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How the Iran crisis affects fertilizer-dependent countries: The case of Mexico

Farmer Cipriano Cruz Arce, 74, harvests maize in Monterrey, Chiapas, Mexico.
Photo Credit: P. Lowe/CIMMYT

By Valeria Piñeiro, Juan Pablo Gianatiempo, Jorge Amado Rueda, and Joseph Glauber

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Key takeaways

> •***Reduced traffic through the Strait of Hormuz is squeezing farmers.*** *Energy and fertilizer prices are climbing faster than food prices, eroding producer profitability.*
>
> •***Mexico is highly exposed to fertilizer import shocks.*** *Heavy reliance on imported nitrogen and potash makes the sector vulnerable to external disruptions like the Iran crisis.*
>
> •***High-value and staple crops face different pressures.*** *Input-intensive exports and nitrogen-dependent maize are especially sensitive to fertilizer price changes.*

The conflict in the Persian Gulf, including limits on cargo traffic through the Strait of Hormuz, has pushed up energy and fertilizer prices and boosted uncertainty in global markets. At the same time, food commodities markets remain relatively well supplied, and prices have not risen at the same pace. This has created a growing imbalance between rising input costs and relatively stable output prices—and an emerging predicament for producers, who risk seeing their profits erode.

For Mexico and other countries of the Latin America and the Caribbean (LAC) region, this dynamic is especially challenging. In recent decades, LAC has consolidated its role as a net exporter of food and fertilizer consumption has steadily increased, driven by agricultural intensification and the expansion of export-oriented farming. Meanwhile, domestic fertilizer production has not kept pace. As a result, the region has become increasingly dependent on fertilizer imports. Reliance on imported nitrogen (N), phosphorus (P), and potash (K) increased from 78%, 63%, and 96% in 2010 to 90%, 71%, and 97%, respectively, over the past five years.[1]

This growing import dependence, particularly on key nutrients such as nitrogen and potash, highlights the region's vulnerability to external supply shocks and price volatility.

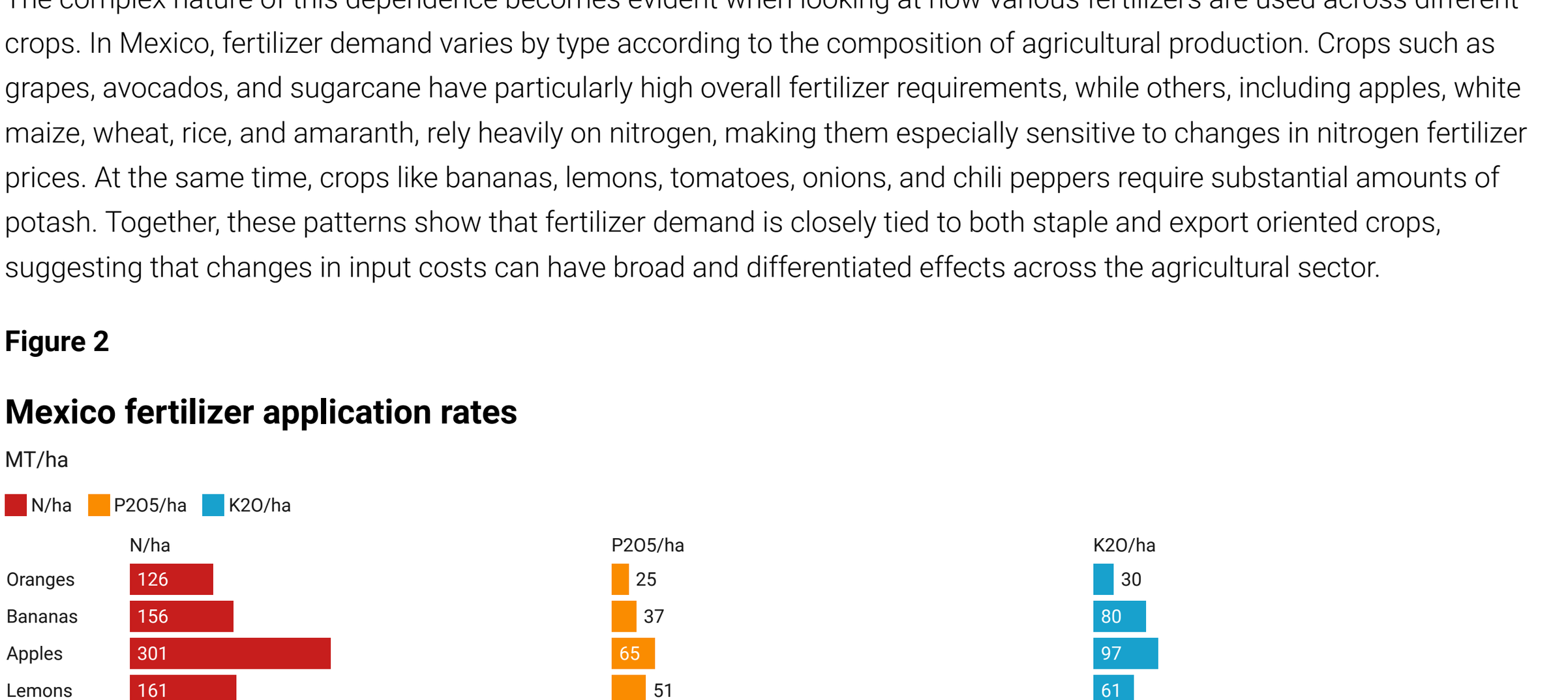
Mexico's dependence on fertilizer imports

