

Hormuz effect: When energy, fertilizer and food collide

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The ongoing disruption to the Strait of Hormuz has emerged as a major shock to global commodity flows, with implications for energy, agriculture, and food security. According to Máximo Torero of the Food and Agriculture Organization of the United Nations, tanker traffic through the corridor has dropped by more than 90 percent within days of the escalation. The strait typically carries around 20 million barrels of oil per day—about 35 percent of global crude flows—along with significant volumes of liquefied natural gas and fertilizers.

Speaking at a United Nations briefing, Torero described the situation as a systemic shock affecting global food systems, not just energy markets. He highlighted the Gulf region's role in supplying nearly half of global sulfur, a key input in phosphate fertilizer production. Disruptions to sulfur flows could impact fertilizer output worldwide, including in major agricultural economies. Shipping challenges have intensified due to surging war-risk insurance premiums, with recovery expected to take months even if tensions ease.

Systemic Shock Transmission

To what extent does the disruption of the Strait of Hormuz represent a new class of systemic risk, where energy, fertilizer, and food supply chains converge into a single point of failure?

The Strait of Hormuz is the world's most concentrated chokepoint for simultaneously disrupting energy, fertilizer, sulfur, and agrifood systems. Under normal conditions, it carries roughly 20 million barrels of oil per day (one-quarter of global seaborne oil), one-fifth of global LNG, and up to 30 percent of internationally traded fertilizers. The current conflict has collapsed tanker traffic by more than 90 percent within days, stalling an estimated 3-4 million tonnes of fertilizer trade per month.

What makes this a *new class* of systemic risk is the convergence of three interdependent chains:

Energy – oil and gas prices spiked 20-35 percent (Brent) and 50-75 percent (European gas).

Fertilizer – no strategic reserves exist; urea prices rose 19 percent in one week.

Sulfur – essential to produce phosphate fertilizer.

Food – Gulf countries import 70-90 percent of their food, and import-dependent nations face immediate yield threats.

Because natural gas is the feedstock for nitrogen fertilizers, and sulfur (half of global trade passes through Hormuz) is essential for phosphate processing, a single disruption simultaneously raises fuel costs, fertilizer prices, and transport expenses. The FAO notes that "there are no large strategic fertilizer reserves comparable to oil stocks," so any sustained interruption quickly elevates global food inflation. This convergence turns a maritime chokepoint into a single point of failure for the entire agrifood value chain.

Fragility vs. Resilience of Globalization

Does this crisis fundamentally challenge the assumption that globalized agricultural supply chains are efficiency-maximizing, but structurally fragile in the face of geopolitical shocks?

Global supply chains are needed to assure all countries have access to the diversity of food that is required and to use our natural resources optimally. Although it is true that on the inputs there are shock points that increase the risks for global supply chains but will be the same for local supply chains. The FAO analysis shows that the current globalized system delivered low costs and just-in-time efficiency in peacetime, but the Hormuz disruption exposes its structural fragility. Within days, a conflict in one region removed a quarter of global oil trade, one-third of fertilizer trade, and a major share of food demand from the Gulf.

The document highlights that the Gulf States' high import dependency (70-90 percent for staples) was sustainable only when trade routes were open. Once the strait closed, their strategic grain reserves (4-6 months) became a finite buffer, not a solution. Similarly, fertilizer-importing countries like Bangladesh (53 percent Gulf dependency) and Kenya (40 percent) face immediate shortages with no alternative supply chain ready.

The FAO's modeling of a "policy inaction baseline" shows that without coordinated intervention, real household income in Gulf countries could decline 14-18 percent, and global cereal producer income could drop nearly 5 percent. This is not a temporary inefficiency; it is a structural vulnerability built into efficiency-maximized, highly concentrated supply chains. The crisis therefore challenges the assumption that globalization's benefits automatically outweigh its geopolitical risks.

Fertilizer Dependency Trap

Given the heavy reliance on energy-linked fertilizers, are we approaching a structural ceiling in yield growth, where input dependency itself becomes the primary constraint on global food security?

