

les dossiers **d'AGROPOLIS** INTERNATIONAL

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Special Partnership Issue



Agroecological transformation for sustainable food systems

Insight on France-CGIAR research

Number 26
September 2021

Overview

This Agropolis International Dossier N° 26 is part of a series of special partnership issues, like N° 15, which reviews 10 years of activities of the LABEX-Europe 'laboratory without walls' program of the *Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA)*, and N° 22 on family farming in Argentina, Brazil and France (2016). It illustrates the dynamic research and extent of expertise on agroecological transitions that abounds in French research institutions and CGIAR, in collaboration with many partners worldwide.

This initiative is under way within the framework of the Action Plan signed by CGIAR and the French government on February 4th 2021 to strengthen French collaboration with CGIAR, where agroecology is highlighted as one of the three key priorities (alongside climate change, nutrition and food systems). Agroecology has been a priority in France since the 2014 *Loi d'avenir sur l'agriculture, l'alimentation et la forêt*, in Europe within the framework of the Green Deal (especially the Farm to Fork Strategy), with the building a European partnership on agroecology, and under France's international development policy geared towards the Global South. In recent decades, CGIAR has conducted research for development together with its partners in the Global South on many aspects related to agroecology, from more sustainable agricultural practices to more inclusive business models, and recently on responsible food consumption strategies.

The Editorial Board members also put forward the relevance of this initiative in the light of the current CGIAR reform process towards a unified 'One CGIAR' with a view to mainstreaming and focusing its research forces and partnerships on achieving the SDGs, while specifically targeting the five Impact Areas identified in the CGIAR 2030 Research and Innovation Strategy document published in late 2020: (i) Nutrition, health and food security; (ii) Poverty reduction, livelihoods and jobs; (iii) Gender equality, youth and social inclusion; (iv) Climate adaptation and mitigation; and (v) Environmental health and biodiversity. The aim is to link these different elements in a holistic and transformative approach to food systems, beyond the usual focus of CGIAR research teams on agricultural production.

According to the Food and Agriculture Organization of the United Nations (FAO), "**agroecology** is an integrated approach which simultaneously applies ecological and social concepts and principles to the design and management of food and agricultural systems. Agroecology aims to optimize the interactions between plants, animals, humans and the environment while taking into account the social aspects that must be addressed for a sustainable and equitable food system."¹ The agroecological transition aims to harness nature's goods and services whilst minimizing adverse environmental impacts, and to improve farmer-consumer connectivity, knowledge co-creation and inclusive relationships among food system actors.

The urgency of the agroecological transformation of agricultural and food systems linked to SDGs is one of the game changing solutions to be discussed at the **UN Food Systems Summit** this year. Moreover, addressing agricultural and food systems will also contribute to the **2030 Agendas** being prepared in 2021 on climate (UNFCCC COP 26*), land (UNCCD COP 15*) and biodiversity (CBD COP 15*). Clearly the diversity of agriculture and food systems on this planet heralds the way to a variety of agroecological transition pathways (different baselines, input usage levels, socioeconomic contexts and

particularly different labor costs and availability in agriculture, different value chain arrangements, levels of connection between farmers and consumers, and consumer preferences in food systems), and also diversity in terms of public action needed (subsidy levels that could be reoriented to incentivize change, implementation of policies from different sectors, research and extension, etc.). However, there are also communalities in terms of understanding the biology, ecology and socioeconomics of farming agroecosystems and their functioning, and how to manage risks, including those triggered by climate change, how they contribute to food system functioning.

Lessons are to be learned from past trajectories in the Global North and other parts of the world. Such insight could help avoid the simplification levied by conventional agricultural models, while shedding light on pitfalls to elude when considering socioeconomic power asymmetries and developing inclusive cooperative systems.