Mexico offers a clear example of this structural dependence. It has consistently relied on imports to meet a large share of its fertilizer demand, especially for potash and nitrogen (Figure 1). In response, initiatives associated with the 2013 Energy Reform aimed to increase domestic production of ammonia and urea through the national petroleum industry. The Fertilizers for Well-Being program, launched in 2019, has utilized fertilizers produced in Mexico, primarily from rehabilitated plants. Since then, four ammonia plants have been reactivated, adding capacity on top of the existing two urea plants and helping to reduce reliance on imported nitrogen. Nonetheless, as agricultural production continues to expand, it remains heavily dependent on inputs sourced from international markets.

Figure 1

Mexico's fertilizer import dependency

Ratio between imports and agricultural use (0% = no imports; 100% = domestic use fully supplied by imports).



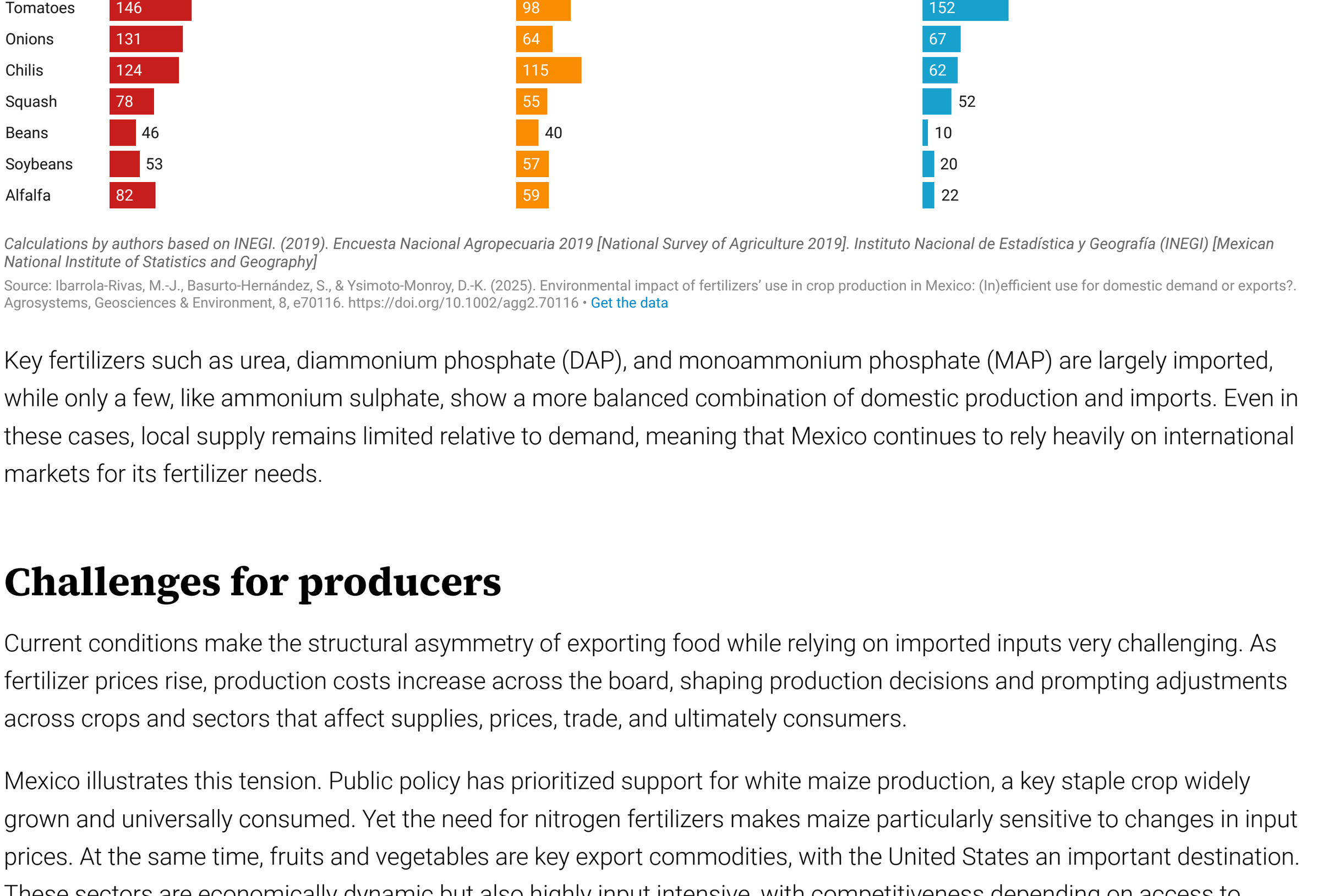
Source: FAOSTAT. • Created with Datawrapper

