

Title : Coffee processing practices and their carbon footprints in Northern Thailand

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ABSTRACT

This study systematically evaluates the carbon footprints of six coffee farms in Northern Thailand, focusing on greenhouse gas (GHG) emissions associated with three coffee processing methods: dry, wet, and honey. Data were collected through a structured questionnaire survey and analyzed using the Cool Farm Tool within a Life Cycle Assessment (LCA) framework. Results reveal that fertilizer application, energy-intensive processing operations, and wastewater management are the primary contributors to GHG emissions. Fertilizer use accounted for 1617.64 kg CO₂ equivalent per hectare and 962.88 kg CO₂ equivalent per tonne of output during cultivation. Diesel fuel consumption in post-harvest wet processing contributed 529.65 kg CO₂ equivalent per hectare, while the wet method itself generated the highest emissions (67,797.00 kg CO₂ equivalent) due to intensive water and energy demands. Comparatively, wet processing exhibited an 87% larger carbon footprint than dry processing and 40% higher than honey processing. Emissions varied significantly with energy sources and processing techniques. Notably, all surveyed farms employed composting instead of open-field burning, suggesting potential for further reductions through optimized composting efficiency and improved wastewater treatment. These findings emphasize the importance of adopting sustainable processing practices and resource management strategies to mitigate the environmental impact of coffee production.