Mapping Net Decarbonization Pathways for Indiaâ€™s Dairy industry: An Economy-wide evaluation of sustainable livestock management practices

Topic: Input-output Analysis for Policy Making (2)
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Background

Indiaâ€™s dairy sector accounts for a substantial contribution to the Indian economy, given that India is the largest milk producer in the world, providing employment for 91 million dairy farmers and further 20 million indirectly. The smallholder farmers in India account for 44% of agricultural land and 75-80% of livestock resources. India is ranked first in livestock population globally. While the dairy sector accounts for 4% of Indiaâ€™s GDP, it is responsible for 9.5% of GHG emissions from the agriculture sector, primarily resulting from methane emissions from feed production and enteric fermentation and nitrous oxide from manure management. India recently overtook China to become the most populous nation in the world and is expected to continue to grow till 2035. The rise in demand for milk and milk products will lead to an upward rise in livestock sector emissions, which is detrimental to Indiaâ€™s aim of reducing GHG emissions by 1 billion tonnes by 2030. Mapping decarbonization measures for the livestock sector can ensure economic gains across the dairy industry supply chain and simultaneously ensure environmental sustainability aligned with SDG 11.

Research question

The broad objectives of the study are given below:

â€¢ Using a comprehensive Farm-to-Fork Life Cycle Assessment (LCA) approach, the study investigates the economy-wide impact of introducing sustainable animal feed for cattle and buffaloes used in milk production and supply to the dairy industry.

â€¢ To evaluate the scope for economic gains for the smallholder livestock farmers through sustainable growth of dairy production in the country.

â€¢ To estimate the environmental impact by calculating the total GHG and Water footprint in alternative animal feedstock scenarios is assessed.

Methodology and Data Sources

The study adopts an Environmental Input-Output LCA (EIO-LCA) approach by referring to the latest Supply Use Tables published by the Government of India for the year 2019-20. Based on the commodity-wise growth rates estimated using the National Accounts Statistics, between 2019-23, the Input-Output table will be updated to the year 2030. The â€˜Ration-Balancing Programme (RBP), undertaken by the National Dairy Development Board, focuses on Balanced feed formulation for cattle and buffaloes in order to increase milk yield and reduce feed cost has been referred. The latest survey conducted by the Government of India on the â€˜Situation Assessment of Agricultural Households and Land Holdings in Rural India 2019â€™ refers to compiling different farmholder category-wise expenses on livestock farming and rearing.

Novelty of research

To the best knowledge of the authors, this is the first-of-its-kind study evaluating an economy-wide decarbonization pathway for the Indian dairy industry. While previous studies have undertaken the direct attributional LCA approach estimating the direct GHG emissions in the dairy industry, this study assesses the economy-wide and environmental impact of not only the dairy industry supply chain but the overarching impact of decarbonization measures in Indiaâ€™s livestock sector on rest of the economy.

Preliminary findings

According to the latest household consumer expenditure survey 2022-23, Indiaâ€™s urban population consumes on average 197 gms/day of dairy products, compared to the dietary recommendation of 312 gms/day according to the Indian Council of Medical Research. While the current consumption of dairy products remains low, trend analysis shows that Indiaâ€™s dietary

patterns have been converging to developed countries wherein the expenditure on dairy products is gradually increasing. In the scenario without RBP intervention, the achievement of recommended dairy products intake by 2030 will lead to an increase in Total output, GDP and Employment of 1.7%, 1.1% and 1.3%, respectively with an increase in GHG and Water footprint by 44.4 tCO2e. and 20.7 thousand cubic meters respectively. However, Indiaâ€™s smallholder farmers spend 73.5% of total expenses on animal â€˜seedsâ€™ and animal feed, compared to only 45% by larger farmers. The implementation of RBP recommended diets that reduce feed cost by 11.8% and emission intensity in the primary stage of milk production, leads to minimal difference in macroeconomic indicators, while the GHG emission decreases by 14.7%. In another case of â€˜detailed RBPâ€™, specific accounting for various types of animal feed, such as green fodder, dry fodder and nutrient concentrates as well as optimal water requirement for the cattle and buffaloes is of higher importance for the smallholder farmers, given their larger share of expenses attributed to animal feed procurement. The Benefit Cost Ratio of livestock rearing is expected to increase from 1.38 to 1.56 by following the detailed RBP, leading to further positive economy-wide and environmental multiplier effects, given their larger livestock holdings.