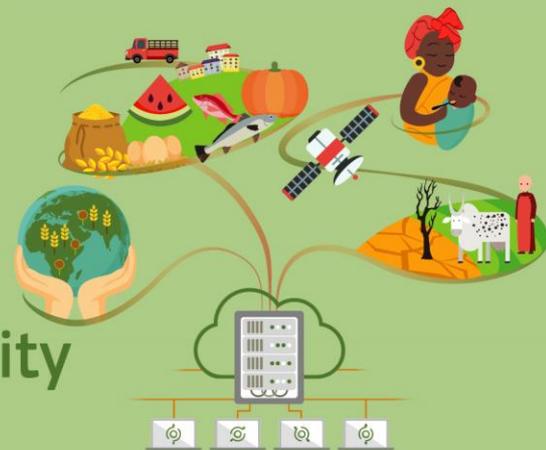




The European Commission's Knowledge Centre for Global Food and Nutrition Security



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
- Agroecological practices lead to an increase in soil organic matter content, playing a role in climate change mitigation
- The scaling up of agroecology can contribute to global food security by achieving equitable and sustainable

The Knowledge 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 will illustrate 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, as well as the challenges in scaling up agroecology.

The Knowledge Centre will use as a point of reference the 60 developing countries in which Food and nutrition security and sustainable agriculture is a focal sector for EU intervention. The activities focus on mapping the implementation of agroecology and analysing the derived socio-economic and environmental impacts for a set of experiences selected in each Country. The Knowledge Centre will produce and make available evidence-based information on the merits of agroecology to support its scaling-up, and to support the debate about the role, in

the short-medium-long term, of agroecology in food security and nutrition, of its relation to other types of agriculture, its applicability (and related constraints) to different socio-environmental contexts (including different farm sizes), and limitations to implementation if any.

Background, Definition and Concept

Though the term or concept of agroecology has been mentioned in the scientific literature since the 1920s, it has no widely recognised accepted definition [1]. Different institutions and countries have, in fact, adopted definitions reflecting their own concerns and priorities [2]. By going through the different definitions, though, 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 [4,5,6] define it 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 sovereignty, right to food, social justice, governance issues, addressing thus the whole food chain and beyond. The HLPE 2019 report concludes 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, which is the perspective under which the Knowledge Centre for Global Food and Nutrition Security operates. 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 eliminates the need for pesticides. It advocates for techniques such as no-till with soil cover, mulching, plant associations, and other key techniques to replace weed killers. 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 [7].

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 requirements 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].

In 2018 FAO published the leaflet “The 10 Elements of agroecology guiding the transition to sustainable food and agricultural systems” [1]. 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-sufficiency¹

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] [11].

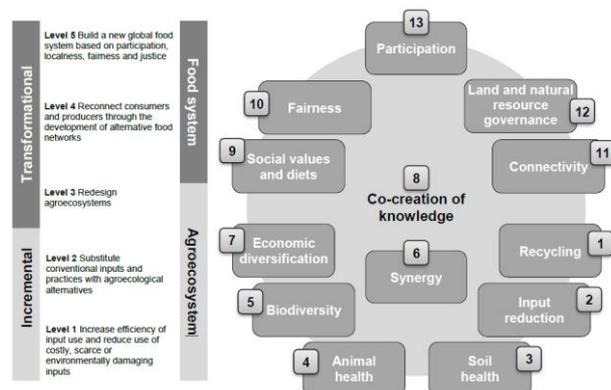


Figure 1 – Five transition levels towards sustainable food systems and related Agroecology principles (sources: [2] [11])

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

Agroecology links to the Sustainable Development Goals (SDGs)

The Scaling up Agroecology Initiative 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.

In order to achieve the SDGs by 2030, FAO highlighted during the 2nd International FAO Symposium on Agroecology that a transformative change is required *'in how food is grown, produced, processed, transported, distributed and consumed'*.

