

**(096)****Life Cycle Assessment of Feeding Strategies in Sri Lankan Smallholder Dairying:  
A Comparison of Greenhouse Gas Emission Costs****Kulasekara, K.G.A.L.S.<sup>1</sup>, Udugama, J.M.M.<sup>1\*</sup>, Dissanayake, D.M.W.S.H.<sup>1</sup>,  
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University of Colombo, Colombo 03, Sri Lanka**\*[menukaudugama@gmail.com](mailto:menukaudugama@gmail.com)***Abstract**

The Sri Lankan dairy industry plays a vital role in meeting national nutritional requirements, with smallholder farmers contributing a substantial share of production. However, this sector also generates significant Green House Gas (GHG) emissions, highlighting the need for sustainable feeding practices. This study employs a Life Cycle Assessment (LCA) framework to analyze the environmental implications of two semi-intensive feeding strategies commonly practiced by smallholders in the North-Western province, which contributes 18-22% of Sri Lanka's milk output. A cradle-to-gate system boundary and a functional unit of 10 L of raw cow milk were considered. The first feeding strategy (FS1) consists of cultivated fodder (Guinea grass), coconut poonac, and commercial cattle feed, while the second strategy (FS2) relies on natural pasture grazing with supplementary commercial feed. Results indicate that FS2 produces 474.13 kgCO<sub>2</sub>eq/10 L of milk, nearly four times greater than FS1 (120.62 kgCO<sub>2</sub>eq/10 L). Moreover, FS2 exhibited higher eutrophication potential due to greater ammonia volatilization and nitrate leaching. Life Cycle Costing (LCC) analysis further revealed that the emission-related cost of FS2 was markedly higher, reflecting its elevated Methane (CH<sub>4</sub>) and Nitrous Oxide (N<sub>2</sub>O) outputs. Conversely, FS1 demonstrated more efficient land utilization, lower emission intensity, and reduced climate costs, underscoring its relative sustainability. The findings emphasize that feed quality, nutrient management, and land use efficiency are central to lowering the environmental footprint of smallholder dairy production. By integrating economic and environmental perspectives, this research provides evidence-based insights for promoting climate-smart feeding strategies in Sri Lanka's dairy sector. Such insights can guide policymakers in designing interventions that enhance both ecological and economic sustainability, thereby supporting the development of a low-emission dairy industry.

**Keywords:** *Climate smart practices, Dairy sustainability, Environmental footprint, Life cycle costing, Nutrient management*