CONTROLLING METHANE FROM BEEF AND DAIRY CATTLE: FACING REALITIES IN THE GLOBAL SOUTH

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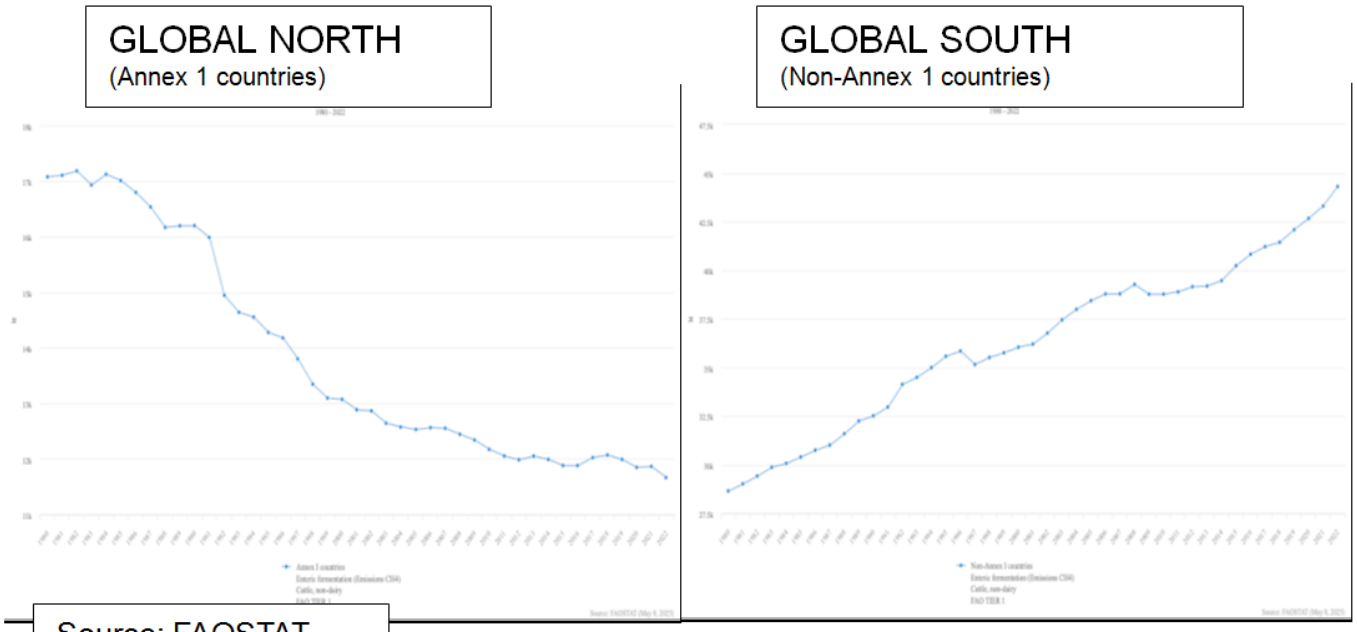
This brief summarizes a longer Discussion Paper by the same title, available from the Salata Institute.

Methane (CH_4) emissions from the digestive systems of ruminant animals, especially beef and dairy cattle, are a potent greenhouse gas. Rich countries in the Global North have made surprising progress against this climate threat, more than lower-income countries in the Global South. As shown in the graphs below, methane emissions from beef production in the Global North have fallen significantly since 1980, while they continue to rise, and from a significantly higher level, in the Global South:

Enteric Fermentation Emissions of Methane from Beef Production, 1980–2022 (Kilotons)



In most cases in the Global North, emissions did not fall due to a production decline. Beef production in the United States (the world's largest producer), increased by 30 percent during this period, while emissions still fell by 16 percent. The Global North achieved its reductions through improvements in livestock productivity based on better quality feeds, better genetics, and better veterinary care. This allowed the animals to gain weight and produce milk more quickly, instead of just eating to stay alive. The result was a reduction in the "methane intensity" of meat and milk products.

Methane intensity in beef and dairy production has also been declining in the Global South, but it remains at much higher levels than in the Global North. Beef production in South America today emits more than three times as much methane for every pound of meat, and in Africa more than four times as much. Producing a kilogram of milk from dairy cattle in South Asia results in more than twice as much belched-out methane, compared to milk production in North America. This persistence of high methane intensity in the Global South is a significant climate threat, since nearly all future growth in beef and dairy production will take place there. The Global South has already become the source of 73 percent of global methane emissions from dairy, and 77 percent from beef.

