Three days training on Life Cycle Assessment (LCA) training for food systems background document

Project: Resource-smart urban value chains and food systems (project leader Vincent Linderhof)
Training dates: July 3-5, 2019
Developed by: Roel Helmes (Wageningen Economic Research)
Trainers: Roel Helmes with a contribution of Pim Mostert (Wageningen Livestock Research)

Context

In order to make basic choices regarding the methods and general approach of the project "Resource-smart urban value chains and food systems" in discussion with each other, the project members from CIAT and affiliates from Wageningen University need to have basic knowledge of LCA. They need more background on the application of LCA in food systems and the link to (healthy) diets. In this way, the researchers can utilize the expertise and experience available in the Vietnamese stakeholder field and their own research skills more effectively for the project goals. In order to go further in-depth in modelling and direct innovation of LCAs of individual food items, the researchers more background in modelling and data collection approaches within LCA, and the challenges therein.

Goal

The course participants will be able to:

- Understand all concepts of LCA
- Read and understand LCA studies and papers for interpretation and meta-analysis
- Talk with LCA experts on their research needs
- Work on excel based LCAs in cooperation

Participants will not be able to:

- Do an LCA in LCA software
- Know their way through all methodological options in a food LCA

Structure of the training:

Each course day was divided into two parts:

- In the morning: presentations on the definition and concepts of LCA and assignments on the theory on group or individual basis, under supervision of the trainer.
- In the afternoon: practice applying LCA to the framework through individual exercises and through project oriented work, reading scientific literature, and defining questions for the trainer.

Trainer: Roel Helmes (Wageningen Economic Research)

Day 1: Wednesday July 3rd

1. *Introduction*
    a. General introduction to LCA
    b. Quick Examples of LCA
    c. Exercise 1 / Discussion: Your goals for the training & getting to know each other
2. *LCA Phase 1: Goal & Scope AND LCA Phase 3: Impact Characterization*
    a. Goal & Scope Definition
    b. Exercise 2: Drawing a supply chain and getting to know the underlying supply network
    c. Exercise 3: Setting up the goal for your own LCA work
    d. Life Cycle Impact Characterization
3. *Exercise on translating goal of work to scoping choices and data requirements*
    a. SimaPro Demo 1: Intro, including Life Cycle Impact Characterization
    b. Exercise 4: Life Cycle Thinking: Is LCA suitable for the example as a means of analysis or not?
    c. Exercise 5: Setting up the scope for your own LCA work

Day 2: Thursday July 4th

1. *LCA Phase 2: Life Cycle Inventory*
    - Life Cycle Inventory Intro
    a. Emission modelling for crops
        - Nutrients
        - Pesticides
        - Suggested reading: Stoessel et al. (2012)
        - Further reading: Ponsioen and Van der Werf (2017) on pesticide contamination in food (Section 2.2) and water Scarcity (Section 2.3)
2. *Discussion & Translation to practice*
    a. SimaPro demo: LCI & Water Scarcity
    b. Discussion of Stoessel et al. (2012) according to specific questions on methods and results
    c. Exercise 6: Studying an LCI modelling approach together for potential replication
3. *Emissions and herd dynamics modelling in livestock production*
    a. PhD work of Pim Mostert (Mostert, 2018)
    b. GLEAM: what does it do, how does it work?
    c. Background material: Mc Leod et al. (2018)

Day 3: Friday July 5th

1. *LCA Phase 4: Interpretation*
    a. Introduction (including Monte Carlo Analysis)
        i. Suggested reading: Method section (at the end) of He et al. (2018)
    b. Maybe SimaPro Demo
    c. Discussions
        i. Suggested reading: Poore and Nemecek (2018)
2. *Food consumption patterns*
    a. Introduction
        i. Suggested reading: He et al. (2018) and Temme et al. (2014); compare methods & general approaches
        ii. Optional reading: Notarnicola et al. (2017b)
    b. Discussion: What are next steps for this project, for everyone's contributions?
3. *Special topics & Questions*
    a. Special Challenges (Ponsioen 2017; Notarnicola et al. 2017a)
    b. Land Use Change, see Section 2.1 of Ponsioen and Van der Werf (2017)
    c. Optional Discussion and Exercise, see Section 2.4 of Ponsioen and Vander Werf (2017)
    d. Questions
    e. Closing Discussion

<u>Acknowledgement</u>

The authors and trainers are grateful for financial support the flagship program Food Systems for Healthier Diets of the CGIAR program Agriculture for Nutrition and Health (A4NH).

Recommended reading:

He, P., Baiocchi, G., Hubacek, K., Feng, K., and Yu, Y. (2018). The environmental impacts of rapidly changing diets and their nutritional quality in China. Nature Sustainability, 1(3), 122.

Mostert, P. (2018). The impact of diseases in dairy cows on greenhouse gas emissions and economic performance. PhD thesis. Wageningen University and Research, 150 pp.

Notarnicola, B., Sala, S., Anton, A., McLaren, S. J., Saouter, E., and Sonesson, U. (2017a). The role of life cycle assessment in supporting sustainable agri-food systems: A review of the challenges. Journal of Cleaner Production, 140, 399-409.

Notarnicola, B., Tassielli, G., Renzulli, P. A., Castellani, V., and Sala, S. (2017b). Environmental impacts of food consumption in Europe. Journal of Cleaner Production, 140, 753-765.

MacLeod, M. J., Vellinga, T., Opio, C., Falcucci, A., Tempio, G., Henderson, B., ... & Gerber, P. J. (2018). Invited review: a position on the global livestock environmental assessment model (GLEAM). animal, 12(2), 383-397.

Ponsioen, T. C., and Van Der Werf, H. M. G. (2017). Five propositions to harmonize environmental footprints of food and beverages. Journal of cleaner production, 153, 457-464.

Poore, J., and Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers. Science, 360(6392), 987-992.

Stoessel, F., Juraske, R., Pfister, S., and Hellweg, S. (2012). Life cycle inventory and carbon and water foodprint of fruits and vegetables: application to a Swiss retailer. Environmental science & technology, 46(6), 3253-3262.

Temme, E. H., Toxopeus, I. B., Kramer, G. F., Brosens, M. C., Drijvers, J. M., Tyszler, M., and Ocké, M. C. (2015). Greenhouse gas emission of diets in the Netherlands and associations with food, energy and macronutrient intakes. Public health nutrition, 18(13), 2433-2445.