VIRTUAL TRAINING MODULE

Life Cycle Assessment in the field of food waste

Findings, challenges and limitations – a quick paper review

This project is co-funded by the European Union through the Interreg Alpine Space programme

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HM Hochschule München University of Applied Sciences
AViTeM Agency for sustainable Mediterranean cities and territories
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TOPICS

- Definitions
- How does LCA work?
- Key benefits of LCA
- Challenges and limitations of LCA on food waste
- Conclusion and outlook
- Useful Tools & Platforms
- Reflection
- Literature

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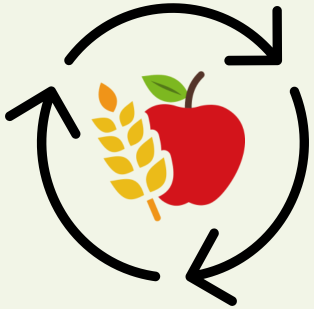


LCA

LCA (Life Cycle Assessment) is a method that assesses the environmental impact of a product across its entire life cycle.

In the context of **food waste**, it helps to better understand environmental impacts and thus supports decision makers.

(Dominguez Aldama et al. 2023)

FOOD WASTE

Food waste refers to the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food service providers and consumers

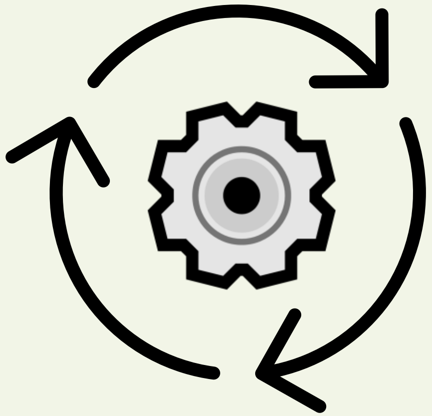
(FAO 2023).

BY-PRODUCTS

By-products are secondary outputs generated during food production or waste valorization processes.

In Life Cycle Assessment, they must be carefully accounted for to ensure environmental impacts are allocated fairly.

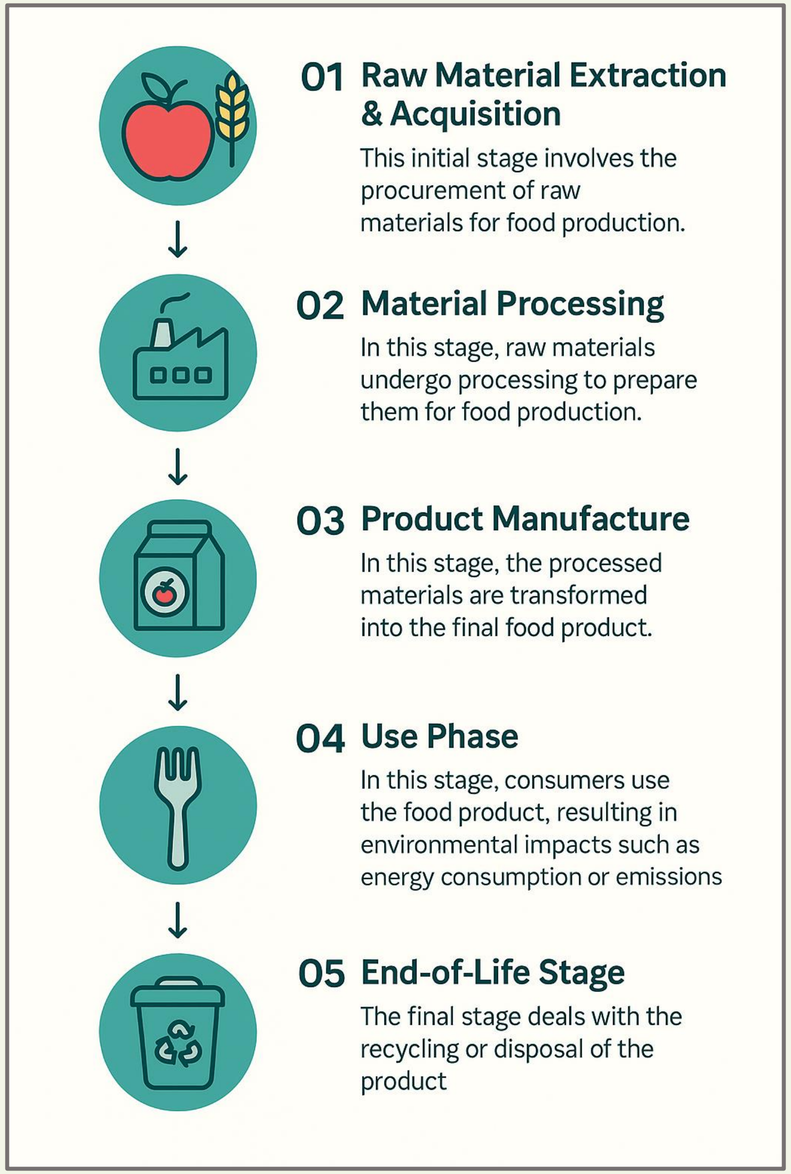
(Dominguez Aldama et al. 2023)



