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Assessing the energy efficiency of agroecological farming systems: understanding the role of Agroecology Networks (AEN) in Southern Brazil

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IPPAE INTERNATIONAL PHD PROGRAM Agricultural Economics, Bioeconomy and Rural Development

DAAD Deutscher Akademischer Austauschdienst German Academic Exchange Service

How to measure the energy efficiency of farming systems by acknowledging the contribution of Agroecology Networks (AEN) and accounting for the energy flows that remain in the system?

Background

- Farming systems remain dependent on fossil fuel-based inputs
- Agroecological farming practices reduce the consumption of external inputs
- Evidence from Brazil suggests that farming systems applying agroecological farming practices and organised in **Agroecology Networks (AEN)** tend to achieve even lower external input requirements

The **literature** lacks quantitative evidence on the extent to which Agroecology Networks (AEN) may contribute to the energy efficiency of the farms. This gap might occur because the frameworks applied commonly:

- underestimate the socio-economic context;
- overlook the energy flows that remain in the farming system (i.e., unharvested phytomass, green manure or self-consumption);
- apply input-output ratios based on energy flows with "socio-economic" value – the consumed/purchased input per produced/sold output.

Objective

To propose a **conceptual framework** which enables context-specific and multi-level energy analysis of farming systems by:

- acknowledging and identifying the farm-to-farm interactions within the Agroecology Network (AEN) that may contribute to the energy efficiency at the farm level;
- accounting for the energy produced by the farm that remains in the system – the internal energy flows.

Materials and methods

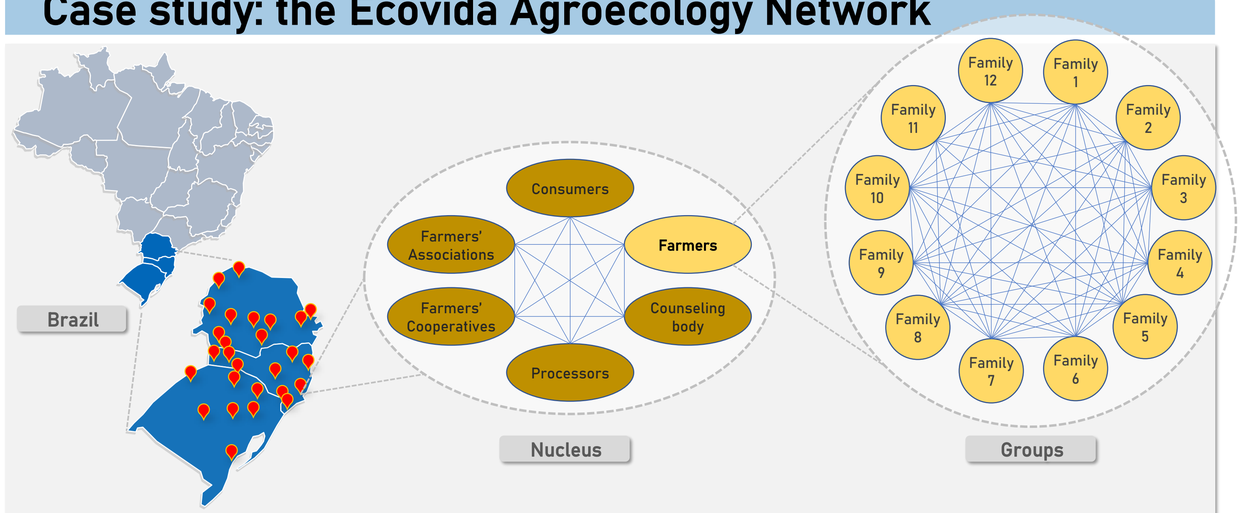
From December 2021 to June 2022, we conducted an in-depth case study of farms organised in the **Ecovida Agroecology Network**, a participatory certification network in Southern Brazil. Based on data collected during the exploratory phase, we:

1) identified the network dynamics relevant for the resource-use efficiency assessment at the farm level;

2) proposed a socio-ecological system representation for analysing the structures and functions of the system;

3) mapped the socio-ecological flows based on the Agroecological Energy Analysis (AEA), method proposed by Tello et al. (2015) and Guzmán Casado and González de Molina (2017).

