international level: productive capacity can remain available while access to the routes needed to move fertilizer becomes restricted. Once supply reaches the US, its availability depends on the domestic transportation system completing the final stages of that movement.

The US fertilizer distribution system depends on several transport modes whose roles differ by product and geography. USDA's Fertilizer Transportation Dashboard tracks weekly fertilizer rail carloads, rail freight rates, monthly barge movements on the Mississippi River System, imports, production, inventories, and regional fertilizer prices.⁵¹ In August 2026, USDA expanded the dashboard to include ammonia pipeline freight rates, noting that most ammonia in the US moves by pipeline.⁵² Rail, inland waterways, pipelines, and trucks therefore form connected parts of fertilizer supply rather than interchangeable alternatives. A disruption affecting one part of the network can increase pressure on the others.

The Mississippi River System provides the clearest direct example of this exposure. In 2024, 22.5 million metric tons of fertilizer moved northbound through locks on the Mississippi River System, 9% more than in 2023. In the same year, 10.7 million metric tons of fertilizer entered through the Ports of

⁵⁰ <https://cdn.sanity.io/files/ixv7nalm/production/469f70a51867d76d67295d3ca67af7873a32bdd1.pdf>

⁵¹ <https://agtransport.usda.gov/stories/s/dtqv-e4ux>

⁵² <https://agtransport.usda.gov/stories/s/dtqv-e4ux>

New Orleans, 14% more than in 2023.⁵³ These figures do not represent the share of all US fertilizer moved by barge, but they show the scale of the river system's role in connecting Gulf supply with inland agricultural markets. USDA's 2026 waterways study found that most states along the inland waterways it examined use those systems to satisfy most or all of their nitrogen-fertilizer demand, while some neighboring states also depend on them for supply.⁵⁴

That dependence operates through infrastructure whose capacity cannot be assumed to remain constant. USDA reported in January 2026 that the average US inland-waterway lock structure is more than 60 years old and that many facilities are operating beyond their intended design lives.⁵⁵ Aging infrastructure and maintenance requirements therefore add a longer-term capacity risk to the shorter-term disruptions caused by water and operating conditions. Weather and water levels can trigger individual disruptions, but the underlying exposure lies in the dependence of large-volume agricultural supply chains on infrastructure that is costly and slow to replace.

Alternative transport modes provide redundancy but cannot automatically absorb large disruptions without cost. USDA's 2026 waterways analysis found that disruptions requiring cargo to shift to other transport modes increased transportation costs.⁵⁶ Rail and truck networks can absorb some redirected shipments, but large diversions place additional demands on available network capacity. A fertilizer logistics disruption can therefore raise costs or slow delivery even when supply remains physically available elsewhere.

Scarce transportation capacity can also become commercially inaccessible even when a route remains physically open. During the 2023 Panama Canal drought, transit slots were auctioned for as much as several million dollars. USDA estimated that a \$2 million auction payment would have raised the ocean freight cost of a US Gulf-to-China grain shipment by about 50%, from \$60 to \$90 per metric ton. Most US Gulf grain vessels bound for East Asia therefore avoided the high-priced auctions and used the longer Suez route.⁵⁷ The example concerns grain rather than fertilizer, but it illustrates a broader constraint for low-margin bulk commodity supply chains. When access to scarce transport capacity is allocated through willingness to pay, the existence of an alternative route does not guarantee economically comparable access for every cargo.

Regulatory rules can also affect the transport options available during disruption. US coastwise shipping law generally requires merchandise moved by water between US points to use qualifying US vessels.⁵⁸ In March 2026, the administration waived those requirements for covered fertilizer and energy-related movements. USDA noted that the fertilizer provision could affect phosphate typically shipped from Tampa to New Orleans for further movement on the Mississippi River System.⁵⁹ The available evidence does not establish how much additional fertilizer moved because of the waiver.

⁵³ <https://www.ams.usda.gov/sites/default/files/media/ReliableWaterwaySystem042025.pdf>

⁵⁴ <https://www.ams.usda.gov/sites/default/files/media/GTR01222026.pdf>

⁵⁵ <https://www.ams.usda.gov/sites/default/files/media/GTR01222026.pdf>

⁵⁶ <https://www.ams.usda.gov/sites/default/files/media/ImportanceofInlandWaterwaystoUSAgicultureSummaryReport.pdf>

⁵⁷ <https://www.ams.usda.gov/sites/default/files/media/GTR11302023.pdf>

⁵⁸ <https://www.maritime.dot.gov/ports/domestic-shipping/domestic-shipping>

⁵⁹ <https://www.ams.usda.gov/sites/default/files/media/GTR03192026.pdf>

The episode nevertheless illustrates how regulatory conditions can affect the routes and transport capacity available when supply chains are under pressure.

The 2026 experience also shows the limits of emergency flexibility. Temporary changes to shipping rules can make existing vessels or routes more accessible, while they cannot create additional locks, rail capacity, terminals, pipelines, or storage after a disruption has begun. The same constraint applies to alternative fertilizer supply. Additional imports or production can improve physical availability, but their resilience value depends partly on whether the domestic transport network has sufficient capacity to move those volumes into agricultural regions.

For US policy, bulk logistics should therefore be assessed as part of fertilizer supply capacity. Production expansion, import diversification, and inventories provide stronger protection when transport networks can redirect and distribute supply under stressed conditions. The relevant economic security assessment should consider the capacity and reliability of inland waterways, rail, pipelines, ports, and connecting infrastructure alongside the location of fertilizer production and imports. Transportation becomes a fertilizer-security constraint when supply exists but cannot reach agricultural markets at the required scale, time, or cost.

The Role and Limits of Strategic Stockpiling

Strategic fertilizer inventories could, in principle, provide short-term insurance against severe supply disruption. Their role would differ from additional production or transport capacity. New mines, processing plants, ammonia facilities, and major infrastructure require years to develop, while inventories can make previously produced fertilizer available during a temporary interruption. Their value would depend on whether stocks can bridge a disruption long enough for production, trade, or transportation to adjust.

China's response to the 2026 fertilizer shock provides a current example. In March, Chinese authorities released nitrogen, phosphate, and compound fertilizers from national commercial reserves at least 15 days earlier than the normal spring cycle as disruption through the Strait of Hormuz tightened global supply.⁶⁰ The Chinese reserve system differs substantially from the structure of the US fertilizer market. China operates a state-directed commercial reserve in which the government sets reserve requirements and qualified enterprises hold fertilizer stocks with public financial support. The government can also require emergency release of those reserves when market conditions warrant.⁶¹ ⁶² The US has substantial commercially held fertilizer inventories, including stocks owned by fertilizer producers, but does not currently operate a comparable federally directed national fertilizer reserve.⁶³ The Chinese system therefore does not provide a model for direct replication. It does show that pre-positioned inventories can give policymakers an additional short-term supply instrument when production and trade cannot adjust immediately.

⁶⁰ <https://www.reuters.com/world/asia-pacific/china-taps-fertiliser-reserves-hormuz-closure-disrupts-global-supply-2026-03-13/>

⁶¹ <https://zfxgk.ndrc.gov.cn/wap/iteminfo.jsp?id=20442> (Chinese language website with Google Translate)

⁶² https://www.ndrc.gov.cn/xxgk/jd/jd/202409/t20240929_1393423.html (Chinese language website with Google Translate)

⁶³ https://agtransport.usda.gov/Fertilizer/Fertilizer-Production-Inventory-and-Disappearance/qize-x4xc/about_data

A US reserve would face product and location constraints. Nitrogen, phosphate, and potash products are not interchangeable, and their storage, handling, and regional uses differ. A reserve defined primarily by aggregate tonnage could therefore hold substantial inventory without holding the products required during a particular disruption. Location would also affect its value. Fertilizer demand is seasonal and geographically dispersed, while as discussed above, transport capacity can itself become constrained. Stocks held far from the affected agricultural market would provide less protection if rail, waterway, pipeline, or terminal capacity were already under pressure.

Any federal reserve would also operate alongside substantial commercial inventories. Producers, wholesalers, cooperatives, retailers, and farms already hold fertilizer stocks to manage seasonal production and demand. USDA's fertilizer transportation dashboard publishes industry data on fertilizer production, inventories, and disappearance, reflecting the role commercial stocks already play in the supply system.⁶⁴ Experience in 2022 and 2026 shows both their value and their limits. In 2022, advance purchases and fertilizer carried over from the previous season allowed some US farmers to avoid part of the price increase that followed Russia's invasion of Ukraine, although fertilizer prices still rose sharply as global supply tightened.^{65 66}

In 2026, the available buffer proved thinner: much of the US fertilizer dealer system operated with limited stocks under a just-in-time model, and shortages emerged during the spring application period.⁶⁷ Fertilizer already present in the US also remained exposed to global price signals, with some imported urea redirected overseas when foreign buyers offered materially higher prices.⁶⁸ Commercial inventories can therefore help bridge a temporary disruption when the required product is already positioned near demand, but their ability to contain a broader price shock is constrained by inventory levels, location, seasonality, and international market conditions. A public reserve could add another buffer during an exceptional disruption, but its additional value would depend partly on how much commercial inventory already exists, where it is located, and whether it can be mobilized.

Reserve acquisition would itself constitute a market intervention. The American Farm Bureau Federation's (AFBF) 2026 fertilizer policy analysis identifies procurement, storage, rotation, cost, market effects, and administration as significant design questions for any US reserve.⁶⁹ Large government purchases made during already tight market conditions could add to demand and increase competition for available supply. Procurement during more balanced conditions could have different effects but would require maintaining and rotating stocks over time. The management problem has a useful analog in the Strategic Petroleum Reserve (SPR), where the timing and method of acquisition, release, and replenishment affect both the public cost of maintaining the reserve and

⁶⁴ https://agtransport.usda.gov/Fertilizer/Fertilizer-Production-Inventory-and-Disappearance/qize-x4xc/about_data; <https://www.iowafarmbureau.com/Article/Should-US-consider-strategic-fertilizer-reserve>

⁶⁵ <https://www.fas.usda.gov/data/impacts-and-repercussions-price-increases-global-fertilizer-market>

⁶⁶ <https://ers.usda.gov/amber-waves/2023/september/global-fertilizer-market-challenged-by-russia-s-invasion-of-ukraine>

⁶⁷ <https://www.reuters.com/business/iran-war-deprives-us-farmers-affordable-fertilizer-spring-planting-looms-2026-03-13/>

⁶⁸ <https://www.reuters.com/business/us-buyers-redirect-imported-fertilizer-overseas-iran-war-drives-up-global-prices-2026-04-17/>

⁶⁹ <https://www.fb.org/imgz/Fertilizer-White-Paper.pdf>

its interaction with the commercial market.^{70 71} A fertilizer reserve would face the additional requirement of maintaining appropriate products in usable condition and in locations relevant to agricultural demand. The economic case for a reserve therefore depends on its size, composition, acquisition strategy, and intended use rather than on the existence of inventory alone.

