

# Quantifying Post-harvest Losses and GHG Emissions from Banana Supply Chains in Sri Lanka

Kamalakkannan, S<sup>A</sup>, Wasala, W.M.C.B<sup>B</sup>, Kulatunga, A.K<sup>A</sup>, Gunawardena, C.R<sup>B</sup>, Bandara, D.M.S.P<sup>B</sup>, Jayawardana, J<sup>A</sup>, Rathnayake, R.M.R.N.K<sup>B</sup>, Wijewardana, R.M.N.A<sup>B</sup>, Weerakkody, W.A.P<sup>B</sup>, Ferguson, I<sup>C</sup>, Chandrakumar, C<sup>D</sup>

<sup>A</sup> Department of Manufacturing and Industrial Engineering, Faculty of Engineering, University of Peradeniya, Peradeniya 20400, Sri Lanka.  
<sup>B</sup> National Institute of Post-Harvest Management, Anuradhapura 50000, Sri Lanka.  
<sup>C</sup> Titirangi, Auckland 0604, New Zealand.  
<sup>D</sup> thinkstep-anz, 11 Rawhiti Road, Pukerua Bay, Wellington 5026, New Zealand.

## Background

- Banana is a popular fruit consumed by Sri Lankans, which has cultural values.
- Sri Lanka produces several banana varieties – both for domestic and export markets.
- It is estimated that 30-40% of the banana harvest is lost during post-harvest stages – causing significant economic and environmental impacts.
- Post-harvest losses are largely due to improper handling, poor transportation and lack of infrastructure and technologies.
- However, to date, limited research is undertaken in Sri Lanka.



Figure 1: Poor Handling Practices in Sri Lanka

## Objective

This study aims to quantify post-harvest losses and related environmental impacts (mainly, climate change) of the sour banana variety across its supply chain in Sri Lanka – using Life Cycle Assessment (LCA)

## Methodology

- Consequential LCA is undertaken, according to the ISO14040/14044 standards.
- Cradle-to-gate (retailer) boundary is considered.
- Life Cycle Inventory (LCI) is developed based on field surveys, observations and personal interviews, covering two major supply chains of sour banana :
  - Farmers, fruit collectors and wholesale sellers in Embilipitiya and Thambuttegama;
  - Retailers in Kandy, Colombo and Gampaha.
- Collected data is categorised as follows: farm, collection centre, wholesale seller, retailer and transport.
- LCA is undertaken using SimaPro 8.3 with IPCC 2013 GWP 100 factors.



Figure 2: Field Surveys for Data Collection

Table 1: LCA Scope and System Boundaries

Definition	Description
Scope	Cradle-to-retailer gate
Functional unit	1 tonne of sour banana ready for consumption
LCI data/exclusions	<ul style="list-style-type: none"> <li>Impacts related to infrastructure and capital are excluded.</li> <li>Banana production impacts are sourced fromecoinvent (Indian dataset – proxy)</li> </ul>

## Results and Discussion

- Cradle-to-retail gate GHG emissions of 1 tonne of sour banana is 707 kg CO<sub>2</sub>-eq, measured using GWP100 metric, as shown in Figure 3.
- Largest contributor is on-farm banana production activities (318 kg CO<sub>2</sub>-eq), which is largely driven by irrigation activities that are powered by coal-based electricity in Sri Lanka.
- Transport from wholesale to retail is the second largest contributor (184 kg CO<sub>2</sub>-eq) – driven by significant transport distances, followed by retail activities (75 kg CO<sub>2</sub>-eq) – driven by organic wastes disposal.
- Scenario analyses showed that using rail as an alternative transportation mode could reduce GHG emissions by 67 kg CO<sub>2</sub>-eq per tonne.
- Total post-harvest losses of sour banana is 27% - the largest in the retail stage (7.9%) followed by transportation from wholesale to retail (7.6%) and wholesale stage (6.2%). This is associated with 271 kg CO<sub>2</sub>-eq of GHG emissions (see Figure 4).
- It gives an indication that reducing post-harvest losses is crucial for mitigating the environmental impacts of the banana supply chain in Sri Lanka.

