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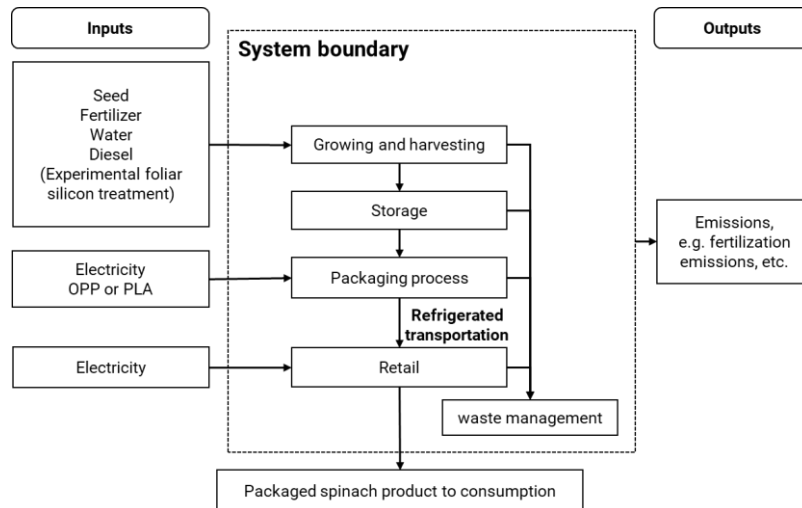


Introduction

- 26% of GHG emissions, 32% of terrestrial acidification and 78% of eutrophication impacts are the result of food production, distribution and waste¹.
- Packaging reduces food waste by protecting products and extending shelf life².
- A foliar silicon treatment has been identified as a method for extending the shelf life of baby leaf spinach.
- Life Cycle Assessment (LCA) is a tool used to evaluate the environmental impacts of food systems, including vegetable production and distribution in different countries³⁻⁷.
- Results of an LCA for Global Warming Potential (GWP) impacts of packaging and foliar treatment are presented, in terms of waste reduction for an Irish baby leaf spinach supply chain.

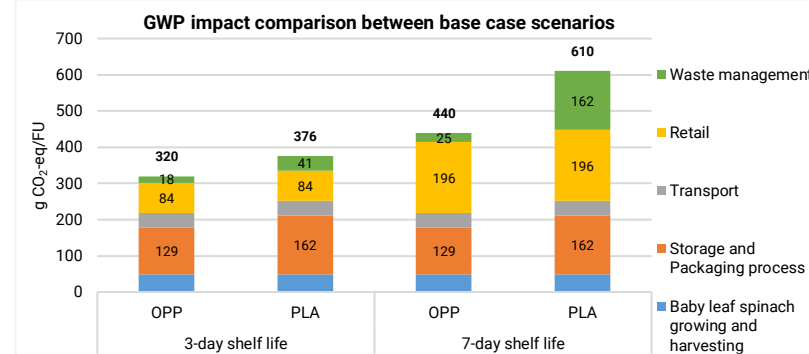
Methodology

- **Study Goal:** assess and compare the GWP of Irish baby leaf spinach with different packaging materials (Oriented Polypropylene (OPP) and Polylactide (PLA)) and a foliar silicon treatment.
- **Functional unit:** supplying 1kg baby leaf spinach.
- **Life Cycle Impact Assessment (LCIA) method:** ReCiPe 2016⁸.
- **Scope – system boundary**



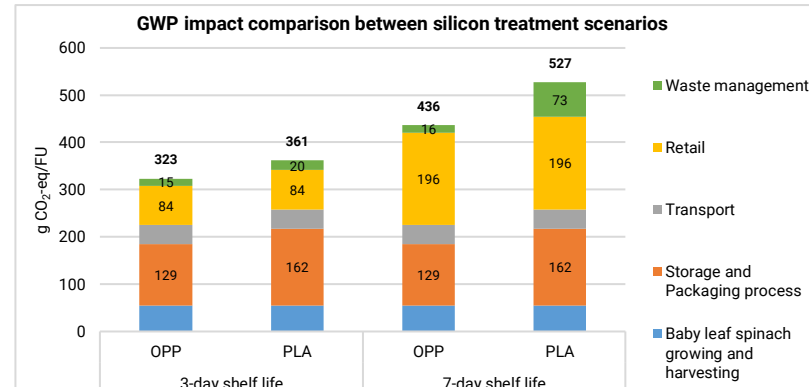
Results

- **Packaging Scenarios:** PLA case emits 12% - 39% more GHG emissions than OPP due to the material embedded impacts and more waste managed.



- **Foliar treatment with 2 packaging scenarios over 3- and 7-day shelf life:**

- Foliar silicon reduces food waste and 4% GHG emissions for PLA in 3-day shelf life. Foliar silicon treatment with OPP has 1% more GWP impacts than OPP only.
- Foliar silicon treatment has more benefits in 7-day shelf life, with 1% and 14% reduction in GWP for OPP and PLA packaging.
- However, longer shelf life causes 37% - 62% more GWP impacts for packaging and silicon treatment scenarios in 3 and 7-day shelf life, due to more energy use for refrigeration at retailers and more waste managed.



Methodology

- **Scenario establishment – food waste generation based**

Shelf life	Scenario	Packaging	Food and packaging waste rate
3-day shelf life	Base case scenario	OPP	1.92%
		PLA	9.21%
	Silicon treatment scenario	OPP	0.15%
		PLA	1.81%
7-day shelf life	Base case scenario	OPP	6.03%
		PLA	51.89%
	Silicon treatment scenario	OPP	0.82%
		PLA	20.59%

Conclusion and recommendation

- For an Irish baby leaf spinach supply chain, OPP packaging shows better GWP environmental performance than PLA packaging in this study.
- Foliar silicon treatment saves GHG emissions by reducing food waste but the benefit is less for OPP packaging.
- Foliar silicon treatment is more beneficial in terms of lower GHG emissions with PLA over 7-day shelf life, with 14% of GWP impact reduction between the base case and silicon treatment scenarios.
- However, longer shelf life requires longer storage time at retailers, consuming more energy and resulting in more waste management; ultimately resulting in more GHG emissions compared to 3-day shelf life over the entire cycle.
- Foliar silicon treatment is more beneficial in reducing GWP impact for the PLA case, however assessing trade-offs between other LCA environmental impact categories is also recommended, e.g., fossil resource scarcity.

Reference

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