Mission Multiplier: The Cross-Cutting Case for Food Waste Reduction

August 2026

Super Pollutants

Super pollutants—methane, black carbon, tropospheric ozone, and HFCs—warm the planet far more intensely than carbon dioxide but clear the atmosphere quickly, making them the fastest lever to address near-term warming. The food system, and food waste in particular, is a major source, from farming livestock and fertilizer use to food decomposing in landfills. That makes food waste reduction a common thread running through nearly every super-pollutant pathway, and one of the highest-leverage places to cut them.

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About the Series

Whether your mission is centered on economic resilience, public health, climate, biodiversity, or other areas, progress often depends on addressing challenges that cut across systems—especially those shaped by the global food system. As that system has grown more complex to feed a growing population, it has placed mounting pressure on natural resources and supply chains, with cascading effects on people, animals, the planet, and the economy.

One of the most overlooked ways to ease that pressure—and to accelerate progress across multiple goals at once—is addressing the roughly one-third of all food produced but never sold or eaten. Wasted food also means wasted land, water, labor, dollars, energy, and nutrients, with ripple effects across affordability, animal welfare, biodiversity, public health, regenerative agriculture, and super-pollutant mitigation. Yet food systems receive under 3% of public climate finance—and less than 6% of that targets loss and waste. For philanthropic funders and mission-driven investors, that gap is a powerful, underutilized opportunity to advance core priorities faster while relieving pressure on the broader food system.

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Introduction

Super pollutants, also referred to as short-lived climate pollutants, include methane, tropospheric ozone, black carbon, and HFCs. The term “super” refers to their greater warming potential per metric ton of gas emitted, while “short-lived” refers to the briefer window of time these particulates and gases persist in the atmosphere—both relative to carbon dioxide. Other pollutants sometimes considered superpollutants include nitrous oxide, fluorinated gases, and tropospheric ozone precursors like carbon monoxide.

Carbon dioxide is responsible for half of the global warming we’ve experienced to date, and super pollutants are responsible for the other half. Their short atmospheric lifetime makes a compelling case for tackling them in the near term: pulling them out of the atmosphere today would produce cooling effects by 2050, which is why addressing super pollutants, particularly methane, is often referred to as an “emergency brake” strategy. Many of these pollutants also contribute to local air pollution and the health risks that come with it, making mitigation an opportunity to improve quality of life, particularly for disadvantaged communities worldwide. Approximately four million deaths annually are associated with long-term exposure to PM2.5 air pollution alone.

See Appendix for a more detailed linking of specific super pollutants to parts of the food system, and how food waste reduction fits into the relevant solution sets.

The food system, and food waste in particular, is closely tied to super-pollutant emissions, since the human activities that produce them include livestock production, fertilizer application, forest burning for agriculture, refrigerated transport of food, cooking with natural gas and biomaterials, and waste management. This creates an opportunity for a united and coherent approach to super-pollutant reduction across the food system, with food waste reduction representing a common thread and a key strategy for cutting emissions throughout.

How Food Waste Reduction Enables Impact

Food waste reduction addresses super-pollutant emissions on two levels, each targeting a different point in the food system's contribution to methane and other short-lived climate pollutants.

Level 1: Keeping food out of landfill

The most immediate lever is diverting food waste that has already occurred away from landfills, directly reducing the methane generated as organic matter decomposes. Composting, when managed properly, avoids methane production almost entirely, while anaerobic digestion can go a step further, optimizing methane production and capturing the resulting gas as usable bioenergy.

Level 2: Preventing food from becoming waste in the first place

A more upstream intervention is preventing food waste before it happens at all. This still reduces landfill methane by keeping organic matter out of the waste stream, but it also avoids the emissions generated by every activity required to get uneaten food from farm to plate—growing, processing, transporting, and storing food that ultimately serves no purpose. Just as importantly, it sends a more accurate demand signal upstream, encouraging production that is either lower in volume or more resource-efficient.