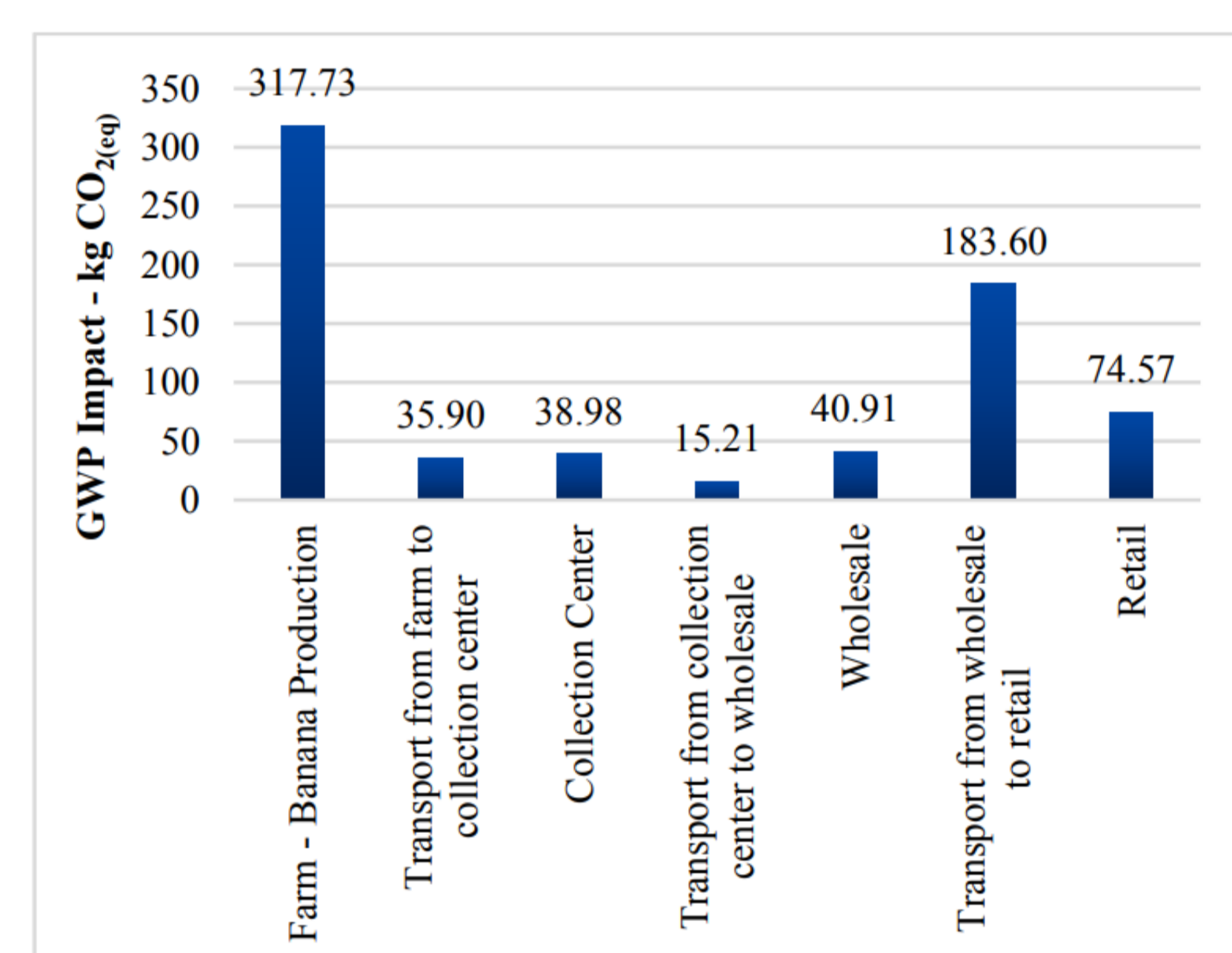


Figure 3: Cradle-to-Gate (Retailer) GWP100 Impacts of the Banana Supply Chain (FU: 1 tonne sour banana)

