THE PHOSPHORUS FIX · A BRIEFING ON AMERICAN FOOD SECURITY

America has about 50 years of its own phosphorus.

It cannot be manufactured. It has no substitute. Two-thirds of the world's reserves sit under a single country — and four out of every five pounds we apply never reach the crop in the season it's applied.

68% in Morocco & W. Sahara · ~1% in the US · 10–30% first-season recovery

THE SUPPLY

Five countries hold more than 80% of world reserves; China holds about 3.4 billion metric tons. USGS lists no government stockpile and no substitute for phosphorus in agriculture. Nearly all US phosphate rock imports, about 98%, come from Peru. Finished phosphate fertilizer has leaned heavily on imports from Morocco and Russia. Phosphate rock joined the US Critical Minerals List in November 2025.

FIRST-SEASON RECOVERY

Crops usually recover 10–30% of fertilizer phosphorus in the application year (Deng et al., 2018). This general literature range varies by soil, crop and measurement method; it is not a measured US-wide average. Decades of over-application have built large soil phosphorus reserves in much of the Corn Belt, while the crop still runs short in season. Residual phosphorus can feed later crops.

WHAT THE WASTE COSTS

The 2025 Gulf hypoxic zone covered 4,402 square miles. Mississippi Basin phosphorus loads are 13% above the 1980–96 baseline, while nitrogen is 28% below. Nitrogen management is working. Phosphorus is going backwards. A 2014 Lake Erie bloom left roughly half a million people around Toledo unable to drink tap water.

THE FIX AND THREE ASKS

Raise first-season phosphorus recovery. Name phosphorus efficiency as a security measure; let a state prove it at scale across row crops and livestock manure; and credit phosphorus made available, not just applied, where nutrients are already counted.

SLIDER MODEL — NOT A NATIONAL APPLICATION INVENTORY

20 Mt domestic rock/year × assumed 29% P_2O_5 = 5.8 Mt P_2O_5 modeled as applied fertilizer. At 20% recovery, 4.64 Mt is not recovered that season (displayed as 4.6). Excludes manure, imports, exports and processing losses. This is not a runoff estimate or permanent-loss total.

Sources: USGS Mineral Commodity Summaries 2024–2026; 90 FR 50494; NOAA/LUMCON Gulf hypoxia survey 2025; USGS Mississippi–Atchafalaya nutrient loads; Deng et al. (2018), Frontiers in Plant Science, doi:10.3389/fpls.2018.01614.

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