How does cow digestion influence GHG emissions?

GHG Fact Sheet Series

Enteric emissions come from the fermentation that occurs during the digestive process in ruminant animals, like cows. This source is the single largest source of greenhouse gas (GHG) emissions in the fluid milk chain.

ENTERIC FERMENTATION BASICS

Ruminant animals have four compartments in their stomachs, the largest of which is the rumen. This structure enables cows to break down fibrous plant material and use it to grow and thrive.

- Ruminants break down feed through microbial fermentation. Microbes in the cow's digestive system decompose and ferment plant materials.
- This process produces volatile fatty acids (VFAs) that cows use as energy. It also releases methane, a greenhouse gas, when cows burp.

Generally, lower feed quality and higher feed intake are associated with greater emissions.

FACTORS THAT INFLUENCE ENTERIC FERMENTATION

Ration Formulation: Diet formulation directly impacts feed intake, energy availability, passage rate, feed efficiency and other factors that influence enteric methane formation.

Forage Quality: High-quality forage promotes feed intake, overall ration digestibility and high productivity, leading to more profits and reduced enteric methane emissions per unit of fat and protein corrected milk (FPCM).

The level of emissions depends on factors like the age weight, and health of the animal as well as the quantity, quality, and composition of feed.

Concentrate Management: Concentrates (grains, oilseeds, and by-product feeds) added to dairy cattle rations can reduce enteric methane emissions per unit of FPCM because they are easier to digest than forages.

Cow Health, Comfort, and Productivity: Improving the efficiency of milk production on the farm increases profit and reduces enteric methane emissions per unit of FPCM. Management practices and facilities that improve cow comfort, cow time budgets and reproductive efficiency lead to improved milk production efficiency of the entire herd.

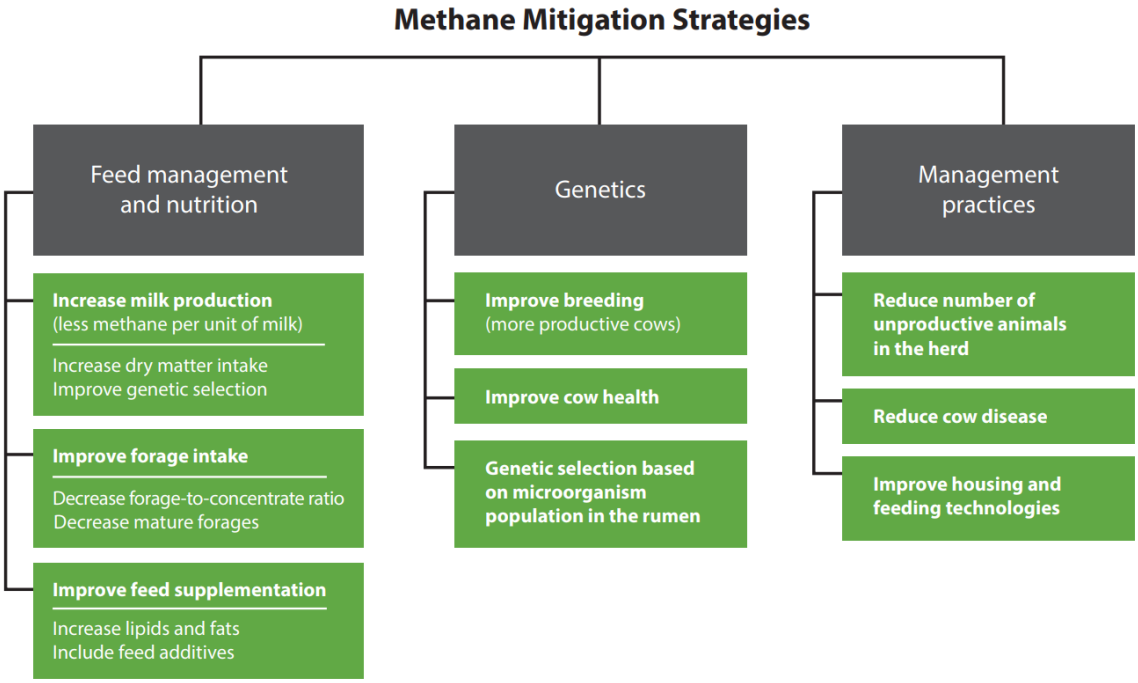
OPPORTUNITIES

Enteric fermentation is a biological feature of ruminant animals. But there are opportunities to reduce enteric emissions in ways that align with business goals of excellent cow health and productivity:

- Consider working with a nutritionist, veterinarian, or other specialist to formulate rations, optimize feeding conditions, and manage herd health / productivity.

- Evaluate the herd's environmental conditions and assess opportunities to improve comfort and health.
- Evaluate and enhance disease prevention strategies.
- Maximize overall forage quality and diet digestibility for highest feed efficiency.
- Maintain balanced protein and carbohydrate levels in the diet.
- Consider the use of concentrates to direct fermentation away from methane production.
- Evaluate forage storage methods to preserve nutrient quality and minimize spoilage.

For a great overview of opportunities and tradeoffs to reduce enteric methane emissions, check out the Sustainability Dairy Project's fact sheet series, which offers this helpful graphic:



LEARN MORE

- FARM Environmental Stewardship Continuous Improvement Reference Manual https://nationaldairyfarm.com/producer-resources/environment/
- Penn State Extension: Carbon, Methane Emissions and the Dairy Cow https://extension.psu.edu/carbon-methane-emissions-and-the-dairy-cow
- Sustainable Dairy Fact Sheet Series: Mitigation of Enteric Methane Emissions from Dairy Cows http://www.sustainabledairy.org/publications/Pages/Fact-Sheets.aspx
- University of Minnesota Extension: The Ruminant Digestive System https://extension.umn.edu/dairy-nutrition/ruminant-digestive-system#energy-feed-digestion-in-the-rumen-1001415