European Commission

The European Commission's Knowledge Centre for Global Food and Nutrition Security

Agroecology

Headlines

- Agroecology is a science, a set of practices and a social movement
- Agroecology aims at avoiding the depletion of natural resources, at balancing the supply of ecosystem services and maintaining or enhancing biodiversity at all levels
- By increasing soil organic matter content and fostering agroforestry, agroecology contributes to mitigation efforts and increasing resilience to climate change
- Agroecology promotes diversification of production at farm level and by preserving agro- and wild biodiversity positive nutritional outcomes for rural population are provided
- The uptake of agroecology decreases the reliance on external inputs, therefore accelerating the transition to circular economy
- The scaling up of agroecology can contribute to global food security by achieving equitable and sustainable food systems

The Knowedlge Centre on Global Food and Nutrition Security collects and organises, in a structured way, information on the application of the agroecological principles at farm/district/regional level, in different areas of the world.

This brief explains how agroecology, being derived from the fusion of the two scientific disciplines agronomy and ecology, can play a key role in enhancing ecological and socio-economic resilience of agricultural and food systems. In addition, it illustrates the interlinks between agroecology and the achievement of the Sustainable Development Goals set by the United Nations General Assembly in 2015 for the year 2030, the role of agroecology in the transition towards sustainable food systems, and the the challenges posed by the scaling up of agroecology.

Background, Definition and Concept

The term or concept of agroecology has been mentioned in the scientific literature since the 1920s [1]. Different insitutions and countries have adopted definitions reflecting concerns and priorities that have evolved through time moving from the plot level to the food system level [2]. By going through the different definitions, core concepts can be identified. Altieri (1983) defined agroecology as "*the application of ecological principles to agriculture*" [3]. Gliessman et al (1998), on the other hand, define agroecology as "*the application of ecological concepts and principles to the design and management of sustainable agroecosystems*". More recently, many sources [1,4,5] define agroecology as a science, a set of practices and a social movement. Such definition highlights the multiple dimensions of the concept, which relate to agricultural production, ecological principles, social impacts, economic performance, food sovereignity, right to food, social justice, governance issues, addressing thus the whole food system and beyond. The HLPE 2019 report [2[concluded that what all definitions have in common, is the goal to develop sustainable food systems, and proposed a definition linking agroecology to sustainable food systems for food and nutrition security. The definition is the following:

"Agroecological approaches favour the use of natural processes, limit the use of purchased inputs, promote closed cycles with minimal negative externalities and stress the importance of local knowledge and participatory processes that develop knowledge and practice through experience, as well as more conventional scientific methods [...]. Agroecological approaches recognize that agrifood systems are coupled social–ecological systems from food production to consumption and involve science, practice and a social movement, as well as their holistic integration, to address food and nutrition security" [2]

Agroecology aims at agricultural systems which maximise the natural functioning of the ecosystems and respect as much as possible natural cycles and the ecology of trophic chains. By creating, re-establishing or enhancing pest-predators equilibria, it minimises the need for pesticides. It advocates for techniques such as no-till with soil cover, mulching, plant associations, and other key techniques to replace the use of

agroechmicals. It promotes the enhancement of soil fertility by protecting the soil biota and the delivery of ecosystem services in general, among which, e.g., pollination plays a crucial role in enhancing yields [6].

Agroecological approaches are by definition linked to the place and its characteristics, including traditional knowledge and local genetic resources. For these reasons there is no definitive set of practices that could be labelled as agroecological, but rather general principles to be fulfilled: (i) reliance on ecological processes as opposed to purchased inputs; (ii) equitable, environmentally friendly, locally adapted and controlled practices; and (iii) systemic approach embracing management of interactions among components, rather than focusing only on specific technologies [2].

Three reference frameworks for agroecology principles and transition levels can be identified: FAO (2018) ten elements, HLPE (2019) thirteen principles, and Gliessman (2007) transition levels. This is the perspective under which the Knowledge Centre for Global Food and Nutrition Security operates.

