AT A GLANCE:

Enteric emissions reduction opportunities

EDF ENVIRONMENTAL DEFENSE FUND + BUSINESS

Introduction

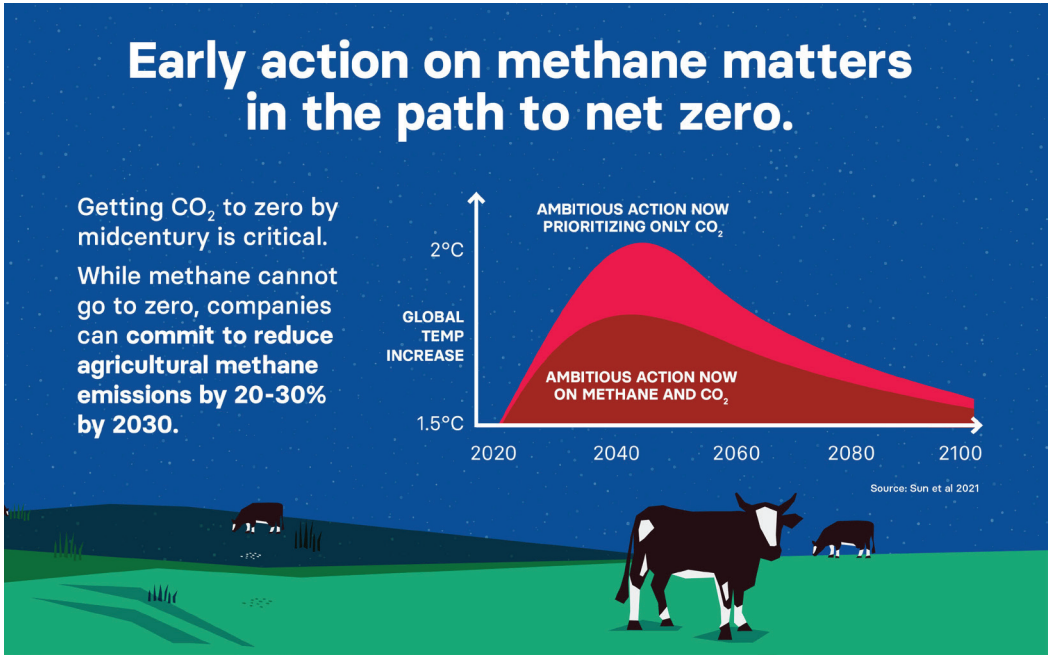
Reducing methane now is the fastest way to slow global warming in the near term and a critical part of avoiding the worst consequences of climate change. It's an opportunity we can't afford to miss. Methane is extremely potent in the short term. In fact, at least 25% of today's warming is driven by methane from human actions.

Companies in the meat and dairy sector are uniquely positioned to tackle methane emissions. By setting an ambitious methane reduction target, companies can slash their greenhouse gas emissions and build more resilient and equitable supply chains, while meeting shareholder and customer demands for climate action.

For many companies, though, moving from setting goals to taking actions at the speed and scale needed to secure a climate-stable future can be challenging. Companies need help navigating the tools and resources, and staying apprised of the most science-based practices to reduce methane emissions.

Meeting ambitious targets requires deploying existing solutions and investing in new innovations that can drive even deeper reductions. Enteric emissions, emitted during the digestive process of ruminants like cows, are the largest source of agricultural methane emissions, followed by manure management. While manure management technologies are widely available, fewer technologies currently exist for reducing enteric methane emissions, making it challenging for companies to drive progress.