The objective of a reserve would need to be defined narrowly. For the purposes of US fertilizer security examined here, the strongest case is for an inventory able to bridge a severe but temporary physical disruption while production, trade, or transportation adjusts. An inventory intended to bridge a temporary physical disruption is a different instrument from one intended to stabilize fertilizer prices or compensate for a prolonged loss of supply. A temporary disruption may require enough inventory to sustain agricultural demand while trade routes reopen or production recovers. China's national commercial fertilizer reserve has broader formal objectives: safeguarding domestic fertilizer supply, maintaining basic price stability, and meeting agricultural fertilizer needs following natural disasters.^{72 73} Its use therefore combines seasonal supply management and emergency protection rather than serving only as insurance against an external supply shock. Attempting to stabilize prices in a globally traded fertilizer market as a primary US policy objective could require much larger inventories and more extensive government intervention. A reserve designed without a clear objective could therefore accumulate substantial cost without addressing the vulnerability that generated the disruption.

AFBF's analysis frames a strategic reserve as a possible risk-management tool while leaving substantial questions over practicality and cost effectiveness.⁷⁴ That is the appropriate level of confidence for US policy. Targeted inventories may be useful where the underlying disruption is severe but temporary and where stocks can be positioned and released into functioning distribution networks. Their value is weaker when a disruption is prolonged or when the binding constraint lies in production inputs, processing capacity, or transportation rather than the immediate availability of finished fertilizer.

For US fertilizer strategy, stockpiling should therefore be treated as one form of short-term insurance within a broader resilience framework. Stockpiling can buy time; it cannot create capability. Inventories can bridge some temporary disruptions, but they cannot replace competitive nitrogen production, sulfur and phosphate-processing capacity, diversified access to potash, or the transport networks required to distribute fertilizer. The strategic case for any reserve should therefore be judged by the specific vulnerability it is intended to cover and by whether it complements, rather than substitutes for, the productive and logistical capabilities required over longer disruptions.

⁷⁰ <https://www.energy.gov/hgeo/opr/filling-strategic-petroleum-reserve>

⁷¹ <https://www.energy.gov/hgeo/opr/spr-sales-and-exchanges>

⁷² <https://zfxgk.ndrc.gov.cn/wap/iteminfo.jsp?id=20442> Chinese language website with Google Translate)

⁷³ https://www.ndrc.gov.cn/xxgk/jd/jd/202409/t20240929_1393423.html Chinese language website with Google Translate)

⁷⁴ <https://www.fb.org/imgz/Fertilizer-White-Paper.pdf>

Part B: The 2026 Crisis and the Limits of Emergency Intervention

The Compound Shock

The 2026 fertilizer crisis combined disruptions in production, trade, industrial inputs, and shipping at the same time. The conflict in the Persian Gulf sharply reduced fertilizer movements through the Strait of Hormuz, while export restrictions elsewhere narrowed access to alternative supply. The resulting pressure was broader than the loss of any single producer. Several of the mechanisms through which fertilizer markets normally adjust to disruption were constrained simultaneously.

The Strait of Hormuz was the largest immediate disruption. Gulf economies contributed to nearly 25% of global nitrogenous fertilizer exports and around 12% of phosphatic fertilizer exports in 2024, according to WTO analysis.⁷⁵ Once the conflict began, fertilizer-related outbound shipments through the Strait to destinations outside the Gulf fell close to zero.⁷⁶ International Food Policy Research Institute estimated that the closure put around a third of global seaborne fertilizer trade at risk.⁷⁷ The exposure extended beyond finished fertilizer because nearly 50% of seaborne sulfur, a key input for phosphate production, normally moved through the Strait before the conflict.⁷⁸

Prices responded rapidly. WTO data show urea rising from around \$400 per metric ton before the conflict to more than \$850 in April before dipping to about \$453 in June. Phosphate fertilizer prices also rose significantly by around 30%.⁷⁹ The retreat from the April 2026 urea peak reflected both weaker seasonal demand as the US spring planting period ended and improving expectations that an agreement could restore fertilizer trade through the Strait.⁸⁰ After the June 15, 2026 interim agreement, urea and other fertilizer shipments began moving through Hormuz again, adding some physical supply, although traffic remained below normal levels and much of the material represented previously contracted cargoes.⁸¹ The movements reflected more than the closure of the Strait alone. Available inventories, production outside the Gulf, trade policy, demand, and expectations about the duration of the disruption also influenced prices. The decline therefore reflected changing demand and expectations alongside the beginning of a physical supply recovery, rather than a full resolution of the underlying constraints.

⁷⁵ https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

⁷⁶ https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

⁷⁷ <https://www.ifpri.org/blog/how-fertilizer-policies-could-exacerbate-hormuz-price-shocks/>

⁷⁸ <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

⁷⁹ https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

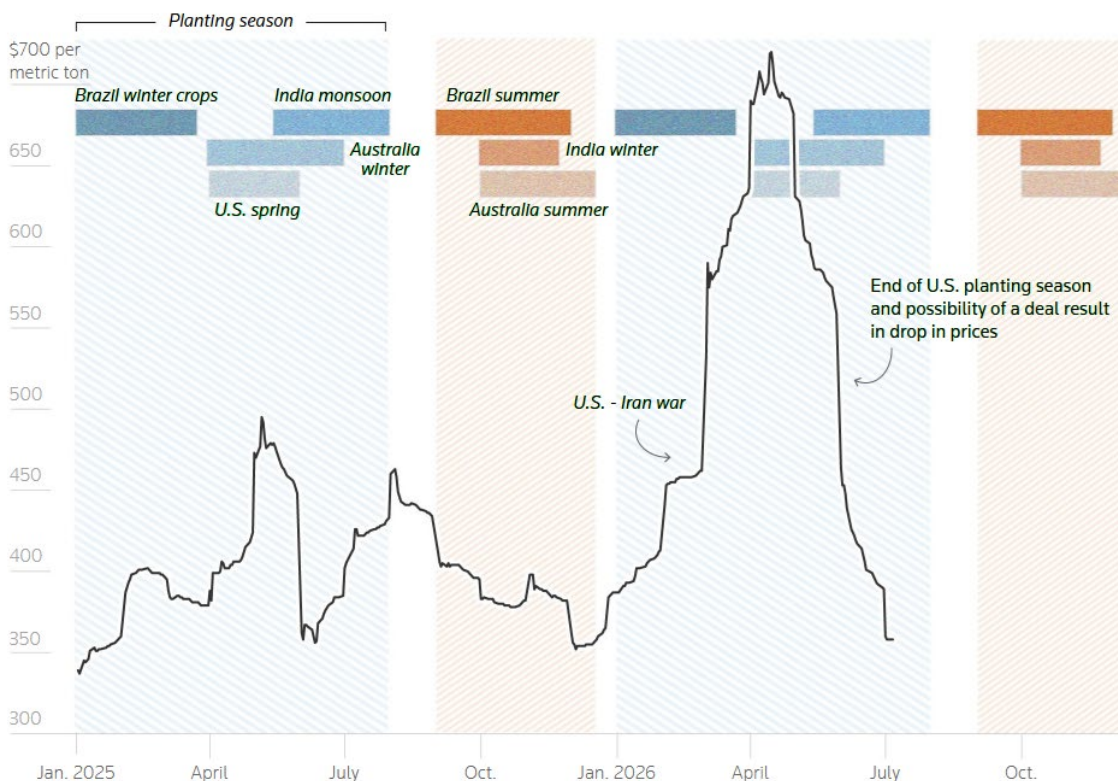
⁸⁰ <https://www.reuters.com/graphics/IRAN-WAR/FERTILIZER/zjvqgwakvx/>

⁸¹ <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

Chart 3: Urea Price Spike 2026

Urea prices spiked when farmers needed it most

Urea (Granular) FOB US Gulf Futures



Note: Planting seasons of top urea importers from gulf countries in 2024 shown. Planting seasons are crop-specific, time frames shown are general estimates. Data through July 6, 2026.

Source: LSEG, U.S. Department of Agriculture

Source: [Reuters](#)

Access to replacement supply narrowed at the same time. China tightened fertilizer export controls in March, including restrictions affecting certain phosphate products and nitrogen-potassium blends, adding to existing controls on urea.⁸² China is a major fertilizer exporter and was one of the producers buyers might otherwise have expected to supply more material as Gulf exports fell. Other exporters also tightened access. Russia extended fertilizer export quotas and suspended export licenses for ammonium nitrate, while Türkiye introduced a temporary ban on sulfur exports.⁸³ As sulfur is an important input into phosphate fertilizer production, restrictions on upstream inputs could tighten fertilizer supply even where they did not directly target finished products. WTO separately estimated that fertilizer export restrictions introduced around the crisis could affect up to

⁸² <https://www.reuters.com/world/asia-pacific/china-restricts-fertiliser-exports-further-crimping-war-tightened-supply-2026-03-19/>

⁸³ https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

15% of global exports.⁸⁴ Trade policy therefore added another constraint to a market already dealing with a major physical supply interruption.

The disruption also crossed fertilizer markets through industrial inputs. Urea production at Qatar's major production complex was halted, while sulfur and ammonia flows were curtailed.⁸⁵ The crisis therefore constrained both finished fertilizer and inputs required for production elsewhere. For phosphate producers in particular, reduced sulfur availability transmitted the Gulf disruption beyond countries directly dependent on Gulf fertilizer imports. The effects reflected the production relationships identified in Part A; fertilizer supply depends on energy, processing inputs, and trade as well as finished-product capacity.

