

# Beef industry can cut emissions with land management, production efficiency

April 5 2021

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Researchers found the most potential for industry to reduce greenhouse gas emissions in the United States and Brazil. Credit: Kenton Rowe for The Nature Conservancy

A comprehensive assessment of 12 different strategies for reducing beef

production emissions worldwide found that industry can reduce greenhouse gas (GHG) emissions by as much as 50% in certain regions, with the most potential in the United States and Brazil. The study, "Reducing Climate Impacts of Beef Production: A synthesis of life cycle assessments across management systems and global regions," is published April 5 in *Global Change Biology*.

A research team led by Colorado State University (CSU) and funded by the Climate and Land Use Alliance found that widespread use of improved ranching [management practices](#) in two distinct areas of [beef](#) production would lead to substantial emissions reductions. This includes increased efficiency to produce more beef per unit of GHG emitted—growing bigger cows at a faster rate—and enhanced land management strategies to increase soil and plant carbon sequestration on grazed lands.

Globally, cattle produce about 78% of total livestock GHG emissions. Yet, there are many known management solutions that, if adopted broadly, can reduce, but not totally eliminate, the beef industry's climate change footprint, according to lead author Daniela Cusack, an assistant professor in the Department of Ecosystem Science and Sustainability at CSU.

Overall, the research team found a 46% reduction in net GHG emissions per unit of beef was achieved at sites using carbon sequestration management strategies on grazed lands, including using organic soil amendments and restoring trees and perennial vegetation to areas of degraded forests, woodlands and riverbanks. Additionally, researchers found an overall 8% reduction in net GHGs was achieved at sites using growth efficiency strategies. Net-zero emissions, however, were only achieved in 2% of studies.

"Our analysis shows that we can improve the efficiency and

sustainability of beef production, which would significantly reduce the industry's climate impact," said Cusack, also a research associate at the Smithsonian Tropical Research Institute in Panama. "But at the same time, we will never reach net-zero emissions without further innovation and strategies beyond land management and increased growth efficiency. There's a lot of room, globally, for improvement."

## Global analysis

Researchers analyzed 292 comparisons of "improved" versus "conventional" beef production systems across Asia, Australia, Brazil, Canada, Latin America and the U.S. The analysis revealed that Brazilian beef production holds the most potential for emissions reductions.

In the studies analyzed, researchers found a 57% GHG [emission](#) reduction through improved management strategies for both carbon sequestration and production efficiency in Brazil. Specific strategies include improved feed quality, better breed selections and enhanced fertilizer management.

The biggest impact was found in integrated field management, including intensive rotational grazing schemes, adding soil compost, reforestation of degraded areas and selectively planting forage plants bred for sequestering carbon in soils.

"My home country of Brazil has more than 52 million hectares of degraded pastureland—larger than the state of California," said Amanda Cordeiro, co-author and a graduate student at CSU. "If we can aim for a large-scale regeneration of degraded pastures, implementation of silvo-agro-forestry systems and adoption of other diversified local management strategies to cattle production, Brazil can drastically decrease carbon emissions."

In the U.S., researchers found that carbon sequestration strategies such as integrated field management and intensive rotational grazing reduced beef GHG emissions by more than 100% - or net-zero emissions—in a few grazing systems. But efficiency strategies were not as successful in the U.S. studies, possibly because of a high use of the strategies in the region already.

"Our research shows the important role that ranchers can play in combatting the global climate crisis, while ensuring their livelihoods and way of life," said Clare Kazanski, co-author and North America region scientist with The Nature Conservancy. "By analyzing management strategies in the U.S. and around the world, our research reinforces that ranchers are in a key position to reduce emissions in beef production through various management strategies tailored to their local conditions."

Darrell Wood, a northern California rancher, is an example of a producer leading the way on climate-friendly practices. Wood's family participates in the California Healthy Soils program, which incentivizes practices with a demonstrated climate benefit.

"As a sixth-generation cattle rancher, I see nothing but upside potential from using our cattle as a tool for reducing [greenhouse gas](#) emissions," Wood said. "Taking good care of our grasslands not only benefits climate, but also wildlife and the whole ecosystem that generates clean air and water. It'll help the next generation continue our business, too."

## **Next steps**

Although the research shows a significant reduction in the GHG footprints of beef production using improved management strategies, scientists don't yet know the full potential of shifting to these emission-reducing practices because there are very few data on practice adoption levels around the world.

"Asia, for example, is one of the most rapidly growing beef markets, but there is an imbalance between the amount of research focus on improving beef production and the growing demand for beef," Cusack said. "We know with the right land management and efficiency strategies in place, it's possible to have large reductions in emissions across geographic regions, but we need to keep pushing for additional innovations to create a truly transformation shift in the way the global beef system operates to ensure a secure food supply and a healthy environment."

**More information:** Daniela F. Cusack et al. Reducing climate impacts of beef production: A synthesis of life cycle assessments across management systems and global regions, *Global Change Biology* (2021). DOI: 10.1111/gcb.15509 , [onlinelibrary.wiley.com/doi/full/10.1111/gcb.15509](https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.15509)

Provided by Colorado State University

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