Life Cycle Assessment of baby leaf spinach: Reduction of waste through interventions in growing treatments and packaging

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Abstract

Food production, distribution and waste impact significantly on the environment, with recognised contributions to GHG emissions and Global Warming Potential (GWP) at each stage of the supply chain. Fresh leaf vegetables, such as salad leaves and spinach, are particularly prone to spoilage and efforts are being made to reduce waste, by increasing shelf-life through growing treatments and packaging choices. This presentation reports on the findings of Life Cycle Assessment studies carried out to support the Science Foundation Ireland (SFI) funded project 'Leaf no Waste'. The study looks at the production of baby leaf spinach grown in Ireland and explores changes in the environmental impacts profile (e.g. GWP) for a foliar silicon treatment and two packaging options (i.e. Oriented Polypropylene (OPP) and Polylactide (PLA)). The system boundary of the study includes the field production of spinach, storage, packaging, retail, and waste management options, for the functional unit 1 kg packed baby leaf spinach. 4 scenarios were selected from the experimental data, namely spinach packed in OPP, spinach packed in PLA, silicon treated spinach in OPP, and silicon treated spinach in PLA. Furthermore, waste at 3-day shelf-life and waste at 7-day shelf-life were compared, to evaluate the effects of the treatments, and the resulting environmental impacts based on the LCA. The preliminary results illustrate that the storage and packaging process and retail stage are among the key contributors to GWP due to packaging material production and energy use. Comparison of scenarios under 3-day shelf life shows that spinach with PLA packaging is worse than that with OPP packaging in both base case and silicon treatment scenarios. However, application of silicon product shows potential to benefit the spinach supply chain with PLA packaging, while it has little effect on OPP packaging cases.

Keywords:

GHG emissions, life cycle assessment, shelf-life extension, silicon foliar treatment, packaging, spinach