The shock reached the US during the spring application period. US exposure varied substantially by nutrient and by individual fertilizer product. USDA estimates that in 2022 domestic production supplied 89% of aggregate nitrogen demand and 98% of aggregate phosphate demand, while domestic potash production supplied only about 3% of demand.⁸⁶ Those aggregate figures can obscure greater dependence within particular products and on particular foreign suppliers.

Table 1: Selected measures of US fertilizer import exposure

Nutrient/product	US import exposure	Relevant source concentration
Nitrogen, aggregate	About 11% of demand met through imports in 2022	Urea was more exposed: Qatar supplied about 22% of US urea imports by volume in 2025, and Gulf producers together supplied roughly 30%. ⁸⁷
Phosphate, aggregate	About 2% of demand met through imports in 2022	Saudi Arabia supplied about 42% of US imports of the principal ammonium phosphate fertilizers in 2025. ⁸⁸
Potash	More than 90% import reliant; USGS estimated 92% net import reliance in 2025	Canada supplied 79% of US potash imports over 2021-24, followed by Russia at 12% and Israel at 3%. ⁸⁹

⁸⁴ https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

⁸⁵ <https://www.reuters.com/world/china/iran-war-fertiliser-squeeze-could-spell-trouble-next-years-grain-harvests-2026-04-27/>

⁸⁶ <https://www.ers.usda.gov/media/9156/err-354.pdf?v=84759>. Note 2022 is the most recent data year for USDA import balance data on nitrogen and phosphates.

⁸⁷ <https://wits.worldbank.org/trade/comtrade/en/country/USA/year/2025/tradeflow/Imports/partner/ALL/product/310210>

⁸⁸ <https://www.spglobal.com/energy/en/news-research/latest-news/agriculture/063026-trump-suspends-import-duties-on-moroccan-fertilizer-for-eight-months-to-ease-supply>

⁸⁹ <https://pubs.usgs.gov/periodicals/mcs2026/mcs2026-potash.pdf>

The national figures therefore understate some product-specific exposure. The US entered the crisis with substantial domestic nitrogen production, but imported urea remained exposed to Gulf disruption; phosphate production was domestically substantial but depended on sulfur and on foreign finished-product supply at the margin; and potash remained structurally import dependent.

In March 2026, The Fertilizer Institute estimated that the US was around 25% short of the usual fertilizer supplies purchased for spring planting. Reuters reported that prices for available supplies had risen by more than one-third since the conflict began.⁹⁰ Domestic nitrogen production reduced the risk of complete dependence on Gulf supply, but it did not prevent international scarcity from reaching US prices and availability. The timing amplified the pressure because fertilizer arriving after application windows cannot fully substitute for material required before or during planting.

Physical flows began to recover after the June agreement, demonstrating that the shock did not eliminate the market's capacity to adjust. By late June, around 640,000 metric tons of sulfur and 427,000 tons of urea had moved out through the Strait after the agreement, compared with only 80,000 tons of sulfur and 275,000 tons of urea during the preceding three-and-a-half months of conflict.⁹¹ Traffic nevertheless remained well below normal levels, and much of the material moving through the Strait represented previously contracted cargo rather than new supply entering the market.⁹² The June agreement allowed some fertilizer flows to resume, but transit remained intermittent and exposed to renewed political and security disruption.

The severity of the 2026 shock came from simultaneous pressure on several parts of the fertilizer system. Gulf production and shipping were constrained, sulfur and ammonia availability tightened, export restrictions reduced replacement supply, and the disruption reached US agriculture during a period of high seasonal demand. Markets continued to adjust, but trade, alternative production, and rerouting had less room to compensate than they would have under a single disruption. The partial recovery after June provides the basis for assessing how commercial markets adapted and where that adjustment capacity reached its limits.

How Commercial Markets Adjusted

Commercial fertilizer markets responded to the 2026 shock through repricing, trade reallocation, alternative routing, use of existing stocks, and changes in demand. These mechanisms partly offset the initial loss of Gulf supply, but much of the adjustment redistributed scarcity rather than creating new production. Supply moved toward buyers and markets able to pay more, while higher costs reduced or deferred some fertilizer use.

Prices provided the fastest adjustment. WTO data show urea going up from around \$400 per metric ton before the conflict to more than \$850 in April before descending to about \$453 in June (Chart 3).⁹³ Reuters analysis associated part of the subsequent decline with the end of the US spring planting

⁹⁰ <https://www.reuters.com/business/iran-war-deprives-us-farmers-affordable-fertilizer-spring-planting-looms-2026-03-13/>

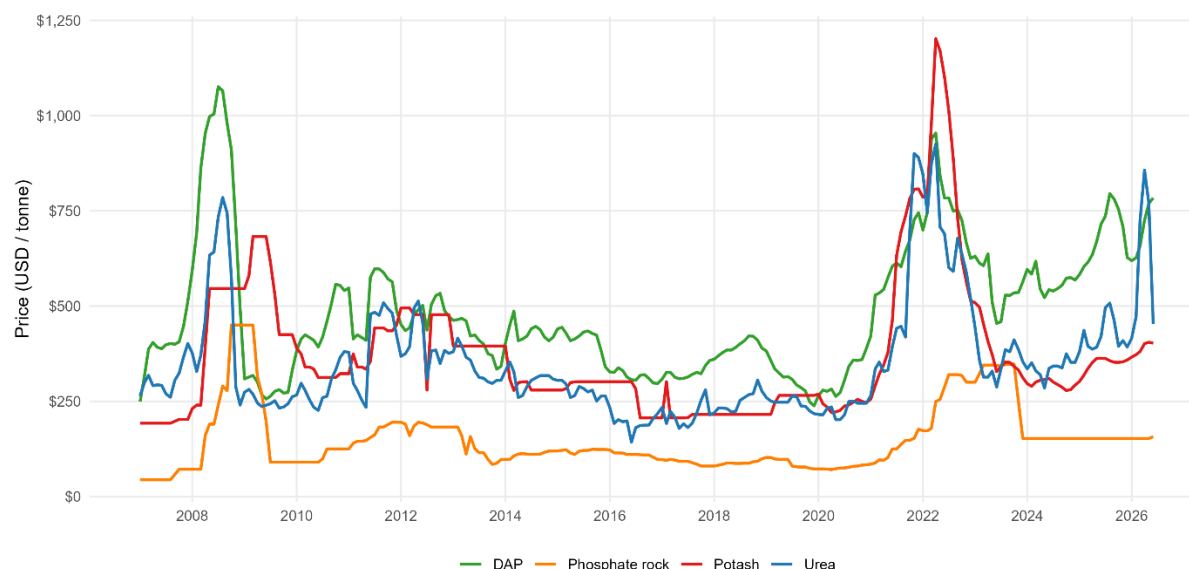
⁹¹ <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

⁹² <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

⁹³ https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

period and improving prospects for an agreement that could restore Gulf trade.⁹⁴ The retreat from the April peak therefore reflected changing demand and expectations as well as the prospect of additional physical supply. It did not indicate that the constraints on fertilizer production and trade had disappeared.

Chart 4: WTO Fertilizers Prices



Source: [WTO](#)

The co-movement of fertilizer prices across major shocks does not reflect a single production chain. In 2000-2001, sharply higher US natural gas prices primarily affected nitrogen economics. The 2008 spike was broader, combining strong agricultural demand and low inventories with higher energy and raw-material costs across nitrogen, phosphate, and potash. The 2022 and 2026 episodes again produced broad price increases, but through disruptions to energy, production, trade, and industrial inputs. Phosphate prices can also transmit higher ammonia and sulfur costs, while potash follows a separate mining-based supply chain. Broad fertilizer price movements therefore become more correlated when several common demand, input, or supply constraints occur together.

Higher prices redirected available fertilizer toward buyers prepared to pay more. In April, Indian Potash Ltd agreed to purchase a record 2.5 million metric tons of urea through a single tender at \$935 to \$959 per ton, compared with roughly \$508 to \$512 per ton in a tender two months earlier. Suppliers offered about 5.6 million tons before sufficient volumes were matched at the successful prices.⁹⁵ The purchase secured a large quantity for India but also committed material that would otherwise

⁹⁴ <https://www.reuters.com/graphics/IRAN-WAR/FERTILIZER/zjvqgwakvx/>

⁹⁵ <https://www.reuters.com/world/india/india-import-record-25-million-tons-urea-nearly-double-price-paid-two-months-ago-2026-04-22/>

have remained available to other buyers. Higher prices could therefore mobilize existing supply without increasing global production in the short run.

The same price signals affected the US market. In April, imported urea already at the Port of New Orleans was purchased for export overseas as international prices rose above US levels. Reuters reported that New Orleans urea was around \$170 per short ton cheaper than fertilizer in overseas markets, creating an incentive to resell material to higher-paying buyers abroad.⁹⁶ The episode shows that fertilizer physically present in the US was still connected to global price signals. Domestic availability could change as traders redirected imported cargoes toward markets offering higher returns.

Trade also adjusted through alternative routes, although physical constraints limited the volumes that could be redirected. WTO reported that some Saudi fertilizer exports moved through the Red Sea Port of Yanbu after Hormuz traffic was disrupted. Higher transport costs and logistical constraints prevented those routes from matching normal export volumes.⁹⁷ Rerouting therefore provided partial redundancy without fully replacing the capacity lost through the Strait.

Production outside the Gulf faced similar limits. Russia, one of the world's largest fertilizer exporters, could not rapidly expand output enough to replace potential Gulf losses. Reuters reported that limited spare capacity, domestic supply obligations, export restrictions, and disruption at production facilities limited Russia's capacity to increase supply, while new export-oriented plants were not expected to begin operating before 2027.⁹⁸ Russian fertilizer products had largely been spared Western sanctions because of food-security concerns, although sanctions-related payment and logistics difficulties continued to complicate exports. The episode illustrates the difference between reallocating existing production and creating additional capacity. Prices can redirect fertilizer relatively quickly; new plants and upstream production require substantially more time.