This upstream approach is most powerful when prioritized by food type, targeting the products most closely tied to super-pollutant production. Beef, dairy, chicken, pork, and rice are especially significant drivers of methane. Beef carries additional weight in geographies where cattle ranching drives land clearing and burning, while high soy-consuming species—chicken and pork, and cattle to a lesser degree—contribute to the deforestation associated with soy production. Palm oil and cocoa carry similar land-clearing risks. Cereals, particularly corn, wheat, and rice, represent a further opportunity: reducing waste in these crops lowers the need for nitrogen-intensive fertilizer, much of which ultimately goes toward feeding animals rather than people.

Funding Food Waste Reduction to Support Super Pollutant Mitigation

Existing super-pollutant funders can support near-term reductions in food system emissions through lower-tech and lower-cost approaches than options like carbon capture, particularly by focusing on methane alongside other detrimental super pollutants. Specific opportunities include the following:

Methane

- **Beef and dairy.** Methane from enteric fermentation and manure management accounts for roughly 40% of all agricultural emissions, with beef and dairy the largest contributors. Tackling waste within these supply chains makes the system more efficient and reduces pressure to overproduce, cutting methane at the source through several mechanisms.

  Reducing mortality rates is one of the most direct: when an animal dies prematurely, all the feed, land, and water invested in it are wasted. Saving more animals helps meet demand with fewer animals farmed overall, limiting herd growth and associated emissions. In dairy, early detection of mastitis through regular somatic cell count measurement can reduce milk discard and culling, supported by inline sensors in automated milking systems like Lely MQC-C and preventive platforms like Dairymaster.

  Preventing food loss further downstream is related; ensuring more product reaches market increases marketable output per animal, signaling to producers over time that fewer animals are needed. A newer opportunity is using certain food waste streams as climate-smart feed additives shown to reduce enteric emissions—an approach being explored by the University of Georgia's Professor Joseph Usack, who is researching fermentation to convert leftover produce into cattle feed, and by startup Gilly Biotechnologies, which is developing a feed additive that improves feed efficiency and reduces methane using agricultural byproducts or by improving the digestibility of food waste in rations.

  Finally, this industry, which already strives to waste little, has room to explore higher-value byproduct upcycling with greater climate benefits than traditional approaches.

- **Rice.** A 2013 Institution of Mechanical Engineers report found that 37-80% of rice produced in Southeast Asia may be wasted; even if half that figure were being wasted today, it would meaningfully contribute to methane emissions. Much of this loss occurs during storage, and low-cost tools like hermetic storage bags from companies such as GrainPro offer smallholder farmers a practical fix. In developed economies, reducing plate waste in restaurants, where rice is often served in oversized portions, offers a complementary opportunity.

- **Advanced food system recycling.** Diverting food waste from landfills produces immediate methane reductions, so it's worth investing in solutions that make diversion more effective and accessible—often low-tech, especially at the community scale. Black Earth Compost, a ReFED Catalytic Grant Fund (CGF) grantee, built a custom, non-proprietary trash separation unit to reduce contamination in its waste stream, designed to be shared with other composters looking to scale. The Compost Research & Education Foundation, also a CGF grantee, is modernizing compost testing standards to detect contaminants like microplastics, PFAS, and pathogens, building the trust needed to scale compost testing more broadly.

Black carbon and PM2.5

Food waste reduction targeting chickens, pigs, palm oil, and cocoa offers a meaningful lever for reducing black carbon and PM2.5 emissions tied to these supply chains.

Nitrogen

Reducing food waste across crops, especially cereals, and animals consuming those crops as feed may offer a simpler alternative to engineering new fertilizers to reduce the amount of nitrogen used for growing crops. This would address nitrogen-related emissions at the source.

Refrigerants

Stronger cold chains in lower- and middle-income countries are an important food waste strategy, but one with an inherent tension: keeping more food in the value chain can come at the expense of refrigerant emissions. UNEP estimates that a lack of effective refrigeration caused 12% of total food production losses in 2017, and the food cold chain accounts for 4% of global greenhouse gas emissions, from both the technologies themselves and the losses that occur without them. The opportunity lies in advancing clean refrigerants alongside food loss reduction—a pairing where the pharmaceutical industry is currently further ahead, offering a model the food industry could follow.

