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Agroecological transformation for sustainable food systems

Insight on France-CGIAR research

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The evolution of agroecology principles has been mapped and a consolidated set of 13 proposed[1] but, as agroecology means many different things, it is rare to find them all followed with equal vigor. This raises questions: do they all need to be followed to claim that an initiative is 'agroecological'; does violating any of the principles render something not agroecological, or is it sufficient to work on the basis of being more or less agroecological, in line with agroecological transitions moving systems towards greater equity and sustainability? Strong statements of principles have counter principles that describe alternative actions or behaviors. Being explicit about these counter principles highlights the decisions that have to made on the basis of values or beliefs about what is important. The HLPE Agroecology report[2] distinguishes normative and causative elements of principles and presents counter principles as continua between two 'poles'. The positions on such continua of any stakeholder in an innovation platform influences their innovation frame and hence likely outcomes (Figure previous page)[3]. A recent framework for analyzing agroecological development projects proposes 21 principles —classified as ecological, socioecological, political and methodological—and highlights how they apply at different scales[4]. Within an innovation and development process at any particular scale, the principles that are being employed can be made explicit. **Where institutions and their innovation platforms or projects make such positions clear, this guides design and makes claims for being agroecologically transparent and accountable.**

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For further information

(1) Wezel A. *et al.,* 2020. Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agron. Sustain. Dev.,* 40.

(2) HLPE, 2019. *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition*. High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security.

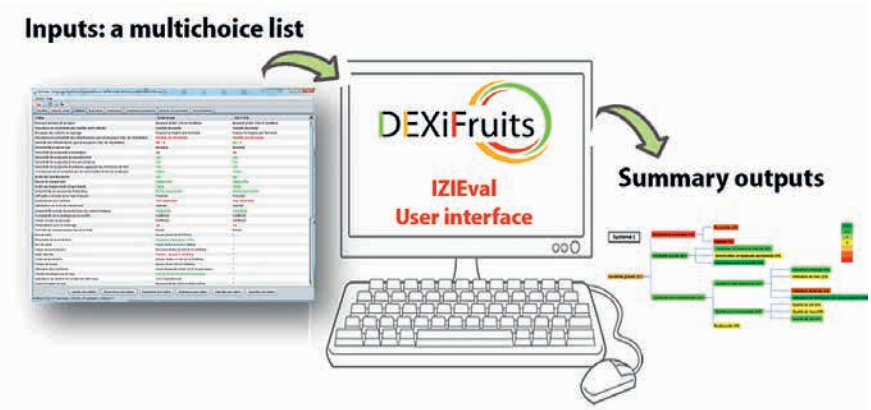
(3) Anderson C.R., Maughan C., 2021. 'The innovation imperative': the struggle over agroecology in the international food policy arena. *Front. Sustain. Food Syst.,* 5: 619185.

(4) Kapgen D., Roudart L., 2020. Proposal of a principle cum scale analytical framework for analysing agroecological development projects. *Agroecol. Sustain. Food Syst.*

MEANS platform

A conceptual framework and INRAE-CIRAD tool for multicriteria assessment of agrosystem sustainability

The agroecological transition encompasses a broad range of practices and system changes. It raises many questions regarding its influence on various functions and impacts of agriculture: productivity, profitability, environmental impacts, ecosystem services, work, product quality, etc. Multicriteria Decision Analysis aims to shed light on these different areas and helps guide choices on potential future directions. This is a vast field that includes many tools and methodological approaches. The MEANS platform—launched in 2012 by INRAE and co-developed by INRAE and CIRAD since 2018—**provides tools and databases to enable multicriteria decision analysis of plant, animal and product processing systems. It hosts research-derived sustainability assessment tools designed,** for instance, for fruit crops (DEXiFruits), field crops (Masc) and poultry farms (Diamond). Environmental sustainability is addressed through life cycle assessment, with the development of dedicated software, i.e. MEANS-InOut, which underpins the creation of agricultural production inventories. Input interfaces facilitate the reconstruction of technical sequences, with models then used to assess pollutant emissions and resource consumption. This reference tool is used to generate the agricultural component of the Agribalyse database dedicated to the environmental impacts of agricultural and food products in France. The MEANS platform continues to be developed to serve scientists and stakeholders in the sectors impacted by changes in agricultural practices (vegetable and animal production, organic farming, etc.). The platform seeks to better account for the complexity and diversity of agroecological practices and to develop socioeconomic assessment tools.



▲ *An example of a tool hosted on the MEANS platform: DEXIFruits devoted to fruit system sustainability assessment.*

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• Lairez J., Feschet P., Aubin J., Bockstaller C., Bouvarel I., 2015. *Agriculture et développement durable, guide pour l'évaluation multicritère*. Educagri Éditions/Éditions Quae, Dijon/Versailles, 232 p.

• MEANS platform: www6.inrae.fr/means

• ACVBio project, Life cycle assessment of organic products: http://itab.asso.fr/activites/projetacv.php

Evaluating the environmental impacts of organic farming

Life cycle assessment must do better

Life cycle assessment (LCA) is the most widely used method for environmental assessment of agricultural systems and their products[1]. LCA estimates the environmental impact of a given product based on all stages of its life cycle, from the outset (raw material extraction), via its production and use, to its disposal or recycling. Pollutant emissions and resource use for each of these stages are quantified. The data are then aggregated into a small number of impact indicators (climate change, eutrophication, energy use, land use, etc.).

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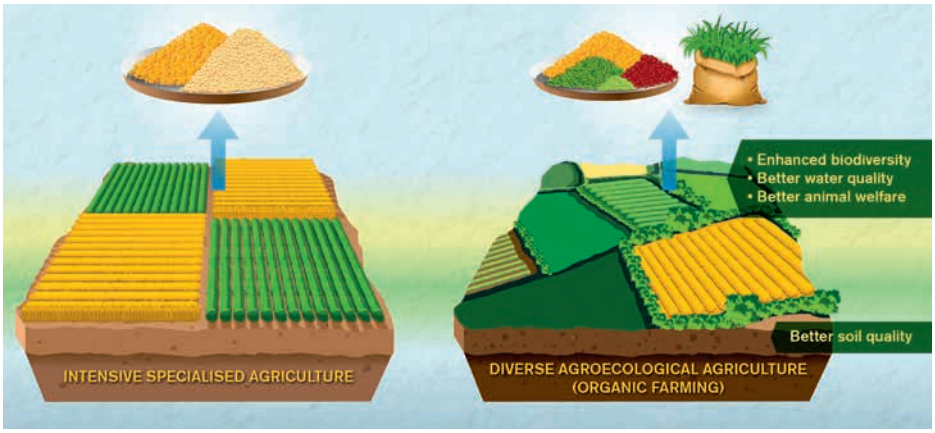

▶ *Conventional farming produces higher yields, but organic farming offers other advantages.*
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