



To The Point Methane Management in Agriculture

Globally, agriculture contributes about 40% of methane emissions, one of the most potent greenhouse gases.¹ Most agricultural methane emissions come from livestock production, including enteric fermentation in cattle and animal manure management. A smaller portion (8%)² of agricultural methane emissions is due to the flooding of rice fields. Multiple opportunities exist to reduce methane emissions in food and animal agriculture supply chains. Farmers and ranchers are already acting to reduce emissions by implementing new on-farm practices for manure and feed management. Examples of beneficial practices covered in this document include installing anaerobic digestors to produce biogas for energy to Alternate wetting and drying techniques for rice farmers. These methane reduction opportunities in agriculture also provide co-benefits such as improved air and water quality, increased energy self-sufficiency, and enhanced soil fertility.

Anaerobic Digestors

One common strategy to reduce methane from manure management is to construct biogas facilities using anaerobic digestors that capture the methane gas naturally produced during the anaerobic fermentation of manure. The captured biogas can be used to generate electricity or fuel. The US produces 70 million tonnes of organic waste annually, allowing US farmers to benefit by producing biogas and choosing sustainable and profitable solutions for waste and manure management.

Anaerobic digestion is a biological process through which microorganisms and bacteria break down organic matter—like animal manure or food waste—and, in the process, produce biogas. When this process occurs in a closed vessel called an anaerobic digester or bioreactor, the biogas can be captured and used for heat, fuel, or electricity production.

Anaerobic digestors are most appropriate for swine or dairy operations that collect and manage their manure at a single point as a liquid. When deciding to build an anaerobic digester, farmers should also consider whether they have an anticipated market for the produced energy, such as generating electricity for their on-farm equipment or the local grid or processing biogas into pipeline-quality renewable natural gas.

Although these facilities are expensive to install, upfront costs can be recouped over time through fuel and electricity production revenue. Research and case studies have shown that dairies can achieve a payback period of 5-10 years with digester projects.^{3,4}

Many farmers use a combination of grants and cost-sharing arrangements to fund upfront costs for digestors, and information on funding opportunities is available in the Resource section below.

While digestors are most economical on large dairies in the US, small-scale digestors are common in agricultural regions of Asia, and there are increasingly small operations in the US profitably implementing small-scale digestors. More than 20 projects in the Environmental Protection Agency's AgSTAR database of 343 digestors were in operation with fewer than 500 dairy cows.⁵

While biogas production has numerous benefits, these facilities come with inherent and operational hazards, which can be mitigated through proper facility design, construction, operations, maintenance, and ongoing monitoring.

Additional Manure Management Strategies

In addition to using anaerobic digestors for biogas, other available manure management strategies reduce methane emissions and can offer financial benefits to farmers, particularly for smaller operations.

Farmers use a daily spread strategy to remove manure from barns daily and apply it to croplands or pastures as a source of nutrients. This practice can decrease emissions if a farmer previously captured manure in a lagoon or slurry system and can provide a source of nutrients that can save farmers on fertilizer costs.

Farmers can also consider composting manure by separating solid waste from liquid and creating large heaps that they turn over the course of weeks or months. Compost can be used directly as a source of nutrients or sold to create an additional revenue stream.

The largest source of methane emissions in agriculture is the enteric fermentation of cow digestion, produced when cows burp.

Ranchers with grazing lands can consider ways to improve their manure management through pasture-based systems. Using this practice, ranchers allow animals to rotate between grazing areas and spread manure through their movement. These practices typically reduce methane emissions and build soil health through sequestered carbon, offering multiple opportunities for farmers to benefit through carbon markets and increased resilience from soil health.⁶

Enteric Fermentation

The largest source of methane emissions in agriculture is the enteric fermentation of cow digestion, produced when cows burp. One currently available strategy to manage these emissions is switching to animal feeds that are higher in fats and carbohydrates, leading to fewer emissions.⁷

Increasingly, researchers are focusing on developing new feed additives that can be added to traditional cattle feed and reduce enteric methane emissions. These additives may be produced from seaweed or materials such as essential oils and tannins. A few additive products are commercially available, and new technologies have recently gained US Food and Drug Administration (FDA) approval. As the market grows, dairy supply chain companies invest in additional research for new product development.⁸

Methane Reduction for Rice Growers

Rice farmers also have a part to play in reducing methane emissions. Continuously flooded rice fields produce methane emissions, so practices that manage flooding can conserve water and reduce methane emissions. A technique called Alternate Wetting and Drying (AWD), where rice farmers alternately irrigate and drain fields across the growing season, can halve emissions. AWD also allows rice farmers to reduce their water use by up to one-third, saving money and increasing their resilience to drought conditions.⁹ Public-private partnerships across the rice industry can incentivize farmers to adopt practices like AWD.

