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ORIGINAL ARTICLE

Environmental Footprints of Yogurt Production: A Case Study of a Small-Scale Manufacturing Process in Sri Lanka

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Abstract
This study investigated the life cycle environmental impacts of yogurt production from cradle to gate at the Pulathisi milk factory in Polonnaruwa, Sri Lanka. The functional unit considered was one kilogram of yogurt produced in the factory using existing technology. The defined system boundary encompassed raw milk production and transportation, machinery fabrication, standardization of milk, and standard unit operations of yogurt production. Material and energy usage data were collected through a series of observations, literature and Ecoinvent 3.7.1 databases. The ReCiPe 2008 method was employed for impact analysis, considering eighteen impact categories with SimaPro software. The inventory analysis included material consumption for machinery fabrication, energy consumption, and emissions for each unit operation in yogurt production. Results were characterized using midpoint indicators, and normalized impacts were calculated. The characterized outcomes of the yogurt production process contributed 2.48 kgCO_2eq to climate change, 0.0297 kgSO_2eq to acidification, 0.0002 kgPeq to eutrophication, and 6.9199 kg 1,4-DBeq to human toxicity. The study identified hotspots, emphasizing the significant contributions of cow milk production and electricity usage to environmental impacts. Potential mitigations, such as improved waste management in dairy farming and switching to renewable energy sources, are proposed to address these impacts. The normalized impacts provided insights for decision-makers and stakeholders to compare environmental performances and guide sustainable practices in yogurt production. The total impact was recorded as 0.014-person equivalent per year per one kilogram of yogurt.

Keywords: *Cow milk, Environmental impacts, Normalized impacts, Renewable energy, Sustainable practices*

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