The complex nature of this dependence becomes evident when looking at how various fertilizers are used across different crops. In Mexico, fertilizer demand varies by type according to the composition of agricultural production. Crops such as grapes, avocados, and sugarcane have particularly high overall fertilizer requirements, while others, including apples, white maize, wheat, rice, and amaranth, rely heavily on nitrogen, making them especially sensitive to changes in nitrogen fertilizer prices. At the same time, crops like bananas, lemons, tomatoes, onions, and chili peppers require substantial amounts of potash. Together, these patterns show that fertilizer demand is closely tied to both staple and export oriented crops, suggesting that changes in input costs can have broad and differentiated effects across the agricultural sector.

Figure 2

Mexico fertilizer application rates

MT/ha


N/ha
P2O5/ha
K2O/ha
Oranges 126 25 30
Bananas 156 37 80
Apples 301 65 97
Lemons 161 51 61
Mangoes 135 71 54
Grapes 700 80 168
Strawberries 139 63 52
Avocado 280 180 139
Sugarcane 253 69 100
Cocoa 75 40 43
Coffee 71 19 23
White maize 184 36 20
Wheat 196 48 7
Rice 231 48 42
Amaranth 260 150 34
Yellow maize 151 60 15
Sorghum 80 31 13
Tomatoes 146 98 152
Onions 131 64 67
Chilis 124 115 62
Squash 78 55 52
Beans 46 40 10
Soybeans 53 57 20
Alfalfa 82 59 22

Calculations by authors based on INEGI. (2019). Encuesta Nacional Agropecuaria 2019 [National Survey of Agriculture 2019]. Instituto Nacional de Estadística y Geografía (INEGI) [Mexican National Institute of Statistics and Geography]

Source: Ibarrola-Rivas, M.-J., Basurto-Hernández, S., & Ysimoto-Monroy, D.-K. (2025). Environmental impact of fertilizers' use in crop production in Mexico: (In)efficient use for domestic demand or exports?. Agrosystems, Geosciences & Environment, 8, e70116. https://doi.org/10.1002/agg2.70116 • Get the data

Key fertilizers such as urea, diammonium phosphate (DAP), and monoammonium phosphate (MAP) are largely imported, while only a few, like ammonium sulphate, show a more balanced combination of domestic production and imports. Even in these cases, local supply remains limited relative to demand, meaning that Mexico continues to rely heavily on international markets for its fertilizer needs.

Challenges for producers

Current conditions make the structural asymmetry of exporting food while relying on imported inputs very challenging. As fertilizer prices rise, production costs increase across the board, shaping production decisions and prompting adjustments across crops and sectors that affect supplies, prices, trade, and ultimately consumers.