In 2018, FAO published the leaflet "The 10 Elements of agroecology guiding the transition to sustainable food and agricultural systems" [7]. The 10 elements of agroecology were meant to guide the transition towards sustainable agriculture and food systems, and help countries to operationalise agroecology. The 2019 HLPE report [2] integrates such a list with other main sources and provides a consolidated list of 13 principles. Three operational principles for sustainable food systems provide the structure of the list, to which individual agroecological principles are attached:
1. improve resource efficiency (principles 1,2);
2. strengthen resilience (principles 4,5,6,7);
3. secure social equity/responsibility (principles 8,9,10,11,12,13).

The consolidated set of 13 agroecological principles is [2]:
1. Recycling. Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass;
2. Input reduction. Reduce or eliminate dependency on purchased inputs and increase self-sufficiency[1];
3. Soil health. Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and enhancing soil biological activity;
4. Animal health. Ensure animal health and welfare;
5. Biodiversity. Maintain and enhance diversity of species, functional diversity and genetic resources and thereby maintain overall agroecosystem biodiversity in time and space at field, farm and landscape scales;
6. Synergy. Enhance positive ecological interaction, synergy, integration and complementarity among the elements of agroecosystems (animals, crops, trees, soil and water);
7. Economic diversification. Diversify on-farm incomes by ensuring that small-scale farmers have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers;
8. Co-creation of knowledge. Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange;
9. Social values and diets. Build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets;
10. Fairness. Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment and fair treatment of intellectual property rights;
11. Connectivity. Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies;
12. Land and natural resource governance. Strengthen institutional arrangements to improve governance, including the recognition and support of family farmers, smallholders and peasant food producers as sustainable managers of natural and genetic resources;
13. Participation. Encourage social organization and greater participation in decision-making by food producers and consumers to support decentralized governance and local adaptive management of agricultural and food systems.

As noted in the 2019 HLPE report [2], agroecology can provide possible transition pathways towards more sustainable farming and food systems. Gliessman (2007) identified five different levels in agroecological transitions. The left hand side of Fig.1 illustrates these transitions, while the right hand side shows the consolidated set of 13 agroecological principles [2] [8].

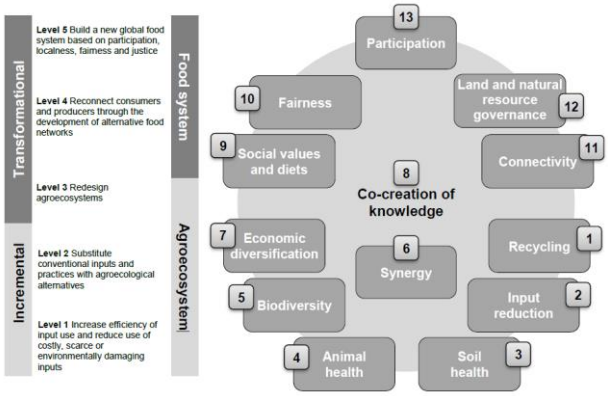

Figure 1 – Five transition levels towards sustainable food systems and related Agroecology principles (sources: [2] [8])

[1] mostly targeted at agrochemicals and including the possibility of organic input exchange among farms

The 2019 HLPE report [2] identifies two categories of innovative approaches: (a) agroecological and related approaches, and (b) sustainable intensification of production systems and related approaches. The latter includes climate-smart agriculture, nutrition-sensitive agriculture and sustainable food value chains, that generally involve incremental transitions towards Sustainable Food Systems, while agroecological and related approaches are more transformative and providing a central place to social, cultural and political dimensions of the transitions towards Sustainable Food Systems. These two approaches should not be confused, since they represent two different strategies to improve the sustainability of Food Systems and two different visions of the future of Food Systems. They can be to some extent interlinked, in particular the 2019 HLPE report states that "*whether or not any particular form of sustainable intensification could be considered part of an agroecological transition will depend on whether other key agroecological principles, such as co-creation of knowledge, minimizing toxic inputs and maintaining agrobiodiversity, are included*".

Agroecology in the frame of food systems transformation

Stemming from the 2019 HLPE report [2], the Committee on World Food Security has released in 2021 Policy Recommendations on Agroecological and Other Innovative Approaches for Sustainable Agriculture and Food Systems that Enhance Food Security and Nutrition [9]. These policy recommendations - voluntary and non-binding – are organised around five main points:
1. strengthening policy foundations;
2. operationalise performance measurement and monitoring frameworks;
3. fostering the transition;
4. strengthening research, innovation, training and education;
5. fostering stakeholders engagement.