Case Study

Dual Impact in Action

The Global Methane Hub (GMH) is the first globally coordinated philanthropic effort dedicated to reducing methane emissions, having catalyzed more than $500M in funding for 100+ grantees across 152 countries. To identify the key levers for reducing methane emissions, GMH and ClimateWorks Foundation funded a global innovation needs assessment of methane emissions from food systems, which account for 60% of human-caused methane. The assessment identified food loss and waste as one of three innovation areas that together could eliminate more than 5.6 gigatons of CO_2e by 2050, and found that current investment largely misses the biggest methane abatement opportunities in food waste. As a result, food loss and waste mitigation sits at the center of GMH's methane mitigation strategy across both its Waste & Circular Economy and Agriculture programs.

GMH's grantmaking is working to close that funding gap. The Hub supported ReFED's 2024 analysis mapping the 4 million metric tons of methane generated each year by surplus food in the U.S. and the solutions that can cut it, and partnered with the Global FoodBanking Network to develop FRAME, the first methodology to measure methane avoided by food banks, enabling food recovery to be counted and credited as climate action.

At COP30, GMH announced a $30 million investment in the Circular Economy NOW! initiative, led by the COP30 Presidency with UNEP and the Climate and Clean Air Coalition, to prevent food waste, redistribute surplus food, and recycle organic materials — helping cities recover 20 million tons of surplus food annually and feed 50 million people while cutting methane from landfills. For GMH, reducing food waste is among the fastest, most cost-effective levers available for near-term methane reduction, delivering food security and livelihood benefits alongside the climate impact.

"Food waste is one of the largest methane abatement opportunities and also one of the most underfunded. Closing that gap is central to our strategy."

Nicolás Díaz, Senior Program Manager for Waste and Circular Economy, Global Methane Hub

If you'd like to learn more about how your funding can support multiple missions, please reach out to our Capital & Innovation team.

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Appendix

Food waste solutions (bolded in chart) can help mitigate super pollutants across the food system.

Food System Component (not comprehensive)	Relevant Super Pollutant	Solution Mechanisms

Livestock Production	Methane	• Reduce enteric methane production
		• Reduce livestock herd size
		  • Eat less beef
		  • **Reduce food loss and waste**
		• Manage manure better

Rice Production	Methane	• Adjust growing practices
		  • Alternative wet/dry growing
		  • **Biochar application**
		• Reduce rice production/increase yield per land area
		  • **Reduce waste of rice**

Fertilizer Production	Nitrous oxide (N2O)	• Improve application practices • Replace synthetic fertilizer • Reduce crop production, especially those requiring high fertilizer application • **Reduce crop waste**
Burning to Clear Land for Agriculture	Black carbon/PM2.5	• Alternative agricultural practices for land clearing, acknowledging that slash and burn is a traditional practice and alternatives tend to be more labor-intensive and costly. • **Reduce land conversion pressure (including through reduced waste)**
Refrigerated Transport of Food	Fluorinated gases	• Alternative or non-HFC refrigerants (R744/CO2, HFOs) and cooling systems • **Reduce amount of transport required (including from reduced waste)**
Cooking Food Using Natural Gas and Biomaterials	Black carbon	• Better practices for wood-burning; better technology stoves; install filters • Switch to alternative cooking power (biogas, electricity, crop residues) • **Reduce amount of cooking required (including from reduced waste)**
Waste Management: Landfills	Methane	• Capture landfill methane • **Remove organic material from landfill (prevent/donate/recycle instead)**
Waste Management: Incineration	PM, CO, toxics	• Emissions-control practices and technologies • **Remove organic material from incineration (prevent/donate/recycle unavoidable waste instead)** • **For agricultural waste: conservation agriculture, low-till methods, and alternative ex situ uses of crop residues**