High prices also altered agricultural demand. Australian growers shifted some planned acreage toward crops requiring less fertilizer as urea costs rose sharply,⁹⁹ while US farmers planned fewer corn acres and more soybean acres than in 2025 amid higher fertilizer and fuel costs.¹⁰⁰ USDA's March survey put intended corn acreage at 95.3 million acres, 3% below 2025, while soybean acreage was expected to increase 4% to 84.7 million acres. The immediate effect on crop prices was less clear.¹⁰¹ Corn and soybean stocks were both above year-earlier levels, placing downward pressure on prices even as fertilizer costs increased; abundant corn stocks also reduced feedstock costs for livestock and biofuel producers. Fertilizer prices were not the only factor affecting planting decisions, particularly in the US, where crop prices and other economic conditions also influenced

⁹⁶ <https://www.reuters.com/business/us-buyers-redirect-imported-fertilizer-overseas-iran-war-drives-up-global-prices-2026-04-17/>

⁹⁷ https://www.wto.org/english/blogs_e/data_blog_e/blog_dta_10jul26_451_e.htm

⁹⁸ <https://www.reuters.com/business/energy/russian-fertiliser-makers-cant-offset-potential-iran-related-supply-crunch-2026-03-06/>

⁹⁹ <https://www.reuters.com/world/asia-pacific/australian-growers-shift-less-fertiliser-intensive-crops-iran-war-costs-surge-2026-04-02/>

¹⁰⁰ <https://www.reuters.com/world/us/us-farmers-plant-less-corn-iran-war-spikes-fertilizer-prices-2026-04-01/>

¹⁰¹ <https://data.nass.usda.gov/Newsroom/2026/03-31-2026.php>

acreage. The US adjustment therefore operated more clearly through relative crop profitability and planting decisions than through an immediate increase in grain prices.

Partial restoration of Gulf shipments added physical supply to these commercial adjustments from June onward. Urea, sulfur, ammonia, and phosphate cargoes began moving through Hormuz again after the June agreement, although traffic remained below normal levels and much of the material represented earlier sales rather than new transactions.¹⁰² The additional flows helped ease immediate scarcity, while continuing political and security risks limited the extent to which buyers could treat Gulf supply as fully restored. For buyers, the reopening reduced immediate supply pressure without restoring normal procurement: most departing cargoes reflected earlier sales, few new fertilizer transactions were being concluded in the Gulf, and empty carriers had yet to return in significant numbers.¹⁰³

By August, the initial price shock had eased substantially but the underlying market had not returned to its pre-crisis position. Nutrien reported that it expected global nitrogen markets to remain tight during the second half of 2026 because of trade disruption, production outages, elevated energy prices, and strong import demand. It also reported continuing pressure on phosphate markets from disrupted trade flows and constrained sulfur availability.¹⁰⁴ Nutrien's outlook should not be treated as a market-wide forecast on its own, but it is consistent with the continuing physical constraints identified elsewhere in the 2026 evidence.

Commercial adjustment therefore reduced the scale of the initial physical shock, but it did so primarily by reallocating existing supply, changing prices, finding alternative routes, and reducing or deferring some demand. These mechanisms worked best where inventories, spare production, alternative routes, or buyers able to absorb higher prices already existed. They were less effective where adjustment required new production capacity, additional industrial inputs, or infrastructure that could not be created during the crisis. For the US, the greatest immediate exposures lay where substantial domestic capacity still depended on globally priced inputs and markets: nitrogen prices remained connected to international scarcity and imported urea, phosphate production was constrained by sulfur availability, and the timing of the disruption reduced the ability to compensate through later deliveries.

Commercial markets performed their core reallocative function under severe stress, but adjustment came through higher prices, changes in demand, and redistribution of existing supply. The strongest case for policy intervention lies in constraints that market reallocation cannot relax within an agricultural season, including access to replacement supply, transportation flexibility, critical industrial inputs, and productive capacity. Markets could redirect fertilizer faster than they could create new capability.

¹⁰² <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

¹⁰³ <https://www.reuters.com/world/middle-east/fertiliser-shipments-begin-exiting-through-hormuz-strait-2026-06-26/>

¹⁰⁴ <https://www.reuters.com/world/americas/nutrien-misses-profit-estimates-lower-volumes-blunt-higher-fertilizer-prices-2026-08-06/>

Federal Intervention: Trade Access, Distribution Flexibility, and Future Capacity

The federal measures most directly relevant to fertilizer supply continuity in 2026 operated through three mechanisms: easing transportation constraints, reducing barriers to foreign supply, and financing future domestic capacity. Pre-existing federal data systems provided a fourth capability by improving visibility into production, inventories, prices, imports, and transportation conditions. These instruments addressed different constraints and operated on different time horizons. Their significance therefore lies in what each could change: the movement of fertilizer already available, the cost and accessibility of replacement imports, policymakers' visibility into emerging constraints, or the productive capacity available in future disruptions.

Transportation measures came first. On March 18, the President temporarily waived coastwise shipping requirements under the Jones Act for 60 days for fertilizer alongside crude oil, natural gas, coal, and other energy-related products.¹⁰⁵ USDA identified phosphate fertilizer movements from Tampa to New Orleans, where cargoes can enter the Mississippi River distribution system, as a trade lane potentially affected by the waiver. The measure expanded the set of vessels legally available for covered domestic movements, increasing potential routing flexibility during the disruption. Available federal evidence does not establish how much incremental fertilizer tonnage moved under the waiver or whether it materially reduced delivered fertilizer prices. Its demonstrated effect was therefore regulatory: it removed one constraint on the domestic movement of fertilizer already present in the US supply system rather than increasing national fertilizer production or global availability.

Federal trucking policy subsequently addressed another distribution constraint. On May 26, the Federal Motor Carrier Safety Administration, acting in coordination with USDA, waived specified hours-of-service limits and electronic-logging requirements for carriers transporting straight or blended fertilizer for agricultural use in 35 states through August 26.¹⁰⁶ The waiver excluded hazardous-material movements and retained driver-rest, licensing, safety, and other regulatory requirements. It therefore provided targeted transport flexibility rather than a general suspension of fertilizer trucking regulation.

As with the Jones Act action, the available evidence establishes the additional regulatory flexibility but does not quantify the incremental fertilizer volume delivered because of it. The policy could improve the regional availability of fertilizer already within the system without changing the national supply base, an important difference for a commodity whose economic availability depends on reaching the required agricultural region within a narrow application window.

The principal federal trade-access intervention came on June 29. Acting under section 318 of the Tariff Act of 1930, the President declared an emergency concerning phosphate-fertilizer availability and authorized temporary duty-free importation of covered phosphate fertilizer from Morocco for up to eight months or until termination of the emergency.¹⁰⁷ The proclamation's diagnosis was explicit: US phosphate-fertilizer production was insufficient to support domestic agricultural production after accounting for exports, while efforts to expand domestic manufacturing would take time to increase

¹⁰⁵ <https://www.ams.usda.gov/sites/default/files/media/GTR03192026.pdf>

¹⁰⁶ <https://www.fmcsa.dot.gov/emergency/waiver-transportation-fertilizer-products-select-states-05-26-2026>

¹⁰⁷ <https://www.whitehouse.gov/presidential-actions/2026/06/declaration-of-emergency-and-authorization-for-temporary-duty-free-importation-of-phosphate-fertilizer-morocco/>

supply materially. The Section 318 action therefore focused on improving access to existing foreign production during the agricultural season rather than waiting for new domestic capacity or curtailing exports.

Section 318 altered the economics of obtaining existing Moroccan phosphate supply; it did not create additional phosphate rock, processing capacity, or finished fertilizer production. By permitting qualifying imports to enter without collection of the applicable duties and estimated-duty deposits, the measure removed a policy-created component of the landed cost of Moroccan fertilizer and could make that supply more commercially accessible to US buyers.¹⁰⁸ Implementation was also more conditional than a blanket border-wide suspension. Commerce required the exporter or importer to submit a written request before importation for the relevant merchandise, including information on the producer, quantity, US price, proposed entry date, port, transportation mode, destination, and intended use.¹⁰⁹ Approved merchandise normally had to enter within 60 days after Commerce notified the requester that relief had been granted. An initial trade response is already visible: by mid-July, OCP had begun shipping 54000 tons of phosphate fertilizer to the US following the duty suspension.¹¹⁰ The available evidence does not establish whether that material was redirected from European or other buyers, drawn from inventories, or supplied without reducing deliveries elsewhere. The distributional effect on other importing markets therefore remains uncertain.

The broader effect on US import volumes and prices cannot yet be established. The available USDA monthly fertilizer trade data do not yet show July 2026 imports following implementation of the duty relief.¹¹¹ The first reported Moroccan shipment had also not reached distributors when announced, and US retail phosphate prices had not yet shown a material response.¹¹² The effect of Section 318 on import volumes, domestic prices, and trade flows to other markets should therefore be assessed once post-relief shipment and price data become available. The intervention therefore improved the terms on which existing foreign supply could reach the US market while retaining a shipment-specific administrative process. Its effect on US import volumes, domestic prices, and trade flows to other markets cannot yet be established from available post-relief data.

A separate federal capability came from information infrastructure that predated the crisis. USDA's Foreign Agricultural Service launched its Global Fertilizer Dashboard in September 2024, while the Agricultural Marketing Service launched the Fertilizer Transportation Dashboard in October 2024.¹¹³

¹¹⁴ The latter integrates indicators covering fertilizer production, inventories, imports, regional prices, rail movements, rail tariffs, and barge traffic. USDA continued to expand this architecture during 2026. On August 10, AMS added anhydrous-ammonia pipeline-rate data covering five origins and 25

¹⁰⁸ <https://www.whitehouse.gov/presidential-actions/2026/06/declaration-of-emergency-and-authorization-for-temporary-duty-free-importation-of-phosphate-fertilizer-morocco/>

¹⁰⁹ <https://access.trade.gov/Fertilizers%20Morocco%20CVD%20Import%20Duty%20Exemption%20Request.pdf>

¹¹⁰ <https://www.dtnpf.com/agriculture/web/ag/crops/article/2026/07/17/duty-free-moroccan-phosphate-arrive>

¹¹¹ <https://agtransport.usda.gov/Fertilizer/U-S-Fertilizer-Imports-by-Nutrient-by-Month/czt6-fh8z>

¹¹² <https://www.dtnpf.com/agriculture/web/ag/crops/article/2026/07/17/duty-free-moroccan-phosphate-arrive>

¹¹³ <https://www.ams.usda.gov/content/usda-announces-availability-new-agricultural-transportation-data>

¹¹⁴ <https://www.fas.usda.gov/data/visualization-global-fertilizer-trade-dashboard>

destinations, most in the Corn Belt.¹¹⁵ These systems improved observation of the fertilizer system rather than its physical capacity. Better information can help identify emerging shortages, regional price divergence, inventory stress, and transportation constraints earlier, but visibility does not itself add plant output, inventory, railcars, barges, pipeline capacity, or port throughput.