The UN Food Systems Summit (UNFSS), held during the UN General Assembly in New York on 23 September 2021, set the stage for global food systems transformation to achieve the Sustainable Development Goals by 2030. The food system change envisaged by the Summit is going to be triggered and accelerated through two main follow-up initiatives: development and implementation of 'food systems transformation pathways', and the establishment of global 'Coalitions/Initiatives for Action'. One of the Coalition aims at supporting "Food Systems Transformation through Agroecology". The Coalition is going to act at nested scales of implementation (global to local), with a focus on supporting innovation, making use of local and scientific knowledge, enabling transdisciplinary research, and enabling public and private investments for large-scale adoption of agroecological practices.

Agroecology links to the Sustainable Development Goals (SDGs)

The Scaling up Agroecology Inititiative stresses that the adoption of agroecology, particularly in its dimension of sustainable management of the natural capital and enhanced social and economic returns, can contribute extensively to the SDGs, namely through [9]: the eradication of poverty (SDG 1) and hunger (SDG 2), good health and well-being (SDG 3), ensuring quality education (SDG 4), achieving gender equality (SDG 5), increasing water-use efficiency (SDG 6), promoting decent jobs (SDG 8), reducing inequalities (SDG 10), increasing the sustainability of communities (SDG 11), ensuring sustainable production and consumption (SDG 12), building climate resilience (SDG 13), conserving and sustainably using the oceans, seas and marine resources (SDG 14), halting the loss of biodiversity (SDG 15) and (SDG 17) strengthening the means of implementation and revitalizing the Global Partnership for Sustainable Development.

By restoring the functionality and balance of agroecosystems, agroecology can significantly contribute to the goals of the Paris Climate Agreement, the Convention on Biological Diversity and the United Nations Convention to Combat Desertification [10].

Challenges in Scaling Up Agroecology

As agroecology directly supports multiple SDGs via integrated practices and actions which cut across many areas, studies and initiaties have been launched to identify the crucial steps for scaling up agroecology. Among these, FAO has launched in 2018 the 'Scaling up Agroecology Initiative' [11] as a framework for collaborative action and partnerships for agroecology [5].
Among the challenges that need to be overcome in a perspective of agroecology upscaling, the following should be mentioned:

- agroecological transitions require an enabling environment to provide positive incentives to farmers and help them overcome the transition period required to transform the systems and make them sustainable and profitable;
- policies are needed to promote research priorities to support agroecology and other sustainable agricultural approaches;
- rural education and extension systems need to evolve from a focus on single disciplines, increasing yields of single commodities and top-down technology transfer to co-creation of knowledge based on combining scientific and farmers' knowledge;
- a diversity of markets is needed, that emphasize local and regional production and consumption need to be strengthened to encourage diversified agroecological production, focused on short supply circuits;
- agroecological transitions require greater integration across sectors, disciplines and actors to achieve multiple objectives across different scales. In particular, they demand governance solutions that can coordinate actions at landscape and territorial levels.

EU support to agroecology in developing countries

Scaling up the uptake of agroecology in developing countries has multiple objectives, from meeting food and nutrition security goals, increasing resilience of farm and food systems, contributing to climate change adaptation to mitigation, addressing biodiversity loss and soil degradation, to boosting job creation. In line with the priority of the European Green Deal, the Farm to Fork and Biodiversity strategies, the EU supports the adoption of agroecology in developing countries

The objective of the Knowledge Centre for Global Food and Nutrition security in this context, together with other EU funded-research activities [13], is to provide scientific evidence on the impacts of the adoption of agroecological practices in developing countries. Among the researches conducted, an analysis of the literature on 17 Countries [14] has shown that at least 50% of the analysed papers report a positive contribution of agroecological practices to food security, mostly due to improved yields and/or a better economic situation of producers. Diversified crop systems, including the introduction of agroforestry, improve household nutritional status and have positive links to better health conditions. Moreover, a review of case studies [15] has shown that by improving farmers' incomes and increasing resilience to climate change, agroecology contributes to address two critical issue in developing countries in Africa. Participatory research and effective extension services are key conditions for the large-scale adoption of agroecological practices by farmers.

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