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, in 2018 FAO has launched the 'Scaling up Agroecology Initiative' [9] as a framework for collaborative action and partnerships for agroecology [6]. In that context, the European Commission at the Second International Symposium on Agroecology (FAO, Rome 3-5/4/2018) commended FAO for leading on the new initiative intended to trigger a decisive shift in the way of agricultural development. At global level all agreed on the need to drastically change the way the world is producing food in order to revert environmental degradation, tackle climate change, and ensure healthy food for all. The Commission said that it is necessary to be aware about the challenges that scaling up agroecology entails, listing the following points:

- Agroecological transitions require an enabling environment that provides positive incentives to farmers and helps them to overcome the transition period required to transform their systems and make them sustainable and profitable.
- Political and economic support has traditionally prioritised production over long-term sustainability concerns. High-input, resource-intensive farming systems have raised productivity but incur in heavy environmental costs and negative social impacts. Policies promoting these unsustainable farming systems, including current research priorities, need to be re-directed to support agroecology and other sustainable agricultural approaches.

- Conventional research, education and extension systems barely respond to the needs of agroecological systems, which are by definition diverse and aim to maximise the synergies between different components (e.g. soil, water, crops, livestock, trees, human processes). To scale-up agroecology, rural education and extension systems need to evolve from a focus on single disciplines, increasing yields of single commodities and top-down technology transfer models, to knowledge co-creation based on combining scientific knowledge with farmers' knowledge.
- Current market models are not consistent with agroecological production. Markets organised as vertical value chains for single products do not match the realities of diversified agroecological systems. A diversity of markets that emphasise local/regional production and consumption need to be strengthened to encourage diversified agroecological production.
- Agroecological transitions require greater integration among sectors, disciplines and actors to achieve multiple objectives across scales. In particular, agroecological systems demand governance solutions that can coordinate actions at the landscape and territorial scales.

References

- [1] FAO. 2018. The 10 Elements of Agroecology. Guiding the Transition to Sustainable Food and Agricultural Systems. FAO I9037EN/1/04.18 14pp. Rome, Italy.
- [2] HLPE. 2019. Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.
- [3] Altieri, A.M. 1983. Agroecology, the Scientific Basis for Alternative Agriculture. Berkeley, U.C. Berkeley.
- [66] FAO. 2018. Catalysing dialogue and cooperation to scale up agroecology: Outcomes of the FAO regional seminars on agroecology. 117 pp. Rome, Italy.
- [4] Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D. & David, C. 2009. Agroecology as a science, a movement and a practice. A review. *Agronomy for Sustainable Development*, 29(4): 503–515
- [5] Wezel, A. & Silva, E. 2017. Agroecology and agroecological cropping practices. In: A. Wezel, ed. *Agroecological practices for sustainable agriculture: principles, applications, and making the transition*, pp. 19–51. Hackensack, USA, World Scientific Publishing
- [6] Agroecology Europe. 2017. Our understanding of agroecology. <http://www.agroecology-europe.org/our-approach/our-understanding-of-agroecology/>
- [7] Gliessman, Stephen R, Eric Engles, and Robin Krieger. 1998. *Agroecology: Ecological Processes in Sustainable Agriculture*. CRC Press.
- [9] FAO. 2018. Scaling up agroecology initiative. <http://www.fao.org/3/I9049EN/i9049en.pdf>
- [10] FAO. 2018, FAO's work on agroecology - A pathway to achieving the SDGs, FAO Report I9021EN/1/03.18 <http://www.fao.org/3/I9021en/i9021en.pdf>
- [11] Gliessman, S.R. 2007. *Agroecology: the ecology of sustainable food systems*. 2nd edition. Boca Raton, USA, CRC Press. 384 pp.

Contact:
EC-KCFNS@ec.europa.eu

The European Commission's science and knowledge service
Joint Research Centre

 EU Science Hub: ec.europa.eu/jrc/en  @EU_ScienceHub  Joint Research Centre
 EU Science Hub – Joint Research Centre  EU Science Hub