

The energy trap of the green revolution - Energy profiles of past and present farm systems from a comparative perspective

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This special session aims at opening up collaboration and discussion between ecological economics and quantitative environmental history. Feeding the world while tackling natural resource scarcity is one of the most important problems for future sustainability. On one hand, Malthus was proved wrong with the advent of the Green Revolution, which has provided higher yield and labour productivity; on the other hand, industrialization of farming has occurred with an important energy cost: higher energy outputs for even higher energy inputs. The transition shows the energetic inefficiencies of industrial agriculture, which has entailed a shift from a former Malthusian trap to the current energy and environmental trap.

This session aims at explaining this trap from the perspective of social metabolism. We apply a specific energy analysis for agro-ecosystems (Tello et al., 2016; Galán et al., 2016), in which the role of internal energy loops and storage (biomass reused within an agro-ecosystem) is considered a necessary investment for the maintenance and reproduction of the funds (land, livestock, people and associated biodiversity) that provide flows of final products (food, feed, fuel and fibre).

A spatial and temporal comparison is carried out which includes cases of:

- past traditional organic agriculture in which yields and soil fertility could be maintained through labour-intensive processes that internally reused biomass flows;
- industrial agriculture, characterized by a high dependence of external inputs and the abandonment of internal biomass recirculation that kept vital underlying funds such as soil fertility and associated biodiversity; and
- modern organic agriculture, which combines features of both systems.

This comparative approach will allow us to better understand the energy trap of the Green Revolution, characterized by both an increase in output and a shift from biomass reuses to external inputs.

Our hypothesis is that the substitution of biomass reused for external industrial inputs has been a great mistake because the reproduction of agroecological funds requires internal reinvestments of biomass and good ecological conditions.

As a result, industrial agriculture resembles an input-output linear system with less complexity, less energy efficiency, less functionality, and more polluting.

In particular, the discussion will address questions such as “Why increased agricultural outputs are been obtained so far at the cost of increasing inputs even further?”; “Are there ways to escape the energy trap?”; “What would their costs be?” “Can high yield be maintained with less external inputs?”

The insights gained from this session are relevant to understand what a circular economy applied to agriculture should look like, as the lessons learnt from the past can be indicative of feasible pathways for a transition towards new sustainable organic farm systems.

To overcome this energy trap, farmers have to search for more wise combinations of internal reuses and external inputs able to restore and enhance the underlying funds and their joint agro-ecological performance. Our analysis offers some insights to do so.