The evidence points toward a growing constraint, not yet a hard ceiling, but dangerously close in many regions. Nitrogen fertilizers are produced from natural gas, and the Persian Gulf is a low-cost producer. When energy prices spike, fertilizer prices follow directly. The FAO estimates that if the crisis continues, global fertilizer prices could average 15-20 percent higher in the first half of 2026.

The "dependency trap" operates through three mechanisms:

Cost-driven reduction – Farmers facing high prices apply less fertilizer, reducing yields.

No strategic reserves – Unlike oil, there is no global fertilizer stockpile to smooth shocks.

Nonlinear yield response – In low-input systems (e.g., sub-Saharan Africa at 20 kg/ha), even small cuts cause disproportionately large output losses.

The FAO's scenario modeling shows that cereal producers suffer the deepest income losses (up to 4.78 percent globally) because they are the most fertilizer-intensive. Without a shift toward alternative nitrogen sources (e.g., green ammonia) or more efficient use, input dependency will increasingly cap yield growth, especially in import-dependent, low-income countries.

Nonlinear Yield Risk

How should policymakers internalize the nonlinear relationship between fertilizer use and crop yields, particularly in low-input economies where marginal reductions could trigger disproportionate output losses?

Policymakers must treat the fertilizer-yield relationship as a *quadratic cliff*, not a linear curve. The FAO provides a clear example: In Sri Lanka (2021), a ban on synthetic fertilizer imports led to rice production collapsing by 20–50 percent depending on the season, with the Maha harvest dropping approximately 40 percent year-on-year. Similarly, in sub-Saharan Africa, where farmers apply less than 20 kg of nitrogen per hectare (one-seventh of the global average), a small absolute reduction in fertilizer use can cut yields by a large percentage because soils are already nutrient-depleted.

To internalize this risk, policymakers should:

Target temporary subsidies – to low-input farmers first, protecting the most vulnerable yield responses.

Create buffer stocks – of fertilizers for smallholder sectors, not just for commercial farms.

Integrate nonlinear response functions – into early warning systems – the FAO's MIRAGRODEP model already does this, but national agencies need similar tools.

Avoid one-size-fits-all reductions – a 10 percent cut in a high-input system (e.g., Brazil) may reduce yields 5–10%, but the same absolute cut in a low-input system could reduce yields 20–30 percent.

The potential impact IF THE CRISIS CONTINUES MORE THAN A MONTH is most severe in regions like Sub-Saharan Africa and South Asia – precisely because of this nonlinearity.

Energy-Food Price Coupling

Is the current crisis accelerating a long-term decoupling or deeper entrenchment of the energy-food price nexus, especially as biofuel demand rises alongside oil prices?

The crisis is **deepening the entrenchment** of the energy-food price nexus. Three channels reinforce coupling:

Fertilizer feedstock – Nitrogen fertilizer prices move directly with natural gas prices. The FAO notes that “because nitrogen fertilizer production relies heavily on natural gas as a feedstock, the rise in energy prices has further amplified production costs.”

Biofuel demand – Higher oil prices increase the profitability of ethanol and biodiesel. The FAO states: “Higher oil prices increase the profitability of ethanol and biodiesel production, raising demand for feedstocks such as maize, soybean oil, and palm oil. As a result, volatility in energy markets can rapidly transmit to food markets.” US corn futures have already risen on record ethanol output.

Transport and logistics – Higher fuel costs increase irrigation, storage, and shipping expenses, which are passed on to food prices.

There is no sign of decoupling in the FAO's analysis. Instead, the document warns that “a sustained shift toward biofuels could divert crops from food production, amplifying price volatility in 2027 and beyond.” In the long-term scenario, the energy-food nexus remains tightly linked, with global household welfare still 1.45 percent lower than baseline by 2030.

Strategic Autonomy in Agriculture

Should nations now treat food production and input supply chains as strategic assets, similar to semiconductors or defense, and what would a credible roadmap to such autonomy look like?