How does LCA work?

(Finkbeiner et al. 2006)

Life cycle stages of a product, process or service



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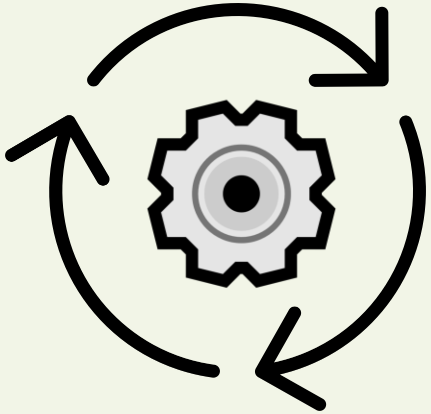
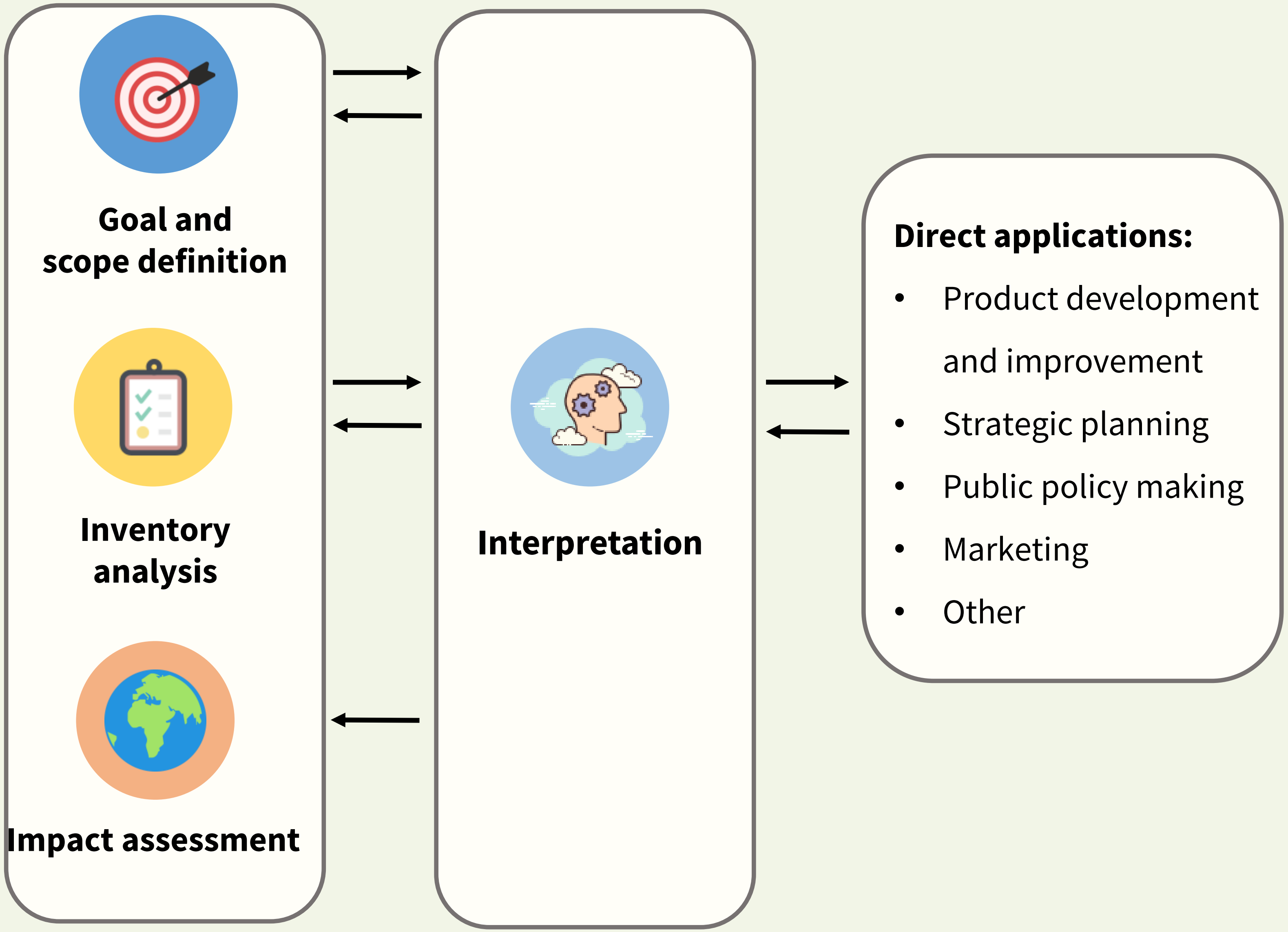
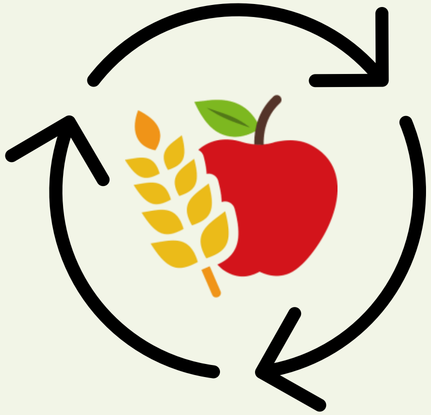


