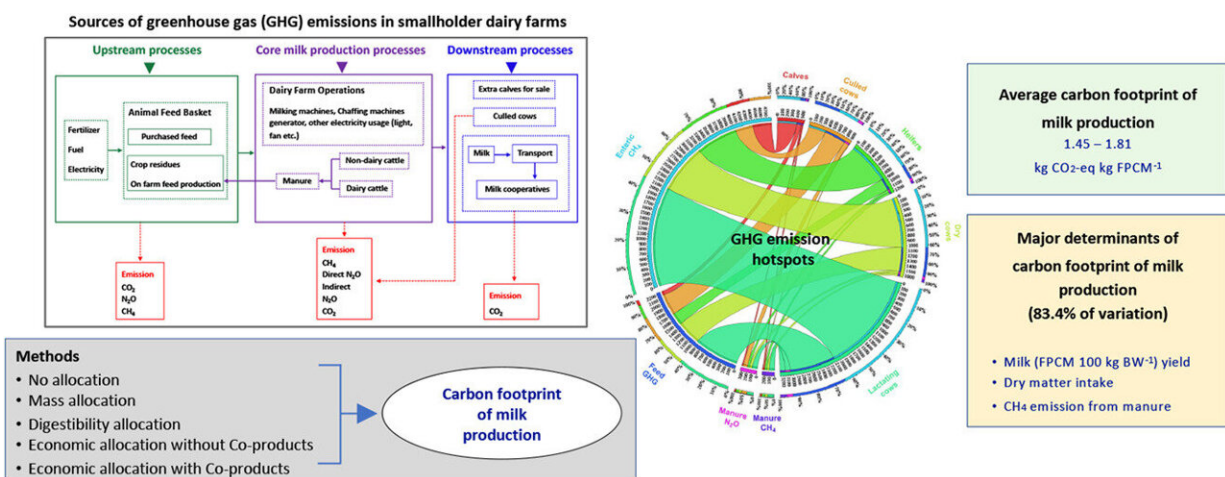


# Pathways for enhancing sustainability and resilience in India's critical small dairy operations

December 20 2023



Graphical Abstract. Credit: *Journal of Dairy Science* (2023). DOI: 10.3168/jds.2022-22153

India—with a dairy sector mainly composed of small dairy farms—is one of the largest milk producers in the world and home to more dairy cows than any other country. Its small farms feed millions and are critical sources of employment, income, and nutrition.

As the dairy sector works toward reducing its emissions and contributing to global sustainability goals, a [new study](#) in the *Journal of Dairy Science*

is illuminating the steps these valuable small dairy farms can take to lower their [carbon footprints](#) while providing enormous economic and nutritional benefits.

The study's lead investigator, Anjumoni Mech, Ph.D., of the Indian Council of Agricultural Research's National Institute of Animal Nutrition and Physiology in Karnataka, India, explained, "The small dairy farms that dominate India's dairy sector—73 million, in fact—have only two dairy cows on average but contribute 72% of India's [milk](#) production. So, understanding their unique impact on the environment, and how it could be potentially lowered, is crucial as we all work toward shared sustainability goals."

While many studies have measured dairy's carbon footprint, very few have focused on smaller farms in India, and none to date have examined the Karnataka region of India, which is a major contributor to the country's overall milk production system.

Dr. Mech said, "We set out to better understand the holistic life cycle of milk production, including its emission hotspots and collective carbon footprint, and ultimately, to outline steps for increasing sustainability. That is a challenge, given that India's smaller farms are also incredibly diverse and operate with various dairy cow breeds, management methods, and landscapes."

Dr. Mech and the research team conducted a life cycle analysis of 47 [small farms](#) in Karnataka. Their analysis primarily used data gathered directly from local dairy farmers, including farm size, animal management, body measurements, and milk production. The team collected data on feeding practices, animal performance, manure disposal, feed and fodder production, and other [farm](#) management practices via a questionnaire.

Additional data (such as emission factors for fertilizer, transportation, and energy) were based on government reports and peer-reviewed literature.

Dr. Mech elaborated, "Our analysis revealed that the carbon footprint of the milk production in these small farms is comparable with small dairy operations in Kenya, Ethiopia, South Africa, and other regions of India. While the data also indicate that these farms are still producing roughly twice the carbon footprint of the high-producing large dairy farms in the Netherlands, Ireland, Sweden, and similar countries, they also shed light on specific opportunities for sustainability improvements."

The major emissions hotspots in the farms were the enteric methane produced from the digestive processes of the cows, along with the [greenhouse gases](#) stemming from feed production.

Dr. Mech said, "Our results indicate that the most effective interventions for reducing the [carbon footprint](#) in smallholder dairy farms are to maintain high-yielding animals and adopt appropriate feeding strategies for better feed utilization. Therefore, the future breeding strategy should target milk production traits and feed utilization efficiency as critical phenotypes for improving the next generation of [dairy cows](#)."

The research team was quick to highlight the need for larger-scale future studies, along with a scenario analysis of how to apply emissions mitigation strategies. Nevertheless, this study is a crucial first step to a more sustainable and resilient path for India's small [dairy](#) farms.

**More information:** A. Mech et al, Assessment of carbon footprint of milk production and identification of its major determinants in smallholder dairy farms in Karnataka, India, *Journal of Dairy Science* (2023). [DOI: 10.3168/jds.2022-22153](https://doi.org/10.3168/jds.2022-22153)

Provided by Elsevier

Citation: Pathways for enhancing sustainability and resilience in India's critical small dairy operations (2023, December 20) retrieved 28 April 2024 from <https://phys.org/news/2023-12-pathways-sustainability-resilience-india-critical.html>

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