Worsening this problem, some strategies proposed for a further reduction in methane emissions in the Global North will be a poor fit in the Global South. Many in rich countries would like to see a cut back in beef and dairy consumption, since it would be good both for the climate and human health. In some cases, this is already happening: per capita beef consumption in the United States is down by more than one-third since the 1970s. In the Global South, however, many diets are still too low in animal protein (annual per capita beef consumption in France is 23 kilograms, while in Nigeria it is still less than 2 kilograms), so calling for consumption cuts would not be good for human health.

Substituting imitation meat products for the real thing is also an unlikely strategy in the Global South. Plant-based or cell-grown imitation products that do not rely on methane-emitting live animals have been widely touted on environmental grounds in the Global North, but they have yet to win over actual consumers. In 2023 in the United States, total retail sales of plant-based imitation meat (and seafood) captured only a 1.2 percent market share (in volume of product), and dollar sales actually declined by 12 percent. These imitation products will be even less popular in the Global South, because they still cost more than the real thing, and also because greenhouse gas mitigation enjoys less priority in lower-income countries. The Government of India has not signed the Global Methane Pledge because it views emissions from its dairy cows and flooded rice fields as “survival emissions” from small farmers struggling to escape poverty.

Another methane-reducing option is feed additives, such as red seaweed and new manufactured products with the same active ingredients. These could become a useful pathway for further methane reductions in the Global North, since beef and dairy cattle get so much of their feed under carefully controlled conditions. In the less controlled pasture-based feeding systems that prevail in the Global South, delivering a correct daily dose through animal feed is not possible. It will also be more difficult to create and operate the carbon credit schemes needed to incentivize daily additive use. Without such schemes, farmers will have little reason to use the additives, since reducing methane emissions by itself earns them nothing.

In both North and South, the only proven path to methane reduction in beef and dairy has been to improve animal genetics and veterinary care, and then bring controlled quantities of high-energy feed directly to the animals, rather than expecting them to rely on unimproved and frequently degraded pastures. These upgrades reduce methane intensity by speeding weight gain and milk production, thus reducing time spent simply belching out methane with little meat or milk to show for it. Farmers make these improvements for the increased production and income they bring, entirely apart from the climate benefit.

Progress has been made moving down this productivity pathway both in India’s dairy sector and in Brazil’s beef sector. In both countries government policies continue to nurture traditional small-herd and pasture-based dairy and ranching operations, but the emergence of modern, controlled-feeding

alternatives is not prevented. Most of resources needed to provide these upgrades come from private companies willing to invest due to strong growth in domestic demand for dairy products in India, and new demands for beef in Brazil to serve export markets.

These investments in beef and dairy modernization will benefit the environment in several ways, compared to a continued expansion of traditional pasture-based systems. Expanding traditional systems will result in more methane emissions while also increasing carbon emissions through continuing forest loss. Creating more pasturelands will also threaten biodiversity by destroying more wildlife habitat. Nonetheless, in September 2024, 105 prominent environmental advocacy organizations signed an open letter to "the private banking sector," calling on banks to "address their role in financing industrial livestock production." This letter incorrectly asserted that upgrading livestock systems will "accelerate climate change" and "drive catastrophic biodiversity loss." These environmental organizations suggested instead a reduction in animal numbers. They possibly did not realize the only proven way to do that is through a productivity upgrade. Compared to the 1970s, every pound of beef production in United States today not only emits less methane; it also requires 30 percent fewer animals.

About the Program

The Harvard Methane Initiative seeks meaningful and sustained progress in reducing global emissions of this very important greenhouse gas — through research and effective engagement with policymakers and key stakeholders. This Initiative is supported by the Salata Institute for Climate and Sustainability at Harvard University. The Harvard Methane Initiative and other Research Clusters supported by the Salata Institute comprise interdisciplinary teams of researchers from across Harvard's schools, whose varied expertise is required to address the complexity of the climate-related problems that they seek to solve. Robert N. Stavins, A.J. Meyer Professor of Energy and Economic Development at Harvard Kennedy School, directs the Harvard Methane Initiative. The findings, views, and conclusions in this publication are those of the authors alone.