

# Scientists provide recipe to halve pollution from food production

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A major report for the United Nations has put forward solutions to halve nitrogen pollution from agriculture and the food system in Europe, including reducing meat and dairy consumption, fertilizer use and food

waste.

Nitrogen, which is vital for [plant growth](#), is present in animal excreta and synthetic fertilizers that are applied to land to boost crop production. But excessive and inefficient use of this nutrient means up to 80% of it leaks into the environment, mostly in various polluting forms of [nitrogen](#): ammonia and [nitrogen oxides](#), which are harmful air pollutants; nitrous oxide, a potent greenhouse gas; and nitrate, which affects water quality.

The new report, titled "Appetite for Change," has been produced by a group of researchers coordinated by the UK Centre for Ecology & Hydrology (UKCEH), the European Commission, Copenhagen Business School and the National Institute for Public Health and the Environment (RIVM) of The Netherlands.

"Appetite for Change" says inefficiencies in farms, retail and wastewater practices mean that the nitrogen use efficiency of the food system in Europe is only 18%, leaving most of the remainder leaking into air, water and soils.

The report puts forward a recipe to halve these overall losses, and its "ingredients" include:

- Halving average European meat and dairy consumption, replaced by more plant-based diets, which would cut pollution and improve human health. (Current meat consumption average is ~70kg a year.)
- More efficient fertilizer application and storage of manure
- Cutting [food waste](#) by retailers and consumers, thus reducing the amount that must be produced
- Better wastewater treatment to capture nitrogen from sewage, which would reduce emissions and enable recycled nutrients to be used on fields

- Helping the shift towards more balanced diets by providing financial incentives for foods that have a low impact on the environment and adopting public sector catering contracts that offer these sustainable food choices, for example.
- A coherent combination of policies addressing food production and consumption to better support a transition towards sustainable systems
- Mobilizing farmers, industry, government and consumers and helping them agree to work together to reduce nitrogen losses throughout the food system, for example through setting up governance platforms at national, regional and local levels.

Professor Mark Sutton of UKCEH, one of the editors of "Appetite for Change," explains, "Action does not begin and end at the farm gate; it requires a [holistic approach](#) involving not only farmers but policymakers, retailers, water companies and individuals. It is also not saying we should all become vegan. Our analysis finds that a broad package of actions including a demitarian approach (halving meat and dairy consumption) scored most highly in looking to halve nitrogen waste by 2030."

The report uses the ambition to half nitrogen waste by 2030 as a focus since this has been set by the UN Colombo Declaration and extended by the Kunming-Montreal Global Biodiversity Framework.

The protein consumption of the average person in Europe greatly exceeds recommendations of the World Health Organization. The report says a [balanced diet](#) that has less meat and dairy would improve nutrition and make people healthier, reducing demand on health services.

"Appetite for Change" builds upon their "Nitrogen on the Table" report in 2014, which set out the problem, saying the food system in Europe, especially livestock, accounts for 80% of the continent's nitrogen emissions.

In addition to not having emissions directly from livestock, growing vegetables and other plant produce is typically more efficient than livestock agriculture, requiring less land and fertilizers.

Some 40% of farmland in Europe produces food for livestock, though there is also heavy dependence on imports of feed, such as oil seeds and fertilizers. Nitrogen fertilizer costs for farmers have spiked in the past two years, largely as a result of the war in Ukraine, emphasizing the need to reduce the wasteful losses of expensive nitrogen resources.

Dr. Adrian Leip, an [environmental scientist](#) at the European Commission, who is lead editor of the report, comments, "The unprecedented rise of energy, fertilizer and food prices since 2021 underlines the need to address the vulnerability of the current [food system](#). Plant-based diets require less land and fertilizers, reduce energy use and increase our resilience to the current multi-crisis: food, energy, climate. Freeing up land to restore habitats would help tackle the climate and biodiversity crises."

For "Appetite for Change," the scientists investigated 144 scenarios, involving varying reductions in meat and dairy consumption, agricultural and retail practices, and investment in wastewater treatment. They looked at the benefits or trade-offs for the environment and health, severity and costs of possible measures.

Considering all the scenarios, the researchers concluded a balanced range of actions, including halved meat and [dairy consumption](#) ("demitarian" approach) with improved farm and food chain management could achieve a 49% reduction in nitrogen losses, and had the highest score for net societal benefit.

Of the many scenarios explored, the report found that a plant-based diet combined with ambitious technical measures could reduce nitrogen

waste by 84%; this scenario did not offer net societal benefit when the environmental benefits were offset against the stringency of actions needed to achieve this.

UKCEH coordinated the "Appetite for Change" report on behalf of the Task Force on Reactive Nitrogen of the UNECE Convention on Long-range Transboundary Air Pollution, which is co-chaired by Prof Sutton. The report will be available on the taskforce's [website](#) from 20 December 2023.

Provided by UK Centre for Ecology & Hydrology

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