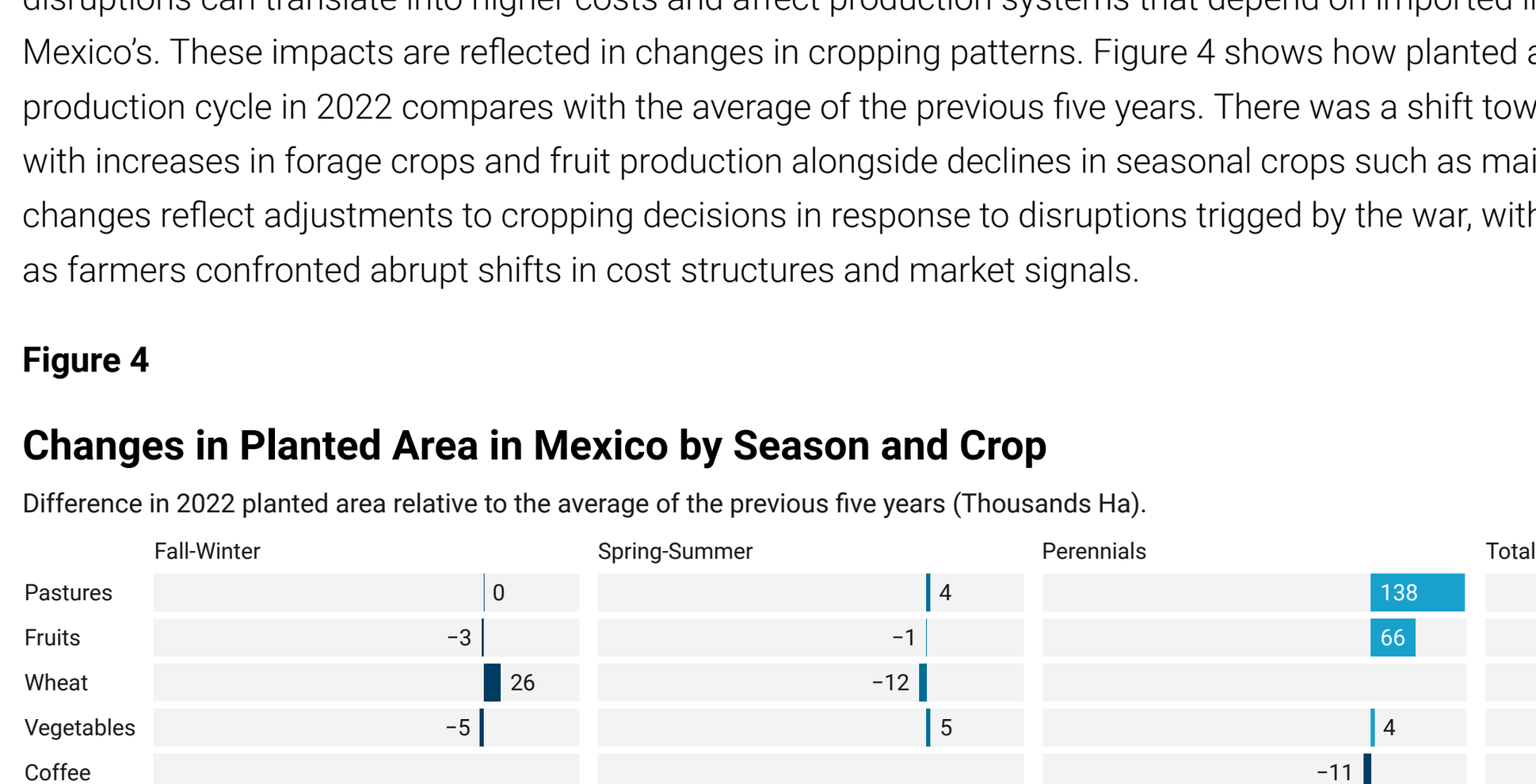
Mexico illustrates this tension. Public policy has prioritized support for white maize production, a key staple crop widely grown and universally consumed. Yet the need for nitrogen fertilizers makes maize particularly sensitive to changes in input prices. At the same time, fruits and vegetables are key export commodities, with the United States an important destination. These sectors are economically dynamic but also highly input intensive, with competitiveness depending on access to fertilizers as well as complementary inputs such as irrigation, logistics, and labor. In terms of fertilizer, they require on average 38% more nitrogen, 55% more phosphorus, and 198% more potassium compared to grains.