The July 1 launch of the FIELDS program marked a shift from short-run access measures toward prospective capacity expansion. USDA made \$500 million available through FIELDS for competitive grants intended to expand or bring into operation independent domestic fertilizer process-manufacturing capacity.¹¹⁶ Awards range from \$15 million to \$150 million and require non-federal matching funds equal to 50 percent of total eligible project costs. Eligible investments include construction or expansion of manufacturing facilities, process-manufacturing equipment, and supporting fertilizer logistics, although logistics cannot constitute the primary project purpose. USDA defines process manufacturing to include operations such as producing ammonia from natural gas and converting ammonia into urea, while excluding mixing, blending, or bagging alone.¹¹⁷ The program therefore targets productive capability rather than merely downstream handling or distribution.

FIELDS cannot explain the US market's adjustment to the spring 2026 shock. As of mid-August, applications remained open until August 17; USDA anticipated awards only in December 2026 or January 2027, and funded projects may have performance periods of one to five years.¹¹⁸ Its importance lies instead in the constraint it seeks to alter over time. Where the Jones Act and trucking waivers could change how existing fertilizer moved, and Section 318 could change the terms on which existing foreign phosphate entered the US, FIELDS is designed to increase the productive capability available during future disruptions. That difference in time horizon is central to evaluating the 2026 response.

Federal intervention therefore expanded the channels through which existing fertilizer could reach US buyers faster than it expanded the underlying supply base. Transportation waivers increased potential regional delivery flexibility; Section 318 reduced a policy barrier to accessing existing Moroccan phosphate; federal data systems improved visibility into emerging constraints; and FIELDS created a financing mechanism for additional productive capacity over a longer horizon. The 2026 response demonstrated the distinction between access to supply and expansion of supply. In the short run, federal policy could remove legal and logistical frictions surrounding fertilizer already available somewhere in the system. It could not rapidly expand the production, processing inputs, or durable transportation capacity on which fertilizer continuity ultimately depends.

Findings from the 2026 Stress Test

The 2026 crisis showed that the US fertilizer system could absorb part of a severe external shock through market reallocation and targeted federal intervention. Commercial markets repriced scarcity, redirected cargoes, drew on inventories, used alternative routes, and reduced or deferred

¹¹⁵ <https://www.ams.usda.gov/content/usda-announces-availability-new-fertilizer-transportation-data>

¹¹⁶ <https://www.rd.usda.gov/media/file/download/fy26-fields-nofo.pdf>

¹¹⁷ <https://www.rd.usda.gov/programs-services/business-programs/fertilizer-investment-expansion-long-term-domestic-supply>

¹¹⁸ <https://www.rd.usda.gov/media/file/download/fy26-fields-nofo.pdf>

some demand. Federal measures relaxed transportation constraints and reduced a trade-policy barrier affecting Moroccan phosphate, while existing USDA information systems improved visibility across production, trade, prices, inventories, and logistics. These responses helped preserve continuity. Their limits appeared where continuity depended on additional production, critical industrial inputs, or durable transportation capacity that could not be expanded during the crisis.

Higher prices redirected fertilizer toward higher-paying markets, alternative routes preserved some trade at greater cost and lower throughput, and regional transportation constraints could reduce the value of supply available elsewhere in the system. Farmers absorbed part of the adjustment through higher input costs, while elevated prices contributed to some reductions or deferrals in fertilizer use. Federal authorities faced a similar constraint: transportation and trade measures could improve access to existing supply more quickly than new productive capacity could be created. The system therefore proved more capable of reallocating supply during a disruption lasting several months than of compensating quickly for sustained losses of external supply, critical feedstocks, or transport capacity.

The 2026 stress test leaves a broader strategic question: how far can existing supply, trade, and logistics arrangements preserve fertilizer availability when a disruption lasts longer, affects several parts of the system simultaneously, or constrains an upstream input shared across multiple supply chains?

Part C: Future Scenarios, Risks, and Strategic Opportunities

Persistent disruption does not simply extend the initial shock. It changes the system responding to it. Producers alter output and product mix, traders establish new routes, buyers shift suppliers, and governments adjust trade and transportation policy. Duration alone therefore does not determine severity. New supply and logistics arrangements may reduce exposure over time, while declining inventories, constrained replacement capacity, congestion on alternative routes, or common upstream dependencies can intensify it.

The scenarios that follow examine four ways these pressures could develop: prolonged disruption of fertilizer and feedstock flows through the Strait of Hormuz; stronger competition for natural gas and LNG and its effect on domestic nitrogen economics; tighter cross-sector competition for sulfur and phosphorus inputs; and compound disruption of domestic fertilizer logistics. The scenarios then provide the basis for considering where US policy may need to strengthen productive capacity, preserve alternative supply options, secure critical transport infrastructure, or integrate fertilizer more fully into wider economic security planning.

Table 2: Indicators for Monitoring Scenario Conditions

Scenario	Indicators worth monitoring
1. Prolonged Hormuz disruption	Fertilizer and sulfur throughput through Hormuz; Gulf urea and sulfur export volumes; duration of shipping interruptions; export restrictions by major replacement suppliers; international urea, phosphate and sulfur price spreads; evidence of congestion or declining throughput on alternative routes
2. Tighter US natural gas balance	US gas production growth; storage levels; LNG feedgas demand; power-sector gas consumption; regional pipeline constraints; sustained movement in US gas prices relative to competing fertilizer-producing regions
3. Sulfur and phosphate competition	US and international sulfur prices; refinery and gas processing recovery volumes; sulfur imports and inventories; phosphate-plant operating rates; growth in sulfur-intensive mineral processing; evidence of competing industrial demand for sulfuric acid
4. Compound domestic logistics disruption	Mississippi River restrictions and lock conditions; northbound barge volumes and rates; fertilizer rail carloads and service conditions; regional fertilizer price spreads; inventories in major agricultural regions; simultaneous capacity constraints across river, rail, terminal and trucking networks

Source note: Potential monitoring sources include USDA fertilizer production, trade, inventory, price, and transportation data; EIA natural gas production, storage, demand, and price data; USGS sulfur data; and international fertilizer trade and shipping data.

The scenarios are not assigned probabilities but rather a more operational approach is to monitor indicators showing when the system is moving toward the conditions tested in each scenario.

Scenario 1: Prolonged Hormuz Disruption

A prolonged disruption of the Strait of Hormuz would test whether the adjustments that preserved fertilizer continuity in 2026 can be sustained across another agricultural cycle. Assume roughly a year of severely impaired traffic, with intermittent movements and partial bypasses but no durable return to normal throughput. The question shifts from immediate rerouting toward durability: whether replacement suppliers, inventories, alternative logistics, and product substitution can continue carrying the system after the easiest adjustments have already been used.

The experience of Ukraine shows why persistent disruption can produce a different supply system rather than a prolonged version of the initial shock. Since 2022, Ukrainian commodity exports have shifted among Black Sea routes, Danube ports, rail, road, and the EU Solidarity Lanes.¹¹⁹ By June

¹¹⁹ The EU Solidarity Lanes are river/rail/road routes supported by the EU beginning in 2022 to help Ukraine mitigate loss of Black Sea access due to the Russian invasion.

2026, the Solidarity Lanes had carried around 102 million tonnes of Ukrainian agricultural exports since their creation.¹²⁰ Yet when Black Sea access tightened sharply again in 2026, Ukrainian officials estimated that alternative routes could replace only around half of the affected seaborne capacity and at higher cost.¹²¹ Persistent disruption can therefore generate new infrastructure, trading relationships, and routing capacity without recreating the scale or economics of the original system. For Hormuz, the implication is that adaptation may gradually shift the constraint from the Strait itself toward the ports, land corridors, transloading capacity, insurance, and supplier capacity needed to sustain alternative routes.

For phosphate, duration would test whether the sulfur adjustments observed in 2026 can become durable. Morocco's OCP responded to the initial shortage by drawing on inventories, widening sulfur sourcing, and shifting more production toward phosphate fertilizers that require less sulfur and no ammonia than other commonly traded formulations.¹²² Across another agricultural cycle, inventories provide progressively less protection, alternative sulfur sources face competing demand, and changes in product mix remain constrained by agricultural and commercial requirements. The exposure identified in Part A therefore becomes more consequential with time: geographically separate phosphate suppliers can still face a common constraint when their ability to produce finished fertilizer depends on the same tight industrial input. Supplier diversification offers less protection when the underlying input remains constrained.

Nitrogen would develop differently. The domestic production base provides the US with substantial physical protection, while particular downstream products remain exposed to international replacement markets, as established in Part A. During the initial shock, higher prices and trade reallocation can draw supply from alternative exporters. Across successive agricultural cycles, that adjustment becomes increasingly dependent on whether those producers possess spare capacity rather than merely cargoes that can be redirected. Potash provides the useful contrast. Its principal vulnerabilities lie outside Hormuz, particularly in Canadian production and North American transportation. A prolonged Gulf disruption would therefore deepen the differences among the three nutrient systems rather than produce a common fertilizer-wide exposure.