How does LCA work?

(DIN EN ISO 14044)

Phases of an Life cycle assessment framework

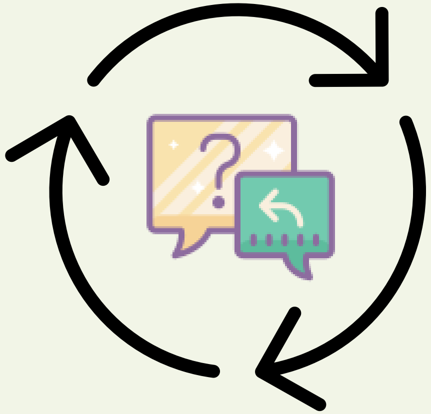




What are the key benefits of LCA?

(Kaltenbrunner et al. 2024)

- Evaluating environmental impacts
- Identifying critical points
- Guiding prevention strategies
- Supporting informed decision-making
- Developing sustainable practices
- Comparing products or systems
- Aligning with circular economy goals
- Highlighting trade-offs



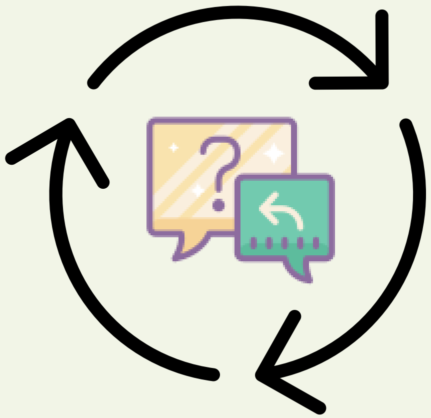
Challenges and limitations of LCA on food waste I

1) **Scope Definition Complexity**
Choosing different system boundaries—such as “farm-to-gate” vs. “farm-to-table”—and whether to include preparation stages can drastically change LCA results and limit comparability.
(Kaltenbrunner et al. 2024)

2) **Data Variability & Quality**
Inconsistent and incomplete data from diverse food systems (e.g., on water or energy use) weakens the reliability and credibility of LCA outcomes. (Shamraiz et al. 2019)

3) **Methodological Inconsistencies**
Varying LCA approaches depending on research goals and data strictness reduces the reproducibility and robustness of results.
(European Commission – Joint Research Center 2010)

