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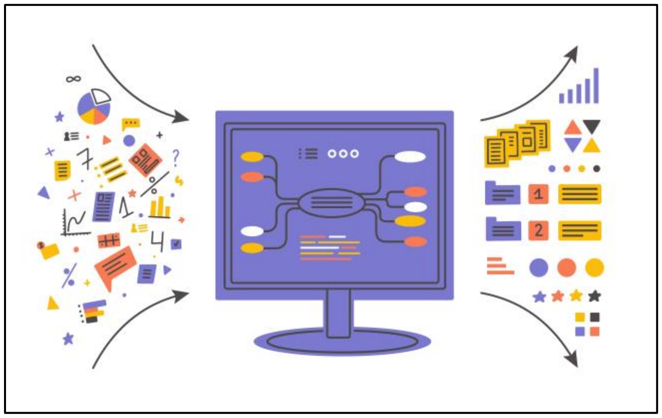
Goals, Strengths, and Limitations Governing the Use of Life Cycle Assessment in Food and Agriculture



The quantitative elements of LCA are effectively based on supply chain mass and energy flow accounting linked to impact assessment models.

- The most common questions addressed by LCAs are related to environmental assessment, especially environmental impacts such as global warming potential or water embodied in a product or process.
- While LCAs are very powerful tools for analyzing entire supply chain systems for impacts, there are some questions LCAs cannot answer, such as normative value decisions, ethical framing, and risk mitigation.

While LCA studies may differ greatly in complexity and scope, they all adhere to common principles and share a common methodological framework.

- Four principles of an LCA study are: the life cycle perspective, a relative approach, transparency, and comprehensiveness.
- LCA studies also follow a common methodological approach involving our phases: goal and scope definition, inventory analysis, impact assessment and interpretation.

To properly conduct a life cycle assessment will entail four core activities, including: (1) defining the goal and scope of the study, (2) life cycle inventory, (3) life cycle impact assessment, and (4) interpretation

- After setting the goals for the study, clearly defining the scope is crucial step in LCA.
- Broadly there are two classes of life cycle assessment: (1) bottom-up or process-based LCA and (2) top-down or input-output (I/O) LCA.
- Life cycle impact assessment converts the emissions and resource uses into units of potential environmental impacts.
- When analyzing endpoint results, the impacts are aggregated as damages to human health ecosystem quality and natural resources, which allows more direct discussions of safeguard objects.

Big data analytics, the process of using big data to support decision-making, have been used to fill life cycle inventory data gaps and characterize uncertainties.

- For accurate LCI data of nitrous oxide emissions, efforts are needed for nation-wide, region-specific data collection, emission monitoring, verification, and inventory assessment.
- Uncertainty analysis quantifies the uncertainties of LCA results and provides a level of likelihood and confidence in LCA results. Uncertainty in LCA includes parameter, scenario, and model uncertainty.

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