As the disruption persists, the policy problem also changes. Inventories, supplier substitution, alternative routing, trade flexibility, and changes in fertilizer product mix can extend continuity while unused commercial and logistical capacity remains available. Their leverage declines as the constraint shifts toward limited production, constrained industrial inputs, or saturated alternative transport routes. Successful adaptation may preserve overall throughput while relocating the binding constraint elsewhere in the system, exposing capacity limits that were less visible during the initial disruption. The danger from a prolonged Hormuz disruption is that successive rounds of adaptation consume the easiest alternatives, leaving US fertilizer continuity increasingly dependent on capacity that cannot be created within the next agricultural cycle. The macro-policy question is whether the

¹²⁰ https://transport.ec.europa.eu/news-events/news/solidarity-lanes-latest-figures-june-2026-2026-07-27_en

¹²¹ <https://www.reuters.com/world/ukraine-turns-alternative-grain-export-routes-counts-losses-russia-blocks-ports-2026-08-04/>

¹²² <https://www.reuters.com/world/africa/moroccan-fertilisers-maker-ocp-raises-15-billion-hybrid-bond-2026-04-16/>

US has enough diversity across supply, industrial inputs, processing, and transportation to avoid repeated dependence on emergency measures as the disruption persists.

Hormuz also creates a separate exposure through global energy markets. Domestic nitrogen plants may remain physically available while stronger competition for natural gas changes their cost position. Scenario 2 examines how rising LNG and domestic gas demand could alter that advantage even without a physical disruption to US nitrogen capacity.

Scenario 2: A Tighter US Natural Gas Balance

US nitrogen resilience depends partly on whether the natural gas system can continue supporting domestic fertilizer production at competitive cost as other sources of demand grow. Current conditions do not indicate an immediate tightening of that system. EIA's August 2026 outlook expects US natural gas production to continue rising, with relatively high inventories helping moderate prices despite further growth in consumption and LNG exports.¹²³ This scenario therefore assumes a less favorable balance: demand grows faster for a sustained period than domestic production and the infrastructure needed to move additional gas can respond. The strategic risk is a gradual erosion of the cost advantage that has supported US nitrogen production.

Continued expansion of LNG exports creates one source of additional demand. LNG export terminals draw natural gas from the domestic pipeline system as feedgas before liquefying it for shipment overseas. EIA reports that US developers have announced substantial additions to liquefaction capacity through 2029, concentrated principally on the Gulf Coast.¹²⁴ This does not mean that each unit of new export capacity removes an equivalent quantity of gas from domestic users. Gas production and transportation infrastructure have so far been able to expand in anticipation of additional demand, and substantial pipeline investment is already under construction in Texas and Louisiana to move growing production toward LNG terminals and other consumers.¹²⁵ EIA's longer-term outlook similarly projects significant growth in US natural gas production as domestic and international demand rises, while identifying additional pipeline construction as necessary to move that supply toward major consuming regions.¹²⁶ The fertilizer exposure develops when growth in demand persistently outruns this supply and infrastructure response.

Industrial Energy Consumers of America (IECA) presents a more adverse view of that balance. IECA argues that expanding LNG export capacity can accelerate winter inventory withdrawals and increase pressure on domestic natural gas prices, while insufficient pipeline capacity and rising transportation costs can leave industrial consumers more exposed during periods of high demand.¹²⁷ These claims represent the position of industrial energy consumers rather than an EIA forecast, but they identify the downside mechanism relevant to fertilizer: LNG demand becomes more consequential for nitrogen production when gas production, storage, and pipeline capacity do not expand sufficiently alongside it.

¹²³ <https://www.eia.gov/outlooks/steo/report/natgas.php>

¹²⁴ <https://www.eia.gov/todayinenergy/detail.php?id=66384>

¹²⁵ <https://www.eia.gov/todayinenergy/detail.php?id=67707>

¹²⁶ <https://www.eia.gov/pressroom/releases/press587.php>

¹²⁷ <https://www.ieca-us.org/wp-content/uploads/Cicio-12.pdf>

Rapid electricity-demand growth could add another source of pressure, including demand associated with AI and data centers. Data centers principally consume electricity, so their relevance to fertilizer runs through the power system rather than through direct competition for natural gas. EIA tested a case in which electricity demand grows faster than expected while generating capacity remains limited to projects already anticipated through 2027. Under those conditions, existing natural gas plants supply a substantial share of the additional generation: gas-fired generation rises 7.3% between 2025 and 2027 in the higher-demand case, compared with 1.7% in EIA's baseline.¹²⁸ This is a sensitivity rather than a forecast that AI growth will produce that outcome. Additional power generation, gas production, pipelines, and other energy resources can respond over time. The significance for fertilizer is narrower: unusually rapid growth in electricity demand can increase the call on the domestic gas system if power-sector capacity does not expand quickly enough.

For nitrogen fertilizer, the initial effect of a tighter gas balance would be economic rather than physical. Domestic plants could remain capable of operating while higher natural gas costs narrowed the US cost advantage supporting nitrogen production. Part A showed that this relationship has been relevant before: sustained periods of high US gas prices weakened domestic ammonia production economics, while the subsequent expansion of lower-cost shale gas helped restore domestic capacity. Natural gas can account for roughly 70-80% of the operating cost of ammonia and urea production, making feedstock prices a major determinant of competitiveness.¹²⁹ Access to relatively low-cost US gas therefore places domestic producers competitively on the global nitrogen cost curve and can offset higher costs elsewhere in the production system. The advantage is relative rather than universal: Gulf producers also benefit from low-cost natural gas, while most Chinese ammonia production relies on coal.¹³⁰ The relevant comparison is therefore not the US gas price in isolation but the position of US producers relative to competitors abroad. Higher domestic gas prices would not necessarily weaken US nitrogen competitiveness if competing producers faced still greater cost increases. The more consequential scenario is a sustained narrowing of the US gas-cost advantage, because that would reduce the economic protection provided by domestic production even while the plants themselves remained available.

The scenario changes the meaning of domestic fertilizer capacity. Additional nitrogen manufacturing strengthens economic security most when the energy system supporting that capacity can also respond to rising demand. The policy issue is therefore more than whether LNG exports or AI-related electricity growth should be constrained to protect fertilizer. It is whether US natural gas production and infrastructure remain sufficiently responsive for export, power, and other domestic demand to grow without materially weakening the economics of domestic nitrogen production. Natural gas provides an important contrast with sulfur because gas production can respond more directly to sustained demand and investment. Scenario 3 examines the consequences of stronger competition for an industrial input whose supply is less responsive.

Scenario 3: Cross-Sector Competition for Sulfur and Phosphate Processing

A fertilizer system can become less resilient before it becomes physically short of sulfur. If sulfur-intensive mineral processing absorbs a larger share of available supply, fewer cargoes, inventories,

¹²⁸ <https://www.eia.gov/todayinenergy/detail.php?id=67344>

¹²⁹ <https://www.iea.org/commentaries/how-the-energy-crisis-is-exacerbating-the-food-crisis>

¹³⁰ <https://www.iea.org/reports/ammonia-technology-roadmap/executive-summary>

and alternative sources remain available for redirection when fertilizer producers lose a major supplier. Phosphate-based battery supply chains create a different exposure. They do not compete directly for finished fertilizer, but they introduce another strategic use for phosphate resources and higher-purity processing capacity.

The sulfur mechanism was visible during the 2026 disruption. Indonesian nickel processors and African copper producers joined fertilizer manufacturers in seeking replacement sulfur as Gulf supply tightened. Reuters found that the exposure depended on the production method: some mineral processors relied heavily on purchased sulfur or sulfuric acid, while others were partly protected because their own smelting operations produced acid.¹³¹ Expansion of the sulfur-intensive processing routes would therefore create a larger non-agricultural claim on the same material fertilizer producers seek during disruption. It would not need to displace normal fertilizer consumption to weaken resilience. A larger share of sulfur committed elsewhere would leave less supply available for reallocation when fertilizer production comes under pressure.

Sulfur supply cannot quickly adjust to that competition. Because much of the material is recovered from oil refining and natural gas processing rather than produced primarily in response to sulfur demand, higher prices can redistribute available supply faster than they can expand it. The result can be a market that remains adequately supplied in normal conditions but has progressively less room to absorb a disruption. The 2026 shortage also showed how quickly that pressure can move into trade policy. China moved to halt sulfuric-acid exports while seeking to protect domestic fertilizer availability, reducing an alternative source for mineral processors abroad.¹³² In a scenario where US and allied mineral-processing capacity also expands, stronger critical-mineral supply chains could therefore increase demand for an input required by phosphate fertilizer. The relevant constraint is whether sulfur availability grows alongside both systems.

Phosphate-based batteries present a more prospective form of cross-sector exposure. Fertilizer and battery production begin from the same phosphate resource but diverge into different processing chains, with battery applications requiring further purification. The International Energy Agency identifies the refining of phosphate rock into battery-grade purified phosphoric acid as a potential supply bottleneck and projects a deficit as early as 2030 under its stated-policy scenario. China currently produces about three-quarters of the global supply of this battery-grade material.¹³³ This does not establish that battery manufacturers are currently diverting phosphate from fertilizer production. It shows that phosphate resources are beginning to support another strategically important industrial chain. Additional battery demand could encourage investment in phosphate production and processing, but it could also reduce the flexibility available to agriculture if upstream supply or the earlier stages of phosphoric-acid production become constrained.

Sulfur and phosphate therefore present different versions of the same economic security problem. Sulfur already shows how growth in another strategic industry can reduce the supply available for

¹³¹ <https://www.reuters.com/world/asia-pacific/gulf-disruption-squeezes-indonesia-nickel-makers-sulphur-supply-2026-03-06/>

¹³² <https://www.reuters.com/markets/commodities/iran-wars-sulfurous-fallout-spreads-copper-nickel-2026-04-17/>

¹³³ <https://www.iea.org/reports/global-critical-minerals-outlook-2025/beyond-nmc-batteries-supply-chain-issues-for-emerging-battery-technologies>

fertilizer adjustment during disruption. Phosphate presents a longer-term question as agriculture and battery manufacturing increasingly draw on the same upstream resource while requiring different downstream processing. Domestic fertilizer capacity provides stronger protection when the industrial inputs and processing systems supporting it can expand alongside demand from other strategic sectors. Otherwise, strengthening one supply chain can leave less flexibility in another without producing an obvious shortage during normal market conditions.