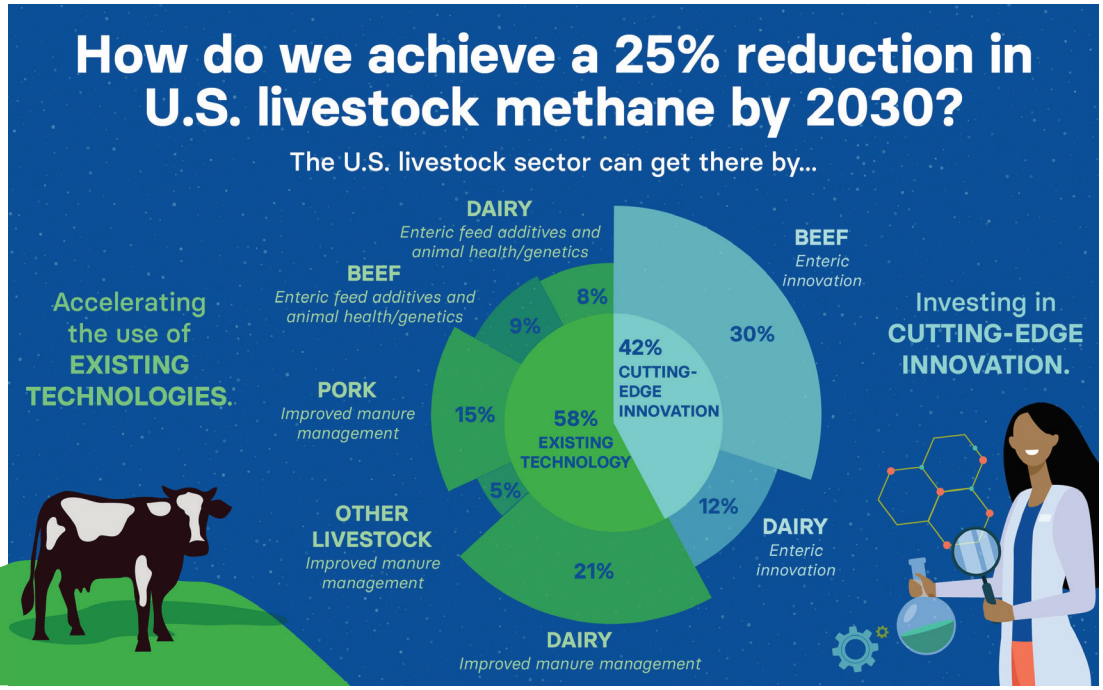
Companies in the food and agriculture sector can follow this guide to better prioritize, plan and implement solutions needed to reduce enteric methane emissions and to make progress toward broader net zero climate goals.



Ambitious and early action to reduce methane emissions is critical to slow the rate of warming immediately.

Centering methane in corporate climate action must be a priority for the food and agriculture sector.[1]

Unlike CO2 emissions, methane emissions do not need to go to zero to meet our long-term temperature goals. Rather, the U.S. livestock industry should aim to reduce its methane emissions by 20-30% by 2030. Achieving such reductions would be in line with the Global Methane Pledge made by more than 100 countries at COP26 to reduce methane emissions by 30%.



Companies can act now to implement available enteric emissions technologies and support new innovations.[2]

PATHWAY TO METHANE REDUCTIONS

Advance progress toward enteric methane reductions by following a four-part strategy

1 **Set an ambitious, public methane reduction target.** Setting a target sends a strong demand signal for methane-reduction tools. Public commitments can also drive more investment writ large, including incentives, public-sector R&D investments, or more traditional funding from venture capital or impact investment into this space. But setting goals alone is not enough: Concrete plans are needed to drive progress at the speed and scale necessary for securing a climate-stable future.

2 **Build procurement and financial systems into your company that will incentivize the deployment of low-methane products in your supply chain.** As methane-reducing tools come to market, creating effective incentives for producers to use them is essential for ensuring their deployment. Forthcoming market analysis by EDF indicates that supply chain incentives would be one of the most effective tools to increase adoption of enteric solutions by producers. To meet climate goals, companies can provide price premiums and market advantage opportunities for producers that adopt proven enteric solutions. To prepare for this, begin to build the case to leadership about why methane reduction tools are critical to your success on climate. As you allocate resources toward your climate strategies, make sure to set aside a budget for methane reducing technologies.

3 **Trial already-existing solutions in your facilities or supply chains and monitor the progress.** Several companies are piloting the use of methane inhibitors that have already achieved regulatory approval in some parts of the world. For example, Nestle is using Agolin Ruminant, an essential oil blend, in a portion of its dairy supply chain to reduce enteric emissions. JBS recently announced a deal with DSM to use Bovaer, the trade name for 3-NOP, in its supply chains in Brazil and Chile, and Arla Foods will pilot use of Bovaer with 10,000 cows on more than 50 farms in Europe. These large-scale efforts can help demonstrate positive outcomes, share lessons learned and streamline adoption by the broader industry.

4 **Invest in innovative technologies.** More technologies that can reduce enteric emissions at a higher rate and that can be easily operationalized in the grazing setting are needed. Companies can invest in research and development to help drive new innovations forward. Through the Greener Cattle Initiative, companies such as ADM, Nestle and JBS USA are investing alongside public funding to address critical research gaps around enteric emissions.

An outlook for driving methane reductions over time

NOW

- Set an ambitious methane reduction target.
- Build internal incentive structures.
- Trial available solutions and communicate results.
- Invest in innovation.

2025-2030

- Scale best available technologies, leveraging the incentives and pilots from the first stage.
- Invest in innovation to continue to fill gaps, with a particular focus on grazing solutions.
- Report progress annually.

2030+

- Implement the newest technologies as they are available in key sourcing geographies.

Stay connected to best-available science on new technologies and tools. EDF can help! Contact: kanderson@edf.org

OVERVIEW OF SOLUTIONS PIPELINE

Various technologies and solutions for reducing enteric methane are coming to market.

Stay connected with the evolving science and prepare to use the right tools as they come online. Here is what you need to know about the state of science today.