These transformations need to be **closely tuned to the initial contexts, which vary considerably between regions and countries**. Agroecological transformation cannot be a 'one size fits all' endeavor. Indeed, in some parts of the world where inorganic input and pesticide use is generally low and sometimes nonexistent, and where available water is in very short supply, the priority is often focused on increasing access and usage of these inputs to boost production and productivity. Agroecology is relevant, even under these conditions, and can provide solutions while minimizing environmental impacts. Any decisions to increase such input use must strive to strike a balance between short-term productivity gains and longer-term resilience, environmental health and sustainability gains. The linkage between sustainable intensification and agroecological transformation emerges here as a point of analysis.

These issues have led researchers from CGIAR and French research organizations to work together in compiling this Dossier to **showcase their expertise and research advances at the disposal of other researchers, policymakers, extension services, NGOs and farmers' associations** committed to promoting the agroecological transition. This transition process requires commitment to explore and support new ways of conducting research based on systemic and transdisciplinary approaches, implementing inclusive participatory methods, the solution-based theory of change, fostering partnerships with national agricultural research systems, while **enhancing orchestration of research, policy and investment efforts to converge towards sustainable and resilient food systems!**

We clearly highlight research conducted on the basis of these premises in this Dossier. The research outputs showcased have been achieved through recent research programs and projects geared towards the design and implementation of genuinely sustainable food systems, i.e. equitable for both producers and consumers in different parts of the world. To reflect this, we have drawn on the different food system transformation levels identified by Stephen Gliessman (2016). These are intersected with FAO's 10 elements for agroecology and the 13 principles outlined in the report of the High Level Panel of Experts on Food Security and Nutrition (HLPE) on agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition (2019).

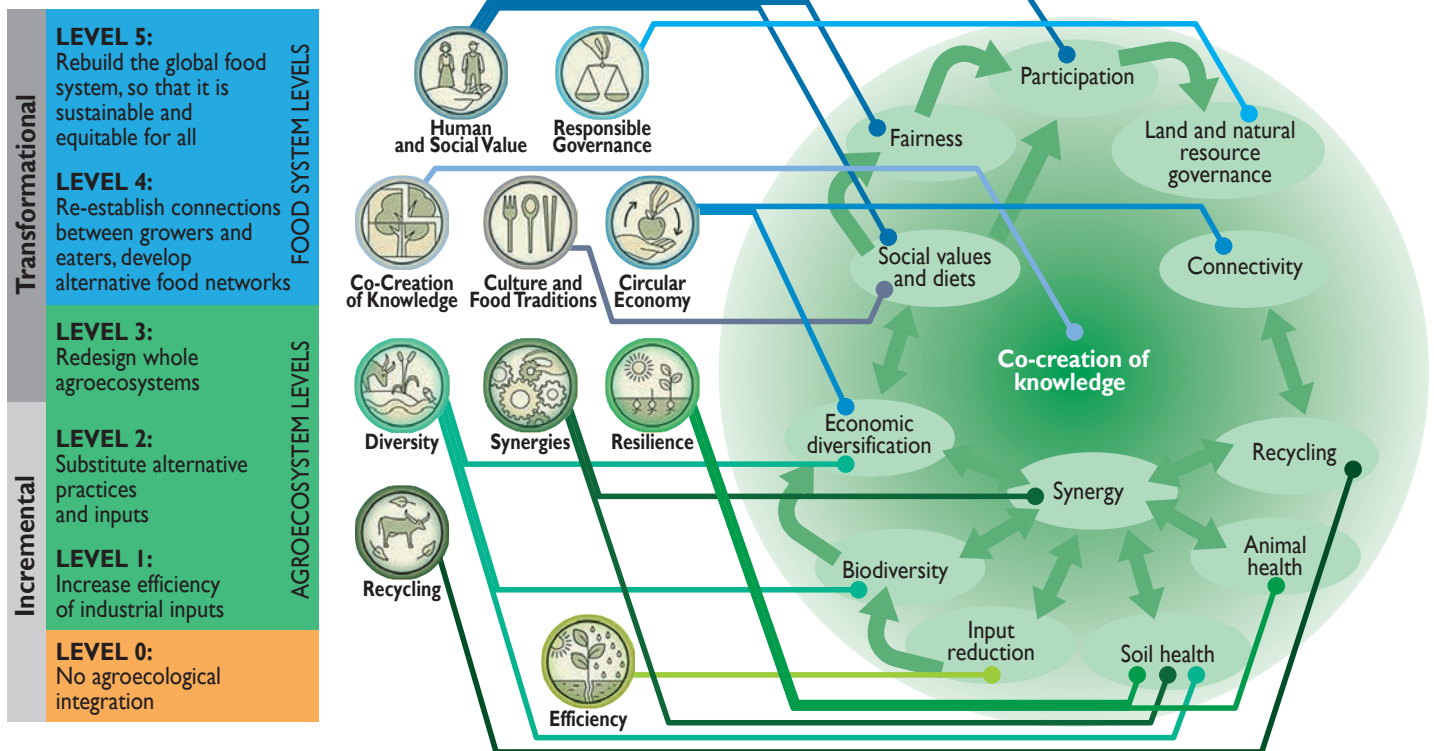
* CBD: Convention on Biological Diversity
COP: Conference of the Parties
UNCCD: United Nations Convention to Combat Desertification
UNFCCC: United Nations Framework Convention on Climate Change

