

Infographic: Eliminating synthetic fertilizer won't solve agriculture's nitrogen pollution problem

Nitrogen pollution is a pressing problem for ecosystem health and the climate. Large shares of nitrogen applied to farms as synthetic fertilizer or manure wash into rivers — causing algal blooms and killing off marine life — and contribute to greenhouse gas emissions. The impacts are so large that in 2018, a group of nitrogen experts determined that the world must halve the amount of nitrogen dumped into the environment to avoid the worst impacts on wildlife.

Many people argue that synthetic fertilizers are at the heart of the problem. Because synthetic fertilizers are the biggest contributor to nitrogen pollution, the thinking goes, we should radically limit their use, if not eliminate them entirely from the food system. The solution, in other words, lies in organic fertilizers such as animal manure.

However, this would be ineffective, infeasible, and counterproductive for several reasons. There is a strong environmental case to be made for synthetic fertilizer, captured in the suite of infographics below.

THE ENVIRONMENTAL CASE FOR SYNTHETIC FERTILIZER

ORGANIC FERTILIZERS OFTEN POLLUTE MORE PER UNIT



Manure emits around 10-20% **more nitrogen pollution** per unit applied.

FERTILIZER IS GROWING CLEANER

Farmers increasingly can replace some fertilizer with engineered nitrogen-fixing microbes.

MICROBES

Nutrient sensors, high-resolution maps, and other precision farming equipment are enabling farmers to use fertilizer more efficiently.

PRECISION APPLICATION

NITRIFICATION INHIBITORS

Fertilizers increasingly include compounds that reduce nitrogen pollution.

LOW-CARBON FERTILIZER

Researchers & companies are starting to manufacture

MOST FOOD IS GROWN WITH SYNTHETIC FERTILIZER

In the US, synthetic fertilizer **causes most nitrogen pollution**, but only because it **grows the most crops**.



11% Manure

36% Legume fixation

53% Synthetic fertilizer



THE SHADOW FOOTPRINT OF ORGANIC

The US currently uses nearly 20% of its total land area for cropland.



Without synthetic fertilizer, we'd need **80% more** cropland to grow the same amount of crops.

NITROGEN LAUNDERING



Most manure comes from cows fed crops grown with synthetic fertilizer.

To view this infographic on a separate page, click [here](#).

First, while we should make the best possible use of animal waste, applying manure to crops often generates even [more nitrogen pollution](#) than synthetic fertilizer. Synthetic fertilizers are responsible for the most pollution only because they are the most used, not because they are worse for the environment.

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Second, doing away with synthetic fertilizer would [expand the footprint of agriculture](#), threatening ecosystems and worsening climate change. Because there isn't enough manure and compost, we would need to expand our use of other nitrogen sources (legumes and fallowing fields) that require extra land — a lot of extra land. Eliminating synthetic fertilizers would require an 80% increase in cropland.

Finally, focusing on replacing synthetic fertilizer overlooks [more promising ways](#) to reduce nitrogen pollution. For instance, farmers can adopt precision farming equipment that helps them apply just the right amount of fertilizer to their crops. These technologies include soil nutrient sensors, tractors with GPS and auto-steering, and machines that vary how much fertilizer they apply. [Read more here](#) about innovative ways to reduce nitrogen pollution from agriculture.

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