Cost Savings

Farmers can unlock a range of significant benefits that contribute to environmental sustainability and enhance their economic viability by effectively managing methane emissions. These benefits include:

- **Generating Energy and Diversifying Revenue** | Anaerobic digestors and biogas facilities offer a pathway for farmers to generate revenue from manure and waste products from their operations by generating fuel, electricity, compost, or fertilizer.
- **Accessing Emerging Carbon Credit Markets** | Emerging credit markets are compensating farmers directly for their efforts to reduce greenhouse gas emissions. Adopting practices that directly reduce methane emissions may qualify farmers to access these markets and bring in additional revenue.¹⁰
- **Accessing Financial Incentives from Supply Chain Programs** | Many companies in the dairy value chain are setting methane reduction goals and piloting initiatives to address emissions from manure and enteric fermentation. Farmers may be able to work directly with their downstream customers to enroll in projects that financially incentivize new practices such as integrating feed additives to reduce emissions.¹¹

Learn More & Connect

For more information about protecting your company, contact your local Chubb Risk Engineer, email us at RiskEngineeringServices@chubb.com, or visit www.chubb.com/engineering.

Resources

Technical Guidance

- The Environmental Protection Agency's AgSTAR program, www.epa.gov/agstar
 - Is Anaerobic Digestion Right for Your Farm?, www.epa.gov/agstar/anaerobic-digestion-right-your-farm
 - Practices to Reduce Methane Emissions from Livestock Manure Management, www.epa.gov/agstar/practices-reduce-methane-emissions-livestock-manure-management
 - Success Stories, www.epa.gov/agstar/agstar-stories-farm
- To The Point: Biogas Energy Production (Located on the Chubb Risk Engineering Resource Library)

Funding Opportunities

- State and local opportunities can be identified through trusted organizations:
 - Find NRCS Resources in Your State, www.nrcs.usda.gov/conservation-basics/conservation-by-state
 - Find Your Extension Office, www.uaex.uada.edu/about-extension/united-states-extension-offices.aspx
 - Find Your Soil and Water Conservation District, www.nacdnet.org/general-resources/conservation-district-directory/
- USDA's Rural Energy for America Program Energy Audit & Renewable Energy Development Assistance Grants, www.nacdnet.org/general-resources/conservation-district-directory/

1. "Helping livestock farmers cut methane emissions", www.edf.org/issue/climate-smart-agriculture/livestock-methane
2. "How Can We Incentivize Reducing Methane Emission in Rice Farming in Asia?", www.adb.org/news/events/how-can-we-incentivize-reducing-methane-emission-rice-farming-asia
3. "Funding On-Farm Anaerobic Digestion", www.epa.gov/sites/default/files/2014-12/documents/funding_digestion.pdf
4. "Making money from waste: The economic viability of producing biogas and biomethane in the Idaho dairy industry", www.researchgate.net/publication/324693875_Making_money_from_waste_The_economic_viability_of_producing_biogas_and_biomethane_in_the_Idaho_dairy_industry
5. "Livestock Anaerobic Digester Database", www.epa.gov/agstar/livestock-anaerobic-digester-database
6. "Practices to Reduce Methane Emissions from Livestock Manure Management", www.epa.gov/agstar/practices-reduce-methane-emissions-livestock-manure-management
7. "Ways to Reduce Methane Production in Cattle", beef.unl.edu/reduce-methane-production-cattle
8. "FDA paves the way for reducing methane emissions from livestock", www.edf.org/media/fda-paves-way-reducing-methane-emissions-livestock
9. "Methane emissions are driving climate change. Here's how to reduce them.", www.unep.org/news-and-stories/story/methane-emissions-are-driving-climate-change-heres-how-reduce-them
10. "Athian and Elanco Animal Health Team Up to Transform Food Production through Methane Reduction", www.elanco.com/en-us/news/athian-and-elanco-animal-health-team-up-to-transform-food-production-through-methane-reduction
11. "Danone commits to cut dairy methane emissions in partnership with farmers and EDF", business.edf.org/insights/danone-commits-to-cut-dairy-methane-emissions-in-partnership-with-farmers-and-edf/

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