1. FAO. The 10 elements of agroecology guiding the transition to sustainable food and agricultural systems, <http://www.fao.org/3/i9037EN/i9037en.pdf>

5 Gliessman's levels

10 FAO elements

13 HLPE principles



▲ Linking FAO's 10 elements, Gliessman's 5 levels of food system transformation and the 13 HLPE principles

Correspondence based on Wezel et al., 2020. Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agronomy for Sustainable Development*, (2020) 40: 40.

This Dossier is organized in two main parts, i.e. Agroecosystems and Food Systems, while adopting the organization levels proposed by Gliessman, as well as a third part that showcases the results of cross-cutting and more methodologically-oriented research.

Part 1 - Agroecosystems

1 - Increasing the efficiency of practices in order to reduce the use of costly, scarce or environmentally damaging inputs

This chapter deals with Gliessman's first transformation level which aims to increase the efficiency of inputs and natural resources. It presents results of research conducted in many countries geared towards improving resource use efficiency (soil, water), while reducing chemical input reliance and the environmental footprint of production systems and postharvest treatments. Research on complex processes (nutrient cycles, interactions between soil organisms, crop protection), as well as the added benefits of participatory research approaches in varietal selection and breeding programs are discussed. The chapter also illustrates the 'co-creation of knowledge' principle.

2 - Substituting intensive external input use by biodiversity-derived ecosystem functions

This chapter focuses on increasing crop performance by strengthening ecosystem functions driven by the agrobiodiversity. This so-called ecological intensification process enhances biomass production by improving nutrient and water cycles and combating pests and diseases, while keeping external input use to the bare minimum. It relates to Gliessman's second transformation level, and essentially concerns cropping systems.

3 - Redesigning agroecosystems on the basis of a new set of ecological processes from farm and landscape

This chapter focuses on the redesign, implementation and management of agroecosystems that differ from current systems. This redesign process may represent a real break with the past while being geared towards long-term change. Although often having a specific focus (less dependence on pesticides and water; work and wellbeing, adaptation to climate change, landscape quality and biodiversity preservation, etc.), it also strives to reconsider all agroecosystem functions and services, and their sustainability and resilience in response to the highly variable nature of external constraints (climate, prices, etc.). This redesign process may take place on the farm or in the landscape, within the scope of collective management or within a broader territorial project involving non-farmer stakeholders.

Part 2 - Food systems

4 - Identifying and overcoming constraints within food systems to achieve agroecological transitions at scale – reconnecting producers and consumers

The development, implementation and scaling of agroecological practices requires an appropriate enabling environment, while overcoming structural constraints that lock farmers into conventional agricultural improvement models, thereby necessitating fundamental shifts in the way food systems are organized and function. This chapter addresses the issue of identifying and surmounting constraints within agricultural, food and land systems to achieve agroecological transitions at scale. Five main issues are tackled: (i) the economic environment linked to value chains, markets and regulations; (ii) the innovation environment; (iii) the role of markets in re-establishing a more direct connection between producers and consumers; (iv) leveraging nutrition objectives and food traditions for agroecology; and (v) designing territorial food systems.

