Global Organic Agriculture: Challenges and Opportunities (GOA)

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GOA Project

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Background

Global agriculture is causing large environmental impacts, and increasing population and affluence add pressure on the natural resources and increase food security risks. One option to deal with these challenges is intensification of food production. An alternative approach is organic agriculture, which generally involves yield reductions.

Objective

The project aims to analyze the current environmental performance of global organic agriculture on a high spatial resolution and to identify improvement potentials and trade-offs of transforming conventional production to organic agriculture with respect to food supply and environmental impacts.

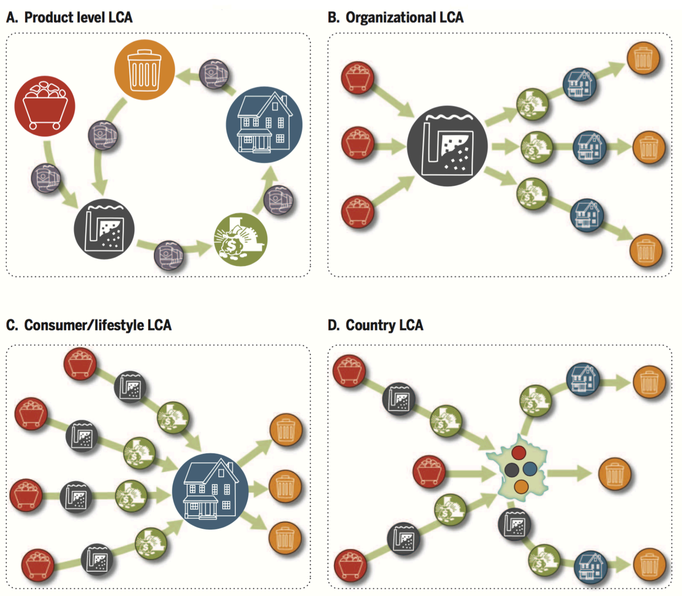

Fig. 1. Life Cycle Assessment (LCA) as a tool to compare environmental impacts of agricultural production. (Figure taken from Hellweg and Milà I Canals, 2014)

Research Approach

- Develop and improved crop water consumption model with a focus on legumes in crop rotations and winter cover crops.
- Introduce a nutrient balance model including livestock and legume interactions into the the global agricultural model to derive yield impacts of changes in fertilization levels.
- Improved consideration of key characteristics of organic production systems on land and pesticide use in the global model.
- Assessment of organic and conventional production systems with respect to water and land use impacts, eutrophication, climate change and ecotoxicity.
- Overall environmental and productivity assessment of global organic and conventional agriculture.

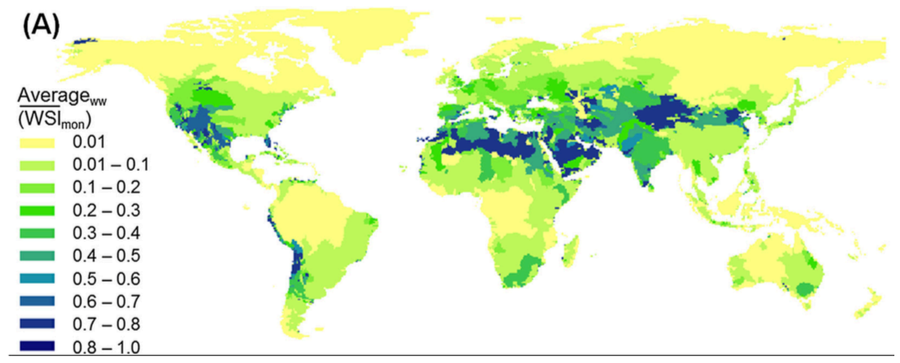

Fig. 2 Monthly water stress index developed by Pfister and Bayer to assess the effects of agricultural production on the environment (Figure taken from Pfister and Bayer, 2014)

Relevance and Expected Outcomes

This project will advance global modeling of agricultural production by creating a model with high spatial resolution that includes specific aspects relevant for organic production. Findings from this project will allow i) identifying regions and systems that are favorable for a shift from conventional to organic production, and ii) addressing differences in environmental impacts between various production systems as well as trade-offs and synergies between different environmental impacts, such as water scarcity and global warming.

References

Stefanie Hellweg and Llorenç Milà i Canals. Emerging approaches, challenges and opportunities in life cycle assessment. *Science*, 344(6188):1109–1113, 2014

Stephan Pfister, Peter Bayer, Monthly water stress: spatially and temporally explicit consumptive water footprint of global crop production, Journal of Cleaner Production, Volume 73, 15 June 2014, Pages 52-62

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