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Life cycle perspectives on the sustainability of Ontario greenhouse tomato production: benchmarking and improvement opportunities

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Abstract

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- 12 Globally, there is a shortage of vegetables to meet the requirements of a healthy diet.
- 13 Greenhouse production can help meet demand for vegetables, but under certain conditions
- 14 it can be very energy intensive and unsustainable, particularly in cold climates, such as in
- 15 Canada. Greenhouse producers in Ontario, Canada, which has the highest concentration of
- 16 greenhouses in North America, have been actively improving the industry to reduce costs
- and address environmental concerns, but very little is known about the environmental
- 18 sustainability of the industry. This study not only addresses the gap in life cycle
- 19 environmental performance of Canadian greenhouse tomato production, it also provides a
- 20 broader sustainability analysis that could be applied to other regions when considering
- 21 improvements in the industry. Life cycle assessment (LCA) was used to benchmark Ontario
- 22 greenhouse tomato production relative to other regions using data from 8 growers. Heating
- 23 with fossil fuels contributed between 50 and 85% of the total impact for ozone depletion,
- 24 global warming, smog, acidification, and respiratory effects. Using willow biomass produced
- 25 in Ontario could reduce global warming impacts of tomato production by 72%. This solution
- 26 requires approximately 50,000 ha of land to produce the biomass needed for the annual
- 27 production of 165,000 t of tomatoes in this region, which is about 10 times more land than
- 28 field tomato production. However, field tomatoes can be up to 50% more water intensive
- 29 than greenhouse tomatoes. To mitigate these trade-offs, the industry needs to consider both
- 30 growing biomass on degraded land and industrial symbiosis to recover wastes so that *Corresponding Author 519-888-4567 x38571

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