Now the Iran crisis is adding new layers of uncertainty to fertilizer markets. Approximately 29% of Mexico's urea imports originate from the Persian Gulf region, with Oman being a key supplier. As a critical transit route for global energy and fertilizer trade, any instability in this corridor can translate into higher costs, delays, or supply constraints.

Figure 3

Mexico urea imports

Metric tons



Persian Gulf includes Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates

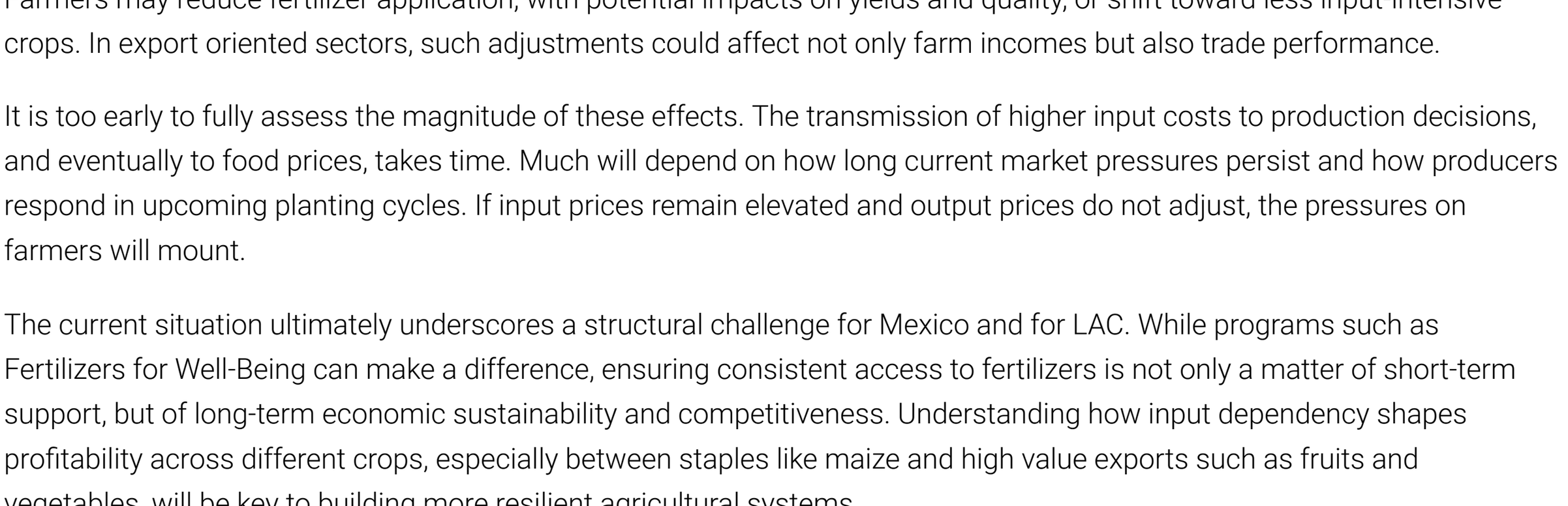
Source: TDM • Get the data

Previous shocks to global fertilizer markets, such as Russia's February 2022 invasion of Ukraine, illustrate how quickly such disruptions can translate into higher costs and affect production systems that depend on imported inputs, including Mexico's. These impacts are reflected in changes in cropping patterns. Figure 4 shows how planted area by crop and production cycle in 2022 compares with the average of the previous five years. There was a shift toward perennial agriculture, with increases in forage crops and fruit production alongside declines in seasonal crops such as maize and beans. These changes reflect adjustments to cropping decisions in response to disruptions trigged by the war, with production reallocated as farmers confronted abrupt shifts in cost structures and market signals.

Figure 4

Changes in Planted Area in Mexico by Season and Crop

Difference in 2022 planted area relative to the average of the previous five years (Thousands Ha).



Source: Author's elaboration based on Dirección general del servicio de información agroalimentaria y pesquera (DGSIAP) data. • Created with Datawrapper

Potential economic impacts

If fertilizer prices remain high and prices for staples such as maize and for high value crops such as fruits and vegetables remain relatively stable, economic impacts may start to reverberate.