The first three scenarios examine external supply disruption, the economics supporting domestic production, and competition for shared industrial inputs. Fertilizer can still be physically available within the US and fail to reach agricultural markets at the required time and scale. Scenario 4 examines a compound disruption of domestic fertilizer logistics.

Scenario 4: Compound Domestic Fertilizer Logistics Disruptions

Fertilizer supply can remain adequate nationally but fail regionally when several supply streams depend on the same domestic transportation network. Consider a major disruption to northbound fertilizer movements on the Mississippi River System coinciding with severe rail-service constraints during a period of high seasonal fertilizer demand. Domestic production, imports, and inventories remain available, while the capacity needed to move that supply into affected agricultural regions contracts at the point when demand is most concentrated.

Recent experience shows that pressure on these modes can overlap. During spring flooding in 2023, high water halted barge traffic on parts of the Upper Mississippi and restricted upbound movements at the same time that fertilizer rail carloads reached their highest weekly level since federal collection began in 2017. USDA reported 6,550 fertilizer carloads for the week ending May 2023 and noted that the increase occurred amid restricted upbound Mississippi barge traffic, alongside lower fertilizer prices and higher corn plantings.¹³⁴ The coincidence shows that river constraints can emerge while rail is already handling unusually high fertilizer volumes, reducing the capacity available to absorb additional diversions.

Separate disruptions show how either mode can lose additional capacity. In August 2024, Canada's two major freight railways shut down during a labor dispute. USDA highlighted the implications for US fertilizer supply because Canada is a major source of potash, sulfur, ammonia, and other fertilizers that move predominantly by rail.¹³⁵ In September 2025, low water on the Mississippi led to draft and tow restrictions that USDA said reduced barge capacity, including tighter restrictions on northbound traffic such as fertilizer.¹³⁶ A compound disruption would place these constraints within the same seasonal period, leaving less transport capacity available to compensate for pressure elsewhere in the network.

River and rail can also form successive stages of the same fertilizer movement. USDA describes fertilizer imports entering through New Orleans, traveling north by barge to St. Louis, and transferring there to rail for distribution to rail-served warehouses. The St. Louis Municipal River Terminal connects to all of the six Class I railroads.¹³⁷ A river disruption can reduce the volume reaching the

¹³⁴ <https://www.ams.usda.gov/sites/default/files/media/GTR05182023.pdf>

¹³⁵ <https://www.ams.usda.gov/sites/default/files/media/GTR08222024.pdf>

¹³⁶ <https://www.ams.usda.gov/sites/default/files/media/GTR09252025.pdf>

¹³⁷ <https://www.ams.usda.gov/sites/default/files/media/GTR01232025.pdf>

transfer point, while rail disruption can delay fertilizer after the barge movement has been completed. Diversion requires suitable equipment, terminals, network connections, receiving capacity, and unused throughput elsewhere. The presence of an alternative route provides limited protection when that route lacks enough spare capacity to absorb a large seasonal shift in volume.

Seasonality limits the value of later recovery. Annual transportation capacity can remain adequate while available throughput during a major fertilizer application period falls short. Fertilizer delivered after the relevant agricultural window cannot fully replace material that failed to arrive when required. Higher prices can redirect some supply toward the affected region, while short-run delivery remains bounded by available railcars, barges, terminals, transfer facilities, and network capacity. A compound logistics failure can convert adequate national supply into regional scarcity without reducing US fertilizer production or imports.

Domestic production and imports from several suppliers can still converge on common river reaches, transfer terminals, rail corridors, and regional distribution networks. Additional production, foreign suppliers, and inventories provide less protection when those shared links lose capacity during the same application period. Fertilizer can be abundant nationally and scarce regionally when diversified supplies depend on transport corridors that lose capacity during the agricultural window in which those supplies are needed.

Strategic Opportunities

The scenarios identify several capabilities that determine fertilizer continuity before a disruption begins: productive and processing capacity, access to alternative supply, and transportation systems able to deliver fertilizer during periods of concentrated agricultural demand. Federal policy has begun to strengthen parts of this system. The remaining opportunity is to connect strategic designation and public investment more directly to the capabilities whose absence would constrain supply during a prolonged disruption.

The opportunities differ in the constraint they address, the speed with which they can affect fertilizer security, and the costs and limitations associated with their use. Table 3 summarizes those differences before the sections that follow examine each opportunity in greater detail.

Table 3: Strategic Fertilizer Policy Opportunities and Tradeoffs

Strategic opportunity	Primary constraint addressed	Main policy effect	Time horizon	Principal tradeoff or limitation
1. Convert strategic designation into operating capacity	Insufficient or concentrated production and processing capacity	Adds domestic productive capability and alternative supply	Medium to long term	Capital intensive; projects take years to develop and must remain commercially viable outside crisis conditions

2. Secure critical fertilizer corridors	Dependence on common ports, waterways, terminals, rail corridors, and transfer points	Protects or expands the throughput needed to move fertilizer during seasonal peaks and disruption	Medium to long term	Infrastructure investment is costly, location-specific, and often serves multiple sectors rather than fertilizer alone
3. Preserve multiple supply options	Concentrated foreign suppliers, trade barriers, or disruption of particular production pathways	Broadens access to replacement supply and increases sourcing flexibility	Short to medium term	Additional suppliers provide limited protection when they depend on the same upstream input, chokepoint, or domestic logistics network
4. Avoid new upstream bottlenecks from strategic industrial expansion	Competition for natural gas, sulfur, and other shared industrial inputs	Aligns expansion of downstream strategic industries with the upstream capacity needed to support them	Medium to long term	Additional upstream capacity may require significant investment and coordination across energy, minerals, agriculture, and industrial policy
5. Improve fertilizer-use efficiency	Exposure created by the amount of fertilizer required to support agricultural production	Reduces fertilizer requirements at the margin through more efficient nutrient application	Short to medium term, with cumulative benefits	Effects vary by crop, soil, weather, technology, and existing farm practices; efficiency cannot substitute for reliable physical supply

Opportunity 1: From Critical-Mineral Designation to Operating Capacity

With phosphate and potash now included on the US Critical Minerals List, the policy task is to convert identified supply vulnerabilities into operating capacity where additional production would materially strengthen fertilizer continuity. Strategic designation can elevate a problem within federal policy, while actual resilience depends on whether viable mining, processing, and manufacturing projects can secure financing and reach operation.

The Payne Institute's work on mineral bankability provides a useful lens. Strategically important projects can still face financing constraints arising from production pathways, market structure, expected revenues, or other commercial conditions.¹³⁸ For fertilizer, that logic supports selective federal intervention where a project addresses an identified supply constraint and public participation can overcome a specific barrier to otherwise credible capacity. Strategic importance alone provides insufficient grounds for support.

FIELDS provides an initial mechanism for moving from strategic concern toward additional fertilizer production. USDA is directing public funds toward new or expanded process-manufacturing capacity while prioritizing technically feasible, financially viable projects with other funding already identified.¹³⁹ Whether the program needs to be expanded should depend on the quality and scale of the project pipeline and on whether credible projects remain constrained after the initial awards. The current program provides at least \$500 million, with individual awards capped at \$150 million, making it potentially significant for facility expansions and other projects where federal participation can unlock additional investment.¹⁴⁰ Larger mining and processing projects may require complementary forms of federal financing. The Michigan Potash project, for example, received a conditional DOE loan guarantee of up to \$1.26 billion, illustrating the capital required to develop new primary production at scale.¹⁴¹ Future federal support should remain concentrated on projects that add usable supply, reduce dependence on difficult-to-replace production pathways, or remove a known processing constraint. Its value should ultimately be judged by whether strategically useful capacity reaches operation and expands the supply options available during disruption.

Opportunity 2: Securing Critical Fertilizer Corridors

Recent fertilizer-specific federal measures have concentrated on additional productive capacity and short-run transportation flexibility. FIELDS can finance logistics associated with new manufacturing capacity, although logistics cannot constitute the primary purpose of a project.¹⁴² The 2026 transportation measures increased the flexibility of existing shipping and trucking capacity during disruption. International corridors such as the Strait of Hormuz and Black Sea routes present a harder problem because their availability depends on geopolitical and security conditions largely outside US fertilizer policy. Their disruption increases the value of alternative suppliers and routes, but those alternatives still depend on domestic ports, waterways, terminals, and rail networks once supply reaches the US. Durable capacity at the river, port, terminal, and rail infrastructure on which fertilizer distribution depends remains principally a matter for broader freight and waterways policy.

¹³⁸ <https://payneinstitute.mines.edu/from-criticality-to-bankability-a-structural-taxonomy-for-strategic-minerals/>

¹³⁹ <https://www.rd.usda.gov/programs-services/business-programs/fertilizer-investment-expansion-long-term-domestic-supply>

¹⁴⁰ <https://www.rd.usda.gov/programs-services/business-programs/fertilizer-investment-expansion-long-term-domestic-supply>

¹⁴¹ <https://www.energy.gov/edf/articles/lpo-announces-conditional-commitment-michigan-potash-produce-fertilizer-us-farmers>

¹⁴² <https://www.rd.usda.gov/programs-services/business-programs/fertilizer-investment-expansion-long-term-domestic-supply>

Domestic production and imports from different suppliers can converge on common river reaches, ports, transfer terminals, and rail corridors before reaching agricultural markets.¹⁴³ Seasonal demand increases the consequences of losing capacity at those locations because delays during a major application period cannot always be recovered through later delivery. Federal freight and waterways planning should give greater weight to infrastructure whose disruption would materially constrain fertilizer deliveries into major agricultural regions or reduce the ability to redirect supply during a disruption.

The practical route is to incorporate fertilizer continuity into existing federal decisions on inland waterways, ports, freight corridors, and major transfer points where agricultural dependence is substantial. Maintenance, rehabilitation, and capacity investment at these locations can increase the resilience value of production expansion and diversified imports by preserving the domestic throughput needed to move additional supply when normal distribution patterns are disrupted.

Opportunity 3: Preserving Multiple Supply Options

The 2026 phosphate response showed why foreign supply remains part of fertilizer resilience even as domestic capacity expands. Temporary duty relief removed a policy-created component of the landed cost of qualifying Moroccan fertilizer at a time when additional US manufacturing capacity could not become available within the agricultural season.