5 - Building a new global food system based on equity, participation, democracy and justice

This chapter focuses on far-reaching transformations in value chains, business models and funding sources, and in the socioeconomic dynamics in territories, as a result of agroecological approaches applied in a diverse range of specific situations with different food system actors. These transformations result in changes in the terms of interaction between agricultural and food system actors that are conducive to more environment-friendly and equitable systems, to the mutual benefit of producers and consumers.

Part 3 - Key processes, methods and tools for agroecology

This crosscutting part illustrates how France and CGIAR are working to provide essential agricultural and ecological knowledge, as well as research methods and tools for initiating the transformation of current schemes into agroecology-oriented systems, value chains and territories. These span different spatial scales, and cover human and social sciences as well as ecology and biotechnology. Research carried out within institutions (national or international) and research infrastructures—often in a transdisciplinary way, with the participation of stakeholders, as well as local or national social initiatives that foster the agrifood system transition process—is showcased.

Some 500 French and CGIAR agroecology scientists and experts from around 100 national and international universities and research organizations from France (among others CIRAD, INRAE and IRD) and abroad, and all CGIAR Centers, were involved in this *Dossier*.

This Dossier is not meant to be exhaustive and other outstanding publications could have been mentioned, as for example the ‘Handbook for the evaluation of agroecology’ published in 2019 by collective of French NGOs*; the research examples presented reflect the diversity and dynamism of scientific and technological research at national and international levels and it shows very well that research partnerships between CGIAR and French institutions are not only numerous and productive but also generate multiple and open partnerships with many other research institutions, including the national agricultural research systems (NARS).

* e.g. The ‘Handbook for the evaluation of agroecology’ (Working Group on Agroecological Transition, 2019): www.fao.org/agroecology/database/detail/fr/c/1197691/

New research questions and a brand new way of doing research

Agroecological approaches come with new research questions. When you change the paradigmatic vision of food systems, address the multifunctionality of agriculture, recognize the urgent and imperious necessity to respect ecosystems and marshal nature and its resources, including biodiversity and its functions, then you need to address questions that have been overlooked by conventional approaches. This includes soil biodiversity, ecosystem health, optimization of functions at plot and landscape levels, etc. Moreover, agroecology is dovetailed with principles such as fairness, social values, diets, land and local resource governance, which implies that scientific research must also focus on addressing questions linked to labor and market organization, stakeholder interactions, behavioral change mechanisms, social inclusion, public policies, added value distribution along supply chains, etc.

Agroecological approaches also imply new ways of doing research and contributing to innovation, as stated in the Call for Action for Agroecological Transition of Agri-Food Systems². Agroecological transformation requires hybridization of scientific knowledge, technological and institutional innovations, local actors’ capacities and knowledge, public policies, infrastructures and means. It is a context-dependent process, with multiple transformational solutions and pathways and local innovation systems have a crucial role to play. Scientific research therefore has to produce knowledge to fuel these local innovation systems through new ways of cooperation with stakeholders, including policymakers. This means accounting for the complexity of agroecosystem functioning in a diverse range of situations and settings, by connecting biological, technical and sociopolitical questions, using inclusive, systemic, interdisciplinary, participatory and transdisciplinary research. These are some of the ambitions of the Transformative Partnership Platform on Agroecology (TPP)³ that was jointly built by French research institutions and CGIAR.

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2. Conclusions of a Joint France-CGIAR Workshop ‘Stepping Up to the Challenge of Agroecological Transition Through Agricultural Research for Development’, held in Montpellier, June 19-20, 2019. www.foreststreesagroforestry.org/fta-publication/call-for-action-for-agroecological-transition-of-agri-food-systems-pdf/

3. <https://glfx.globallandscapesforum.org/topics/21467/page/TPP-home>