Farmers may reduce fertilizer application, with potential impacts on yields and quality, or shift toward less input-intensive crops. In export oriented sectors, such adjustments could affect not only farm incomes but also trade performance.

It is too early to fully assess the magnitude of these effects. The transmission of higher input costs to production decisions, and eventually to food prices, takes time. Much will depend on how long current market pressures persist and how producers respond in upcoming planting cycles. If input prices remain elevated and output prices do not adjust, the pressures on farmers will mount.

The current situation ultimately underscores a structural challenge for Mexico and for LAC. While programs such as Fertilizers for Well-Being can make a difference, ensuring consistent access to fertilizers is not only a matter of short-term support, but of long-term economic sustainability and competitiveness. Understanding how input dependency shapes profitability across different crops, especially between staples like maize and high value exports such as fruits and vegetables, will be key to building more resilient agricultural systems.

Mexico's fertilizer support program: Additional context

The fertilizer market in Mexico has undergone significant structural changes over the past few decades. The country's current import dependence dates to the early 1990s, when, in the context of economic liberalization, Mexico shifted away from fertilizer production, and domestic petrochemical production in general. Fertilizer supply relied primarily on imports. This configuration led to a high level of external dependence, meaning that fertilizer costs and availability have been strongly influenced by international price dynamics, particularly those of energy and natural gas, key to fertilizer production.

Thus, past price spikes such as those triggered by the COVID-19 pandemic and the Russia-Ukraine war led to constraints in fertilizer use and production decisions, highlighting producers' vulnerability to external shocks.

In this context, and in the framework of the 2013 Energy Reform, Pemex Fertilizantes was created in 2015 as a subsidiary of Petróleos Mexicanos (Pemex), the state-owned energy company, to modernize and professionalize the fertilizer industry to compete in an open market. A key aim was restarting national production through the rehabilitation of existing infrastructure and integrating these facilities into the country's energy value chain, reducing dependence on imports.

This strategy included the recovery of productive assets and the reactivation of key petrochemical complexes such as Cosoleacaque in the state of Veracruz (ammonia and urea production), the acquisition of existing private capacity in Lázaro Cárdenas, Michoacán (phosphate fertilizers), and the acquisition of the Roca Fosfórica Mexicana mine in Baja California Sur (phosphate rock). In 2021, these enterprises ceased to operate as an independent subsidiary and were integrated into Pemex Transformación Industrial as part of an institutional reorganization aimed at aligning fertilizer production with the country's petrochemical and energy value chains.

In 2019, meanwhile, policymakers began to consider fertilizers as a strategic input for strengthening the agricultural sector, particularly in more vulnerable territories. In this context, the Fertilizers for Well-Being program was implemented to make chemical and biological fertilizers more widely available and improve agricultural productivity. The program targets small- and medium-scale producers in marginalized areas with an emphasis on priority crops—including maize, beans, and rice, as well as crops of high social or economic importance at the regional or state level—and primarily provides mineral fertilizers such as urea and DAP. Initially launched as a pilot in Guerrero in 2019, the program expanded progressively between 2020 and 2022 to Chiapas, Durango, Morelos, Nayarit, Oaxaca, Puebla, Tlaxcala, and Zacatecas, and achieved nationwide coverage starting in 2023.

In recent years, Mexico has consolidated its policy around the objectives of food sovereignty and self-sufficiency, strengthening the link between fertilizer provision and domestic production. Pemex's role as a strategic supplier has been reinforced through the operation of petrochemical complexes and the promotion of new lines such as biofertilizers, to increase its installed capacity and maximize production in the coming years. Additionally, by the end of 2024, a mandate was established to guarantee the provision of free fertilizers as direct support to small-scale producers.

These developments reflect a transition from a system dependent on international markets to one characterized by greater public intervention, aimed at reducing external vulnerabilities and strengthening agricultural productivity. Despite advances in fertilizer production capacity, the uncertainties around supplies and prices created by the Iran crisis underline the Mexican agriculture sector's continuing vulnerability to external shocks.

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1. Author elaboration based on FAOSTAT input data. Import dependency computed as ratio between imports and agricultural use (0% = no imports; 100% = domestic use fully supplied by imports).

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