1 **Feed additives and animal drugs are the most common method for achieving enteric emission reduction and are coming to market for confined livestock systems.** Several companies are now developing feed additives and animal drugs that producers will be able to add to their centralized feeding regimen to reduce enteric emissions from their animals. These solutions will be critical to reduce enteric emissions from beef feedlots and many dairy operations where animals are centrally fed on a daily basis.

2 **3-NOP is poised to be the first approved effective feed solution.** Of the enteric products in development, the most extensively studied is 3-NOP, which is marketed by DSM under the trade name Bovaer. The feed solution has been approved for use in Europe and South America, and is expected to obtain FDA approval within the next couple of years. Peer-reviewed research has shown 3-NOP to be safe and effective for animals and consumers and reduce enteric methane by an average of 25-40%. [2, 3, 4, 5, 7, 8, 10]

3 A few other feed additives and animal drugs have also shown early promise.

- ***Asparagopsis***, a group of red seaweeds, can reduce methane by 50-80%, depending on the type, amount, and duration of seaweed administration. Several manufacturers are beginning commercialization of the product, including Blue Ocean Barns and Symbrosia in the U.S., and Volta GreenTech in Europe.

  Because the active ingredient in *Asparagopsis* is bromoform, a known human carcinogen that also has ozone depleting effects when released in the environment, more comprehensive studies are needed to determine the safety of the product.[2, 6, 9, 13]

- **Nitrate** has been extensively studied and shown to reduce methane emissions by an average of 10-15%. While nitrate is already on the market for other uses, no company has yet commercialized a nitrate product with a methane emissions reduction claim. It's important to note that nitrate is toxic to livestock in high concentrations, so careful monitoring of the nitrate content of an animal's rations is necessary to ensure animal safety.[2, 11, 12]

- Select **plant compounds** have been identified for their methane reducing potential. A product made of **citrus and garlic extracts** is currently in development under the trade name Mootral, though its efficacy remains to be proven on a large scale. A **blend of essential oils** sold under the trade name Agolin is commercially available today but has not consistently demonstrated high methane reduction effects. **Tannins** are a promising methane reducing compound, but further research and commercialization is required.[2]

Summary: Relative potential of select enteric methane inhibitors in development

	3-NOP	Asparagopsis	Nitrate	Plant compounds
CH4 Reduction potential	Very High	Very High	Low	Low
Confidence in efficacy*	Very High	Low	High	Low
Potential Co-Benefits	Improved feed efficiency	Improved feed efficiency	Reduced urea feeding costs	Improved milk productivity
Potential Risks	None known	Bromoform as potential cancer-causing ozone depleting agent	Toxic in high-concentra-tions	None known

Taken from Hegarty et al 2021

*Confidence in efficacy is based on scientific agreement and the quality of the evidence.

4 For livestock systems that rely on grazing, enteric solutions are at an earlier stage, but there are exciting new developments. In production systems that do not rely on daily centralized feeding, such as beef backgrounding and cow-calf operations, feed additives and animal drugs are more challenging to use to reduce methane emissions. Organizations are undertaking research to develop more flexible approaches for ranchers. These potential solutions range from incorporating a slow-release additive in a mineral block, to dedicated management of forage and breeding programs. Although these potential options are not fully actionable today, producers will have them at their disposal in the coming years as scientific recommendations become clearer.

Conclusion

As the recent IPCC report indicated, climate change is already impacting our agricultural system, and therefore the key commodities food companies need to thrive. By understanding the current and potential future opportunities to address methane emissions from the livestock sector, companies can lead the way in driving implementation of best-available products today while catalyzing new innovation for the future.

Additional Resources

For deeper-dive overviews of the state of the science for enteric feed additives and animal drugs, see these papers, all of which are meta-analyses of identified enteric-mitigating substances:

- Global Research Alliance, November 2021
- UC Davis and Innovation Center for US Dairy, January 2021
- UC Davis for State of California Air Resources Board, January 2021
- International Livestock Research Institute, January 2021

For other resources on the enteric emissions space, consider exploring these pages:

- Summary chart on product availability released by Dairy Management Inc.
- Landing page for the Greener Cattle Initiative consortium
- The Breakthrough Institute's report on recommendations for US beef production

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Citations:

1 https://business.edf.org/files/Methods-Documentation-for-Agricultural-Methane-visuals.pdf

2 Kebreab, Ermias and Feng, Xiaoyu. Strategies to reduce methane emissions from enteric and lagoon sources. Prepared for State of California Air Resources Board. January 2021. https://ww2.arb.ca.gov/sites/default/files/2020-12/17RD018.pdf

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12 https://extension.missouri.edu/ publications/g9800

13 https://www.epa.gov/sites/default/files/2016-09/documents/bromoform.pdf