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Agricultural, and Environmental Issues

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

January 25, 2022 Webinar Questions and Answers

Panelists: Dr. Marty Matlock, Dr. Yuan Yao, and Dr. Kurt Rosentrater

Is there ISO for dairy and beef farms?

No, the ISO Standards are more general, however the LEAP protocols are appropriate.

My take on the goal and scope step is that it requires active engagement of all stakeholders interested in the study outcomes. That should be the gold standard for goal and scope and LCA practice. How well do you think most LCAs meet this standard? Am I being too extreme in my perspective?

Stakeholder engagement is complex, hard, and expensive, so is often under-developed in the LCA process. We strongly recommend a robust and fully documented stakeholder engagement process for all LCAs.

How would you allocate to a by-product?

The LEAP protocols are pretty clear, but I would use mass unless there were a significant reason not to.

What did you mean when you said the inputs are elemental?

They are basic to the manufacturing or production process in the unit process.

How many producers have to provide data to represent a commodity?

Representation is the key. If I am assessing the impacts of tillage practices on GHG emissions from a county in Iowa, I would want data from at least 5 producers who use each practice, approx. 25 producers at a minimum. If I am assessing national corn production I have to zoom back on representation, will use regional data that represent each practice as best I can.

The LCA takes into account Carbon Sequestration?

Carbon dynamics, including sequestration, can be considered if the data exists to substantiate the claim that carbon is indeed being sequestered through a process.





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How do you expect the proliferation of LCA analyses to change global industry, resource extraction, and decision making? Will social LCA be prioritized along with environmental and economic LCA?

LCA approaches are amplifying the need for standardized data collection, uniform reporting, and improved impact models. Social LCA indicators will potentially transform supply chains through potential magnification of reputational risk.

How we can assess the impact of several products in farms?

Multiple products from a single farm requires segregation of impacts (mass and costs) so that each product can be analyzed robustly.

Curious on deciding between 20-year vs 100-year GWP (particularly for methane) - is one the standard?

100-yr is used by NGOs, I recommend 20-yr because that is within a window that current decision-makers can comprehend.

Question on Beef and Dairy LCAs - why do they disagree? And how/why to trust the results of LCAs if they don't agree?

The results vary because input data are variable, boundaries are not consistent, and allocation rules are not standardized.

So if a byproduct is a waste product, then you will still allocate by mass or economic?

Depends on the context. Mass is better, cost of disposal becomes the economic encumbrance if not.

Has analysis been done on ethanol in terms of energy gained?

Yes, go to Google Scholar and search Ethanol Energy LCA. You will find a lot of data, analyses, and perspectives.

Tallow used in biofuels is usually considered a byproduct. It starts at "zero" when you talk to the fuel companies making biofuels. However, some companies want to take the full lifecycle assessment for this byproduct and tie it to the byproduct. Thoughts on "zero" here and how can we help the full benefit and cost of tallow?

Nothing costs zero anything. This is burden avoidance by assuming non-priority products from a process has no burden. Natural gas is a by-product of petrochemical extraction and refining. Does that mean it has no GHG/energy/land/water/health burdens?





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What can be done to get better information to do research and make better decisions?

In the US we need more centralized (government) funding of data sources.

How do we allocate to commodities (such as compost) that result from the use of by-products from the dairy industry (such as Dung and offal for maggot farming)? And is this data available in place?

There are numerous good LCAs that address this part of the circular dairy economy. Google Scholar searches for these key words generate dozens of good articles.

What methodology exist alternative to LCA that may not be impacted by the objectives? Consumers will demand a decrease in the impacts and will not have a way to evaluate the differences in methodology

Risk assessments are the next best thing but most use LCA methods.

For the most recent environmental impact assessment of U.S. produced beef, was C sequestration factored in? To what degree did it offset emissions?

The data on C sequestration is still evolving, so it could not be considered in detail.

Can you please discuss the “environmental tax” the animal feed industry pays for biofuel production because of mass or economic allocation, i.e. distiller’s grain has a C footprint while benefitting the biofuel industry by being a more optimal use outlet than composting, combusting, landfilling, etc.

Dried distillers grains (DDGs) are a significant co-product from ethanol biofuel production. They are so valuable they might someday be the primary product. These products do not get to escape the costs of production. An economic allocation would shift the burden to/from ethanol as prices vary, but one cannot exist without the other.

Do you see LCA playing a larger role in agricultural markets, beyond something simple like carbon foot printing for brand marketing? If so, what capacity does LCA in this space and what are the limitations?

The major indicators I see emerging are Water Use Efficiency, Nitrogen Use Efficiency, Land Use Efficiency, ecosystem services.

Is linear programming the main mathematical tool for doing LCA assessments?

Dr. Hiejungs says no: <https://link.springer.com/article/10.1007/s11367-020-01810-z>

What about system expansion? Isn’t that preferred over allocation?

Yes, when data allow it.





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Isn't a LCA more important to see where improvements can be made in a process rather than making comparisons between processes?

That depends on your perspective or needs.

Can you discuss how we should think of LCAs and the discussion of the "true cost/value of food" being discussed in forums like the UN Food System Summit.

LCAs provide a good perspective on certain aspects of food. The value of food is that it nourishes people. There is no alternative.

Can you provide some examples of publicly available LCA databases (e.g., feed ingredients used in animal feeds) for different livestock and poultry supply chains in North America or the U.S.?

The best source is Google Scholar for these documents. There are a lot. Also see the FAO LEAP website.

We see many published LCA in different journals. Is there a standard protocol to review the papers before they get published? Question is regarding the reliability of the methodology or conclusions from the LCAs?

Peer review is based on the quality of the reviewer. Expertise in agricultural LCAs is growing, so reviews and therefore papers are getting better.

Would you recommend a reference guide for LCA in turf grass?

I would use the documents referenced in the presentation and apply them to this process.

What is the advantage (if any) of LCA assessment over environmentally extended Input-Output models?

They are in part the same thing. LCA has a more extensive methodology for including upstream impacts and burdens.

How do you include people hours or labor in emission LCAs?

The best way is to use the LEAP allocation method for labor. Also, see: Rocco, M. V. (2016). Accounting for human labour in LCA: a novel Input-Output approach. In Convegno della Rete Italiana LCA 2016 Life Cycle Thinking, sostenibilità ed economia circolare (pp. 466-474).

Can LCAs be used to improve weaker elements of a supply chain?

They can be used to identify weaknesses and therefore focus efforts in improving the system.





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One of the “elemental inputs” in most agricultural processes would seem to be humans. How do you account for varying quality of humans (e.g., of management) and costs (i.e., expected incomes)?

Rocco, M. V. (2016). Accounting for human labour in LCA: a novel Input-Output approach. In *Convegno della Rete Italiana LCA 2016 Life Cycle Thinking, sostenibilità ed economia circolare* (pp. 466-474).

What are the risks if we do a bad job with these LCAs with the consumer? We could lose trust super fast.

Better information is an improvement over no information. Perfect information does not exist.