Case study: the Ecovida Agroecology Network

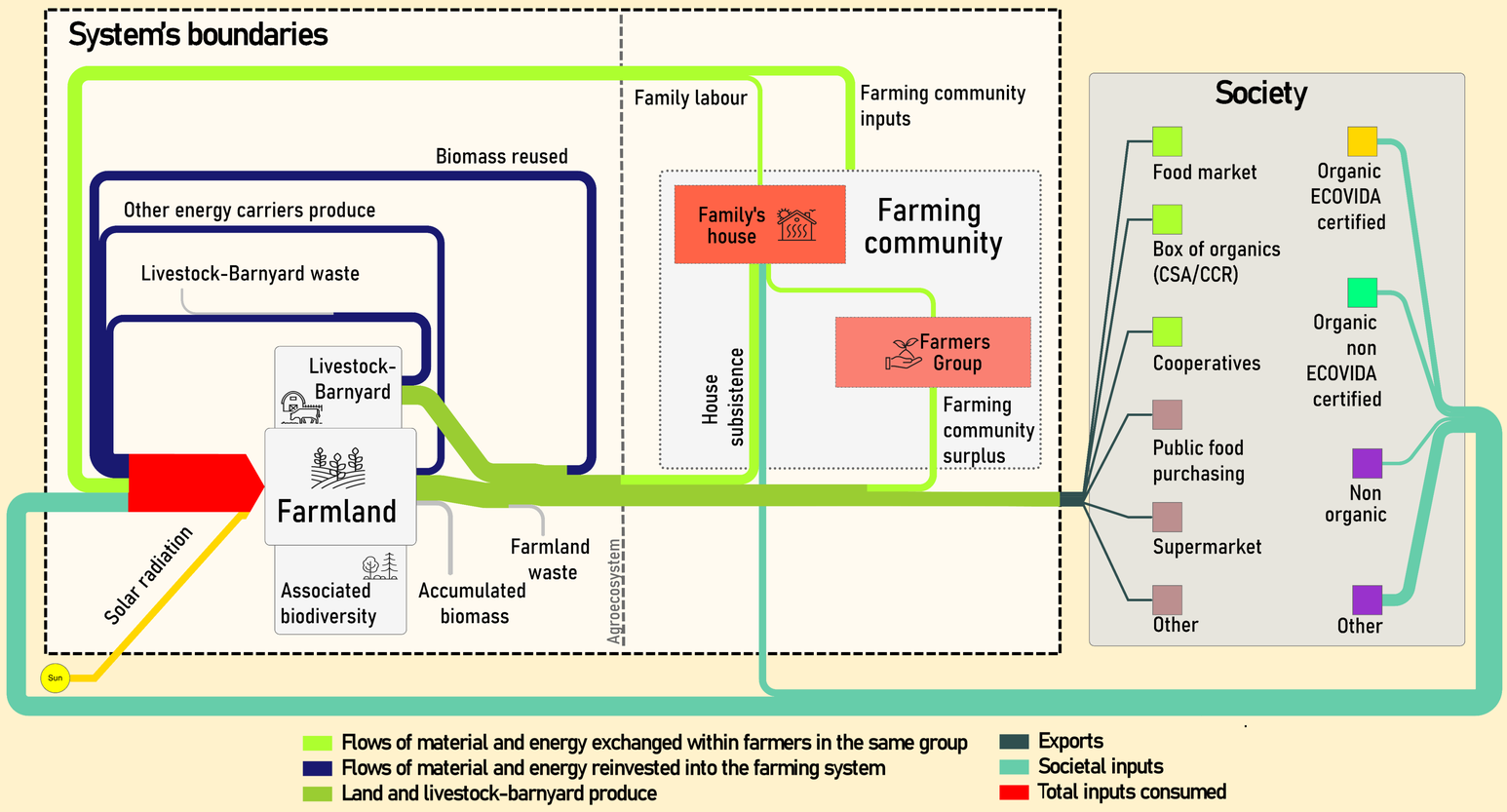


Decentralised and participatory scheme for organic certification. Source: www.ecovida.org.br

Agroecological practices: ecological nutrient management (green manure) and continuous soil cover. Source: Denis Soldera field work 2022

Box of organics and Community-supported Agriculture – CSA. Source: Denis Soldera field work 2022

Results: the conceptual framework



Discussion

By acknowledging the interactions within the Agroecology Network (AEN) and the internal energy flows, the conceptual framework presented:

- enables context-specific and multi-level energy analysis of farming systems;
- explains how socio-economic context may affect the energy efficiency at the farm level rather than just addressing efficiency-based or substitution-oriented practices;
- contributes to broader energy analysis, avoiding incomplete or misleading conclusions about the efficiency of agroecological farming systems.

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