4) **Selection of Impact Categories**
Differences in chosen environmental indicators—like GHG emissions or water use—can skew results and misalign with stakeholder priorities. (Morone et al. 2019)



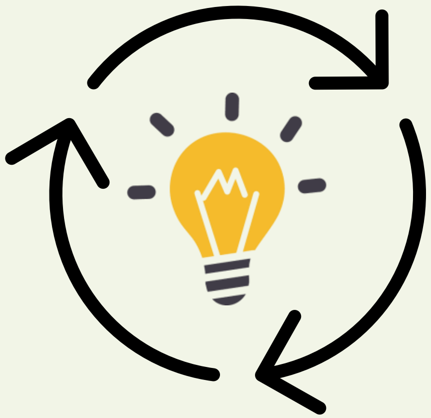
Challenges and limitations of LCA on food waste II

5) **Regional Differences**
LCA findings are often not transferable across regions due to local differences in agriculture, infrastructure, and waste treatment. (Finnegan et al. 2018)

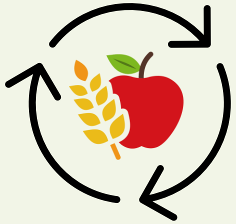
6) **Lack of Standardization**
The absence of a unified framework beyond ISO/PEF leads to inconsistent use of functional units, system boundaries, and datasets. (Peters et al. 2010)

7) **Iterative Nature & Resource Needs**
LCA requires continuous refinement and reliable data, making it resource-intensive and methodologically demanding. (Kaltenbrunner et al. 2024)

8) **Limited Collaboration & Centralized Data**
A lack of shared databases and cross-border cooperation hinders comparability and calls for tools like Agribalyse or the FLW Standard. (Saavedra-Rubio et al. 2022; Roy et al. 2009; Kaltenbrunner et al. 2024)



Conclusion and outlook I



- **LCA is a powerful tool** for the analysis of the environmental impacts of food and food waste.
- However, **differences in scope, standards, and regional contexts** make comparisons across studies difficult.
- **Variability in system boundaries**, chosen methodologies, and data quality lead to inconsistent results.
- **Regional disparities in agriculture and waste management** further complicate harmonization.

Conclusion and outlook II

- Despite existing barriers, **progress is being made** through initiatives like Agribalyse, highlighting the value of standardized platforms, sector-specific databases, clear reporting standards, and cross-border collaboration.
- **A harmonized approach to LCA will support more sustainable food systems and informed policy decisions.**

Useful Tools & Platforms

FoodCycle.ai

An AI-supported decision support tool within the CEFoodCycle project **to manage food surpluses and waste sustainably**. **It connects companies with solutions like food donations, upcycling, energy generation, or animal feed production.** The tool also provides environmental impact analysis to highlight CO_2 savings from sustainable alternatives to disposal.

Website: https://foodcycle.ai/dev/

Agribalyse

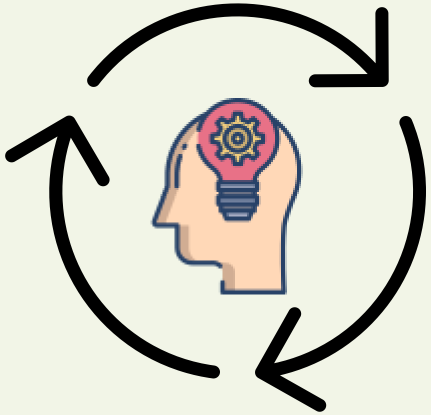
Agribalyse is France's national LCA database for food and agriculture, developed by ADEME and INRAE. It offers environmental profiles for over 2,500 food items, helping estimate the impact of food waste in a harmonized, policy-relevant way.

Website: https://agribalyse.ademe.fr/

Ecoinvent

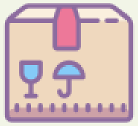
Ecoinvent is a leading LCA database offering high-quality inventory data across sectors, including agriculture, energy, packaging, and waste. It supports accurate modeling of food waste impacts and ensures consistent, transparent data for credible, comparable LCA results.

Website: https://ecoinvent.org/



Reflection

- Where in your business or household is food waste generated?



- How is food transported, packaged and disposed of?

- What environmental impact might the different stages have?

- How could LCA help you make better decisions?

Thank you!

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