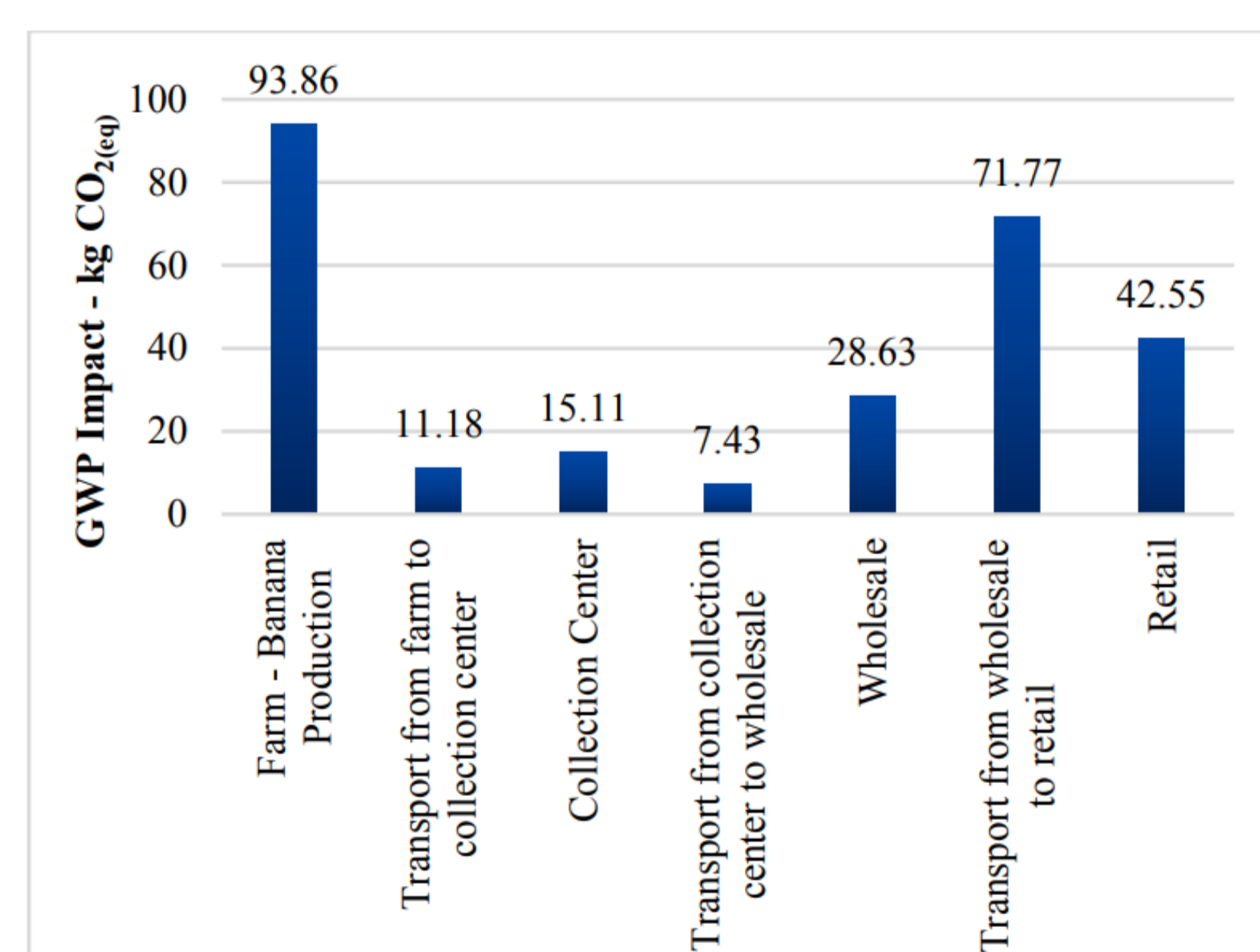


Figure 4: Cradle-to-Gate (Retailer) Post-Harvest Losses related GWP100 Impacts (FU: 1 tonne sour banana)

## Conclusions

- In Sri Lanka, 27% of the sour banana produced is lost during post-harvest stages, which is significant both economically and environmentally.
- Policy and technological interventions are required at all stages of the banana supply chain to mitigate post-harvest losses. This includes development of an action plan for the sector.
- The lessons and experience from this study are relevant for other fresh fruits and vegetables in Sri Lanka and other developing countries.

## Key project outcomes

- Kamalakkannan et al. (2022). Life Cycle Assessment of Food Loss Impacts: Case of Banana Postharvest Losses in Sri Lanka. Procedia CIRP 105, pp. 859-864.
- Chandrasiri et al. (2022). Mitigating Environmental Impact of Perishable Food Supply Chain by a Novel Configuration: Simulating Banana Supply Chain in Sri Lanka. Sustainability 14(19), 12060.

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Correspondence: Dr Chanjief Chandrakumar (Chanjief.Chandrakumar@thinkstep-anz.com)