The measure improved the terms on which existing foreign production could reach the US market, while its eventual effect on import volumes and prices depends on subsequent commercial response.¹⁴⁴ Preserving supply options requires attention to the independence of those options. Additional suppliers provide less protection when they depend on the same constrained industrial input, maritime chokepoint, or domestic distribution corridor. Phosphate provides the clearest example: geographically separate producers can still face common sulfur constraints, limiting the amount of replacement fertilizer available during a prolonged disruption. Trade and sourcing policy should therefore consider whether alternative suppliers broaden the production and logistics pathways available to the US, as well as whether they increase the number of countries from which fertilizer can be purchased.

Existing emergency trade authorities should remain available for selective use when policy-created barriers materially restrict access to replacement fertilizer during a severe disruption. The 2026 phosphate action provides one model for temporary relief tied to a defined supply emergency.¹⁴⁵ Maintaining several commercially usable supply channels alongside domestic capacity gives the US more room to redirect purchases when production, upstream inputs, or trade routes are disrupted.

Opportunity 4: Expanding Strategic Industries Without Creating New Input Bottlenecks

Federal support for strategic industrial expansion can intensify cross-sector exposure when it increases demand for an upstream input faster than supply can respond. Natural gas and sulfur

¹⁴³ <https://www.ams.usda.gov/sites/default/files/media/GTR01232025.pdf>

¹⁴⁴ <https://www.whitehouse.gov/presidential-actions/2026/06/declaration-of-emergency-and-authorization-for-temporary-duty-free-importation-of-phosphate-fertilizer-morocco/>

¹⁴⁵ <https://www.whitehouse.gov/presidential-actions/2026/06/declaration-of-emergency-and-authorization-for-temporary-duty-free-importation-of-phosphate-fertilizer-morocco/>

present two distinct cases for fertilizer. Growth in demand on the gas system can affect the economics of domestic nitrogen production, while sulfur-intensive mineral processing can reduce the supply available for reallocation to phosphate producers during disruption.

Natural gas can respond to sustained demand through additional production and pipeline capacity. Scenario 2 highlighted that pressure on domestic nitrogen economics emerges when growth in LNG feedgas, power-sector, and other demand persistently outruns that response. Where federal decisions materially enable additional demand on the gas system, the associated requirements for production and transportation capacity should be considered alongside that expansion.^{146 147} Keeping gas supply and infrastructure responsive would help preserve the feedstock advantage supporting domestic nitrogen production as other demand grows.

Sulfur presents a harder constraint. Much of its supply is recovered from oil refining and natural gas processing, so stronger downstream demand does not quickly generate additional material. Expansion of sulfur-intensive mineral processing can increase the claim on the same supply fertilizer producers seek during disruption. Where federal policy materially supports such processing, the resulting sulfur demand should be considered alongside available recovery, alternative sources, and logistics.¹⁴⁸

Additional downstream capacity can reduce one strategic dependence while increasing another when common upstream supply remains constrained. US economic security policy should account for these cross-sector effects when supporting major industrial expansion. For natural gas, fertilizer resilience depends partly on production and pipeline capacity keeping pace with demand. For sulfur, it depends more heavily on recovery, sourcing diversity, and logistics because supply responds less directly to higher demand and investment.

Opportunity 5: Improving Fertilizer Use Efficiency

Fertilizer resilience can also be strengthened by improving how efficiently available nutrients are used. USDA's nutrient-management framework emphasizes matching nutrient source, rate, timing, and placement to crop and field conditions. Soil and plant testing, precision and variable-rate application, split nutrient applications, and other nutrient-management practices can improve nutrient-use efficiency and reduce avoidable losses.¹⁴⁹ Existing USDA conservation programs and technical-assistance systems provide channels through which these practices can be adopted more widely.¹⁵⁰

The economic security value of greater nutrient use efficiency differs from additional production or inventories. It does not create fertilizer supply, and its effect on fertilizer requirements varies by crop, soil, weather, technology, and existing farm practice. It can nevertheless reduce exposure at the margin by allowing agricultural output to be supported with more efficient use of available nutrients

¹⁴⁶ <https://www.eia.gov/outlooks/steo/report/natgas.php>

¹⁴⁷ <https://www.eia.gov/todayinenergy/detail.php?id=67707>

¹⁴⁸ <https://www.reuters.com/markets/commodities/iran-wars-sulfurous-fallout-spreads-copper-nickel-2026-04-17/>

¹⁴⁹ <https://www.nrcs.usda.gov/getting-assistance/other-topics/nutrient-management>

¹⁵⁰ <https://www.nrcs.usda.gov/resources/guides-and-instructions/nutrient-management-ac-590-conservation-practice-standard>

and by reducing fertilizer requirements where application exceeds agronomic need. During periods of high prices or constrained supply, those gains can increase the flexibility available to producers without relying solely on additional physical supply.¹⁵¹

Demand side efficiency should therefore complement rather than substitute for reliable production, diversified sourcing, inventories, and transportation capacity. Its strategic value lies in reducing the amount of supply-system capacity required to meet agricultural needs where efficiency gains are economically and agronomically viable.

Conclusion

US fertilizer security depends on the performance of a wider supply system than domestic production alone. Nitrogen, phosphate, and potash each combine different levels of domestic capacity, import dependence, exposure to energy and industrial inputs, and reliance on transportation. Nitrogen benefits from a strong domestic production base but remains sensitive to natural gas economics and international market conditions. Phosphate depends on sulfur, ammonia, processing capacity, and access to external supply as well as domestic phosphate rock. Potash remains heavily dependent on concentrated foreign production, principally in Canada. Across all three nutrients, supply has limited value if the required product cannot reach agricultural markets during the relevant application period. Aggregate import dependence is therefore an incomplete measure of fertilizer security; exposure also depends on the concentration and replaceability of individual products, suppliers, industrial inputs, and transportation pathways.

The 2026 crisis highlighted that existing supply can be reallocated or made more accessible much faster than new capability can be created. Commercial markets redirected cargoes, drew on inventories, changed routes, repriced scarcity, and reduced or deferred some demand. Federal measures increased transportation flexibility and reduced a policy barrier to Moroccan phosphate supply, while FIELDS targeted domestic manufacturing capacity over a longer horizon. Inventories can bridge some temporary disruptions, but they do not replace production, processing inputs, external supply, or transport infrastructure. As a disruption persists, the room for short-run adjustment narrows as inventories are drawn down, alternative routes become constrained, and redirectable supply is committed elsewhere.

Persistent disruption, whether geopolitical, trade, market, or infrastructure driven, can therefore expose weaknesses that remain manageable during a shorter shock. Domestic production can remain physically available while tighter natural gas conditions weaken the economics of nitrogen production. Greater sulfur demand from mineral processing can reduce the spare supply available for reallocation to phosphate producers during disruption. Adequate national fertilizer supply can become regionally scarce when river, rail, terminal, or other transport capacity is constrained during a major application period. Resilience therefore depends on sufficient capacity and independent alternatives across upstream inputs, production and processing, foreign sourcing, and domestic logistics.

¹⁵¹ <https://www.usda.gov/about-usda/news/press-releases/2022/08/15/usda-announces-new-opportunities-improve-nutrient-management>

Strategically useful fertilizer projects need to reach operating capacity. Critical river, port, terminal, and rail infrastructure needs sufficient reliability and throughput to move fertilizer during periods of concentrated demand. Foreign sourcing should preserve commercially usable alternatives that broaden the production and logistics pathways available to the US. Federal support for other strategic industries should account for shared inputs such as natural gas and sulfur when additional demand could weaken fertilizer resilience. Greater fertilizer-use efficiency can complement these supply-side measures by reducing fertilizer requirements where efficiency gains are economically and agronomically viable. Together, these priorities would leave the US fertilizer system better able to absorb prolonged disruption before supply constraints reach a critical agricultural application period, reducing dependence on emergency measures once a crisis is already underway.

Limitations

The 2026 fertilizer disruption remains ongoing, and the full effects of recent federal measures, including temporary phosphate duty relief and FIELDS, cannot yet be established. National supply and trade data can also obscure important differences among individual fertilizer products and regional agricultural markets. The scenarios in Part C test how identified vulnerabilities could develop under persistent disruption; they are not forecasts of the probability or timing of those events. The analysis does not estimate the full economic cost of each scenario or the fiscal and market effects of the policy options considered.

Author Bios

Kruthika Anastasia Bala is the managing director of Resources Now, leading advisory work at the intersection of global energy systems, industrial development, and geopolitics, supporting organizations across energy markets, metals and minerals value chains, infrastructure, and industrial sectors as they navigate geopolitical risk, energy security pressures, and the structural shifts reshaping long-term investment decisions. Previously, she held leadership roles at JS Held, Eurasia Group, and Frost & Sullivan, where she led advisory engagements on market and geopolitical risk across energy supermajors, national oil companies, mining firms, industrial technology companies, financial institutions, and commodity traders. She holds an MSc in Energy Policy from the University of Sussex, Science Policy Research Unit (SPRU), a BSc in Physics from Bharathidasan University, and is a Fellow of the Energy Institute.

Robert (“RJ”) Johnston is the Director of Energy and Natural Resources at the University of Calgary School of Public Policy and a Senior Fellow at the Hamm Institute for American Energy. He is also a Senior Fellow at the Colorado School of Mines Payne Institute on Public Policy. Previously, he was Senior Director of Research at the Center on Global Energy Policy at Columbia University. RJ founded and served as Managing Director of the Eurasia Group’s Energy, Climate, and Resources practice from 2006 to 2021, and served as the firm’s CEO from 2013 to 2018. RJ is a board member of the Alberta Chamber of Resources and is an advisory board member for Nordea Investment Management energy transition funds. He co-authored the Aspen Institute Task Force on US Critical Minerals Policy and was previously a Research Fellow at the Atlantic Council Global Energy Center. RJ holds a doctorate in international relations from American University.

**Energy security for
America and our allies.**



**Hamm Institute
for American Energy**

OKLAHOMA STATE UNIVERSITY

[Hamminstitute.org](https://hamminstitute.org)

info@hamminstitute.org