FAO's policy recommendations implicitly elevate food and input chains to strategic status. The document states that agrifood systems will also need to be treated with the same strategic importance as energy and transport.

A credible roadmap, drawn from the FAO's short-, medium-, and long-term measures, would include:

Short-term (0-6 months):

Develop alternative trade routes (pipelines, rail corridors, alternative ports).

Provide emergency financing to farmers to avoid liquidity-driven planting cuts.

Create targeted fertilizer stockpiles for critical seasons.

Medium-term (6 months - 2 years):

Diversify import sources away from single chokepoints (e.g., from North Africa, Latin America).

Invest in regional reserve-sharing agreements.

Avoid export restrictions that amplify shocks.

Long-term (2-10 years):

Sustainable fertilizer production – The FAO explicitly mentions green ammonia initiatives to decouple nitrogen from fossil gas.

Renewable energy investments – to reduce reliance on Gulf oil and gas.

Domestic agricultural expansion – where feasible, combined with input-saving technologies.

Structural adjustments – to cope with persistent price volatility and biofuel-driven demand shifts.

The FAO emphasizes that diplomatic efforts to reopen the Strait of Hormuz remain the single most effective step, but strategic autonomy requires parallel investment in alternative supply chains and local production capacity.

Policy Coordination vs. Protectionism

Historically, crises trigger export bans and hoarding. What mechanisms can realistically prevent policy fragmentation and protectionist reflexes from amplifying this shock?

The FAO identifies several realistic mechanisms to prevent fragmentation:

Pre-existing coordination platforms – The IEA's coordinated release of 400 million barrels of oil on 11 March is a model. The FAO notes that this is the sixth coordinated emergency stock release in IEA history, showing that institutional habits can override panic.

Market monitoring and early warning – Agencies like the IEA, AMIS (Agricultural Market Information System) and FAO should continuously monitor oil, gas, fertilizer, and staple food markets to detect volatility and emerging supply gaps. Early warnings can trigger pre-agreed interventions before ad hoc bans emerge.

Financial disincentives for bans – The FAO's Food Import Facility provides balance-of-payments support to low-income countries conditional on maintaining open trade. This reduces the pressure to hoard.

Transparency rules – The AMIS (Agricultural Market Information System) initiative, referenced in the document, tracks export restrictions and shames protectionist moves.

Legal frameworks – Insurers now reset coverage every seven days. If governments provide sovereign-backed reinsurance (e.g., the US DFC's \$20 billion plan), they can attach conditions that discourage export bans.

Redesigning Food Systems for the Next Decade

Beyond immediate mitigation, does this moment demand a structural redesign of global agriculture toward localized production, alternative fertilizers (e.g., green ammonia), and climate-resilient systems and how

quickly can such a transition be scaled?

FAO argues that this moment demands a structural redesign, not just temporary fixes. The document's long-term measures explicitly call for:

Sustainable fertilizer production, including green ammonia.

Renewable energy investments to reduce fossil fuel dependency.

Domestic agricultural expansion where feasible.

Structural adjustments to cope with persistent volatility.

Speed of scaling: The FAO's scenario modeling shows that even under a long-term conflict, full recovery does not occur by 2030. That implies that a deliberate transition could take **5-10 years** to meaningfully reduce vulnerability.

Green ammonia is technically ready but requires massive renewable energy capacity and capital. The FAO does not provide a timeline, but commercial-scale plants typically take 3-5 years to build.

Localized production of food in arid Gulf countries is limited by water scarcity; desalination is energy-intensive. Without cheap renewables, localization will remain marginal.

Input-saving technologies (e.g., precision agriculture, enhanced efficiency fertilizers) can scale faster (2-4 years) if supported by extension services and subsidies.

The FAO is clear that the transition cannot happen overnight: "While global food markets remain more stable than during previous crises, the current shock underscores the vulnerability of interconnected energy and agrifood systems." However, the window for redesign is now, because prolonged disruption would lock in higher costs and lower resilience for a decade or more.

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