

**Invisible Villain: Clarifying the Role of Cattle in Emissions and Exploring Potential
Solutions**

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Invisible Villain: Clarifying the Role of Cattle in Emissions and Exploring Potential Solutions

You may not realize it, but a new supervillain has emerged over the past several years. This invisible villain has struck fear and concern into the hearts and minds of so many global citizens with its power to change what they purchase, what they grow, and even what they eat. You may be asking yourself, “what can be so powerful and capable of causing so much damage and destruction?” Believe it or not, the answer for many Americans is *bovine eructation*; you may know it as burping cattle. Many believe that cattle are ruining our planet with the methane they release from their stomachs, which results in greenhouse gas emissions causing more and more consumers to go meatless (Mitloehner, 2018; The Monday Campaigns, 2021). Reportedly half of the respondents in a nationwide survey indicated that they planned to participate in Meatless Monday campaigns in 2022, with environmental concerns being one of the primary causes (The Monday Campaigns, 2021). The beef cattle industry has received substantial criticism from a variety of sources for producing greenhouse gases (Gerber et al., 2013; Mitloehner, 2018). What is often unclear or poorly communicated is just how much responsibility for emissions should be placed on the beef cattle industry. In order to appropriately address climate change, it is crucial to investigate and promote reliable scientific evidence as researchers and producers continue to make the production of cattle more sustainable.

The cattle industry has received increased attention from groups interested in mitigating emissions. A 2006 report by the Food and Agriculture Organization of the United Nations incorrectly stated that livestock produced 18% of the world’s greenhouse gasses. It concluded that livestock harmed the planet more than all forms of transportation (Mitloehner, 2018). That claim has later shown to be inaccurate and has since been corrected by the senior author of the

report (Mottet & Steinfeld, 2018). Conversely, the Environmental Protection Agency (2023) noted that agriculture in its entirety contributed 10% to U.S. greenhouse gas emissions, substantially less than fossil fuels burned for transportation, electricity, and industry, which contributed 28%, 25%, and 23%, respectively. Specifically, animal agriculture represents 3.9% of emissions, and 2% is from cattle production (Mitloehner, 2018). So, even though previous claims about emissions from livestock have not been accurate, the industry continues to receive a disproportionate amount of criticism (Mitloehner, 2018).

Ruminant livestock have a unique digestive system that enables them to consume cellulosic plant materials as a feed source. The rumen is the compartment of the ruminant stomach where most of the breakdown of cellulosic material occurs. The rumen has microbes that produce methane as a by-product, which is released from the animal through belching. This important process is called enteric fermentation where the end product includes volatile fatty acids, or VFAs, as well as greenhouse gasses. VFAs are absorbed through the walls of the rumen and transported to the liver where the animal uses them for energy and methane and carbon dioxide are produced as a result. Enteric methane is what cows burp, and it's a highly potent greenhouse gas that is 28 times that of carbon dioxide (Quinton & Kerlin, 2019).

Although their emissions footprint may have previously been overstated, cattle are still agriculture's number one source of greenhouse gasses worldwide (Quinton, 2019). Removing beef from our diet through campaigns such as *Meatless Mondays* has also shown that it may have a limited effect on our climate (Mitloehner, 2018). A study published in the Proceedings of the National Academies of Science claimed that even if Americans removed all animal proteins from their diets, they would reduce U.S. emissions by only 2.6% (White & Hall, 2017). So, instead of

asking humans to alter their diets, scientists have been investigating ways to alter cattle diets and digestion to reduce these emissions.

University of California-Davis scientists Frank Mitloehner and Ermias Kebreab are looking for ways to make cattle more sustainable and less gassy (Quinton, 2019). Forage-based diets consumed by cattle are typically high-fiber, so researchers are testing for feed additives that can make digestion more efficient. One successful feed additive is derived from an unlikely source—seaweed. Researchers found that *Asparagopsis taxiformis*, or red seaweed, was effective in reducing methane emissions (Roque et al., 2021). The seaweed inhibits a certain enzyme in the cow's digestive system that contributes to methane production. In a five-month trial, researchers added small amounts of dried and powdered seaweed into the feed of beef cattle. They were fed four times a day from an open-air device that measured the levels of methane in their breath. Results showed that while the seaweed-fed cattle gained as much weight as their herd mates, they also burped out 82% less methane (Roque et al., 2021). Researchers also conducted a taste test panel and found no difference in the flavor or quality of the seaweed-fed steers (Roque et al., 2021; Vittek, 2021). UC-Davis researchers acknowledged that this type of red seaweed used in the study has one big drawback: a wild harvest is unlikely to provide enough of a supply for broad adoption (Quinton, 2019). Other trials and studies are seeking ways to grow the seaweed to scale as a potential feed additive that could be sustainably harvested.

Cattle and their burps may not be the actual villains they've been portrayed as, but their influence on our environment remains substantial. Innovations in feed additives, as well as other grazing management strategies, show promise as tools along the way to the greater goal of reaching climate neutrality and net-zero warming in the beef and dairy industries (Place & Mitloehner, 2021). As a testament to progress in sustainability, the U.S. cattle herd has shrunk by

one-third in the last 40 years, yet U.S. farmers are producing more beef now than they did in the 1970s (Bjork, 2020) and evidence shows that removing beef from our diet is not the answer to end greenhouse gas emissions. As they have done for decades, agriculture scientists will continue to work with producers to address sustainability issues that will lead to the best possible outcomes for them and our society.

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To whom it may concern:

I certify that all materials presented here are of my own creation and that any work adopted from other sources is duly cited and referenced as such.

A handwritten signature in cursive script that reads "Gianna Nichols". The signature is written in a dark ink and is positioned above the printed name.

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