Towards sustainable food systems –
Introducing the transformative approach of agroecology

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LIST OF ABBREVIATIONS

AEC	Agroecology Coalition
CIAT	International Center for Tropical Agriculture
CFS	Committee on World Food Security
EbA	Ecosystem-based adaptation
FA	Farm
FI	Field
FAO	Food and Agriculture Organization
FO	Food system
GAP	Good agricultural practices
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GCA	Global Commission on Adaptation
GSF	Global Strategic Framework for Food Security and Nutrition
GMO	Genetically modified organism
HLPE	High Level Panel of Experts on Food Security and Nutrition
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
IPES FOOD	International Panel of Experts on Sustainable Food Systems
NF	Natural Farming
SDG	Sustainable Development Goal
SLM	Sustainable Land Management
UNFSS	United Nations Food Systems Summit

1.

INTRODUCTION TO AGROECOLOGY

This chapter is based on the report *"Agroecological and other innovative approaches: for sustainable agriculture and food systems that enhance food security and nutrition"* by the High Level Panel of Experts on Food Security and Nutrition (HLPE) of the Committee on World Food Security (CFS) in July 2019; the GIZ factsheets (2020, 2023) on agroecology; Gliessman (2016) *"Transforming food systems with agroecology"* and Sinclair et al. (2019) *"The Contribution of Agroecological Approaches to Realizing Climate-Resilient Agriculture."*

↳ HLPE-REPORT #14 (2019)

Agroecological and other innovative approaches: for sustainable agriculture and food systems that enhance food security and nutrition.

The High Level Panel of Experts for Food Security and Nutrition (HLPE) is the science-policy interface of the UN Committee on World Food Security (CFS). In 2019 the HLPE released this report, which serves as the international reference document for agroecology.

↳ GIZ FACTSHEET (2023). AGROECOLOGY

Summary and overview of key literature and the international discussion. The Factsheet also includes some project examples.

↳ GLIESSMAN (2016). TRANSFORMING FOOD SYSTEMS WITH AGROECOLOGY

In this document, Gliessman introduces a framework for classifying "levels" of food system change. All levels taken together can serve as a roadmap that outlines, in an almost stepwise manner, a process for transforming the entire global food system.

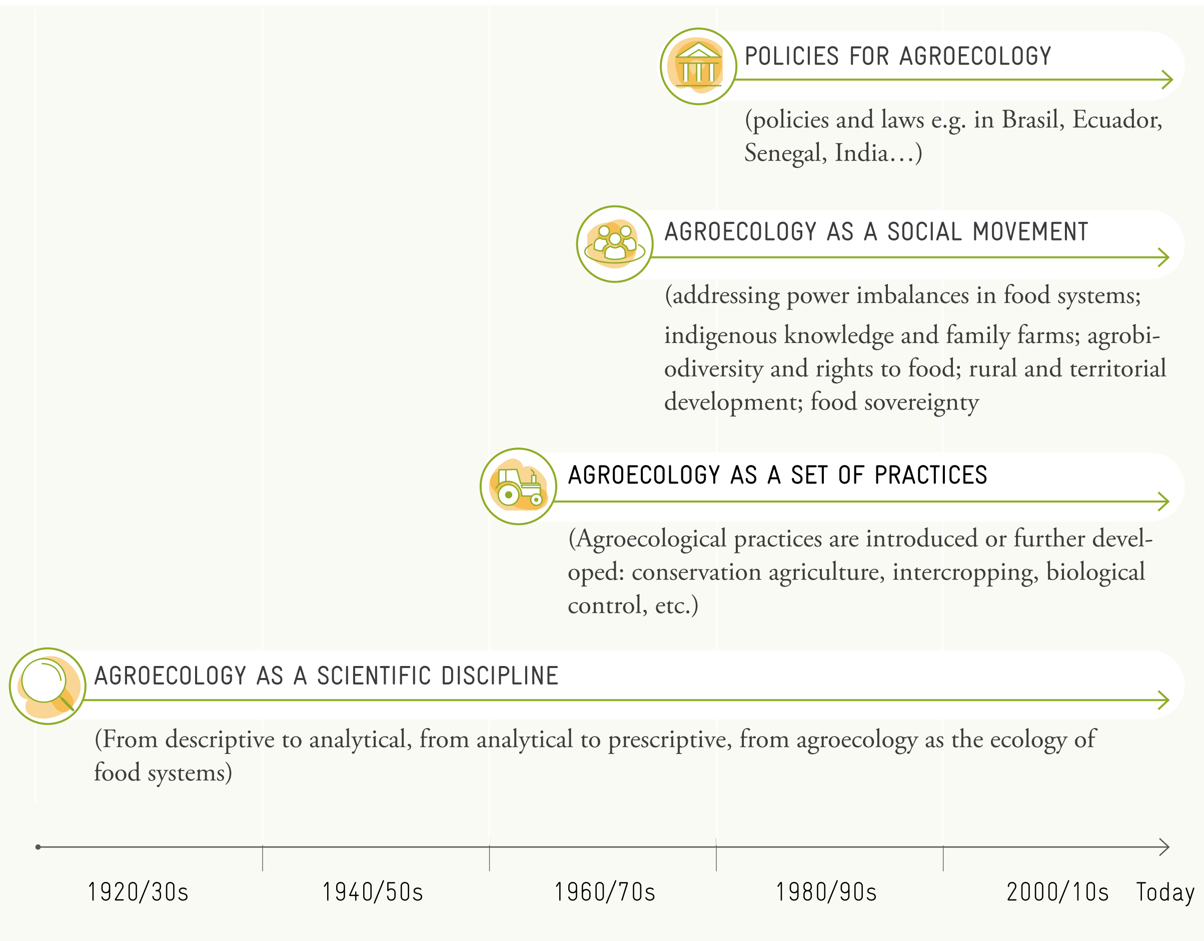
↳ Sinclair et al. (2019) The contribution of agroecological approaches to realizing climate-resilient agriculture

This paper is part of a series of background papers commissioned by the Global Commission on Adaptation (GCA) for its 2019 flagship report. It focuses on the role that agroecological approaches can play in making food systems more agile in adapting to climate change, including field and farm scales and landscape and food system scales.

1.1 What is agroecology?

Agroecology is widely discussed as a pathway towards sustainable agricultural and food systems. Instead of a set definition and clear-cut frame to shape a "new" agriculture, it may rather be considered a school of thought and a transformational pathway for food systems. At its most basic, "agroecology is the application of ecological principles in agriculture. […] Today, agroecology embraces science, a set of practices, and a social movement, as well as the integration of these three elements to design and implement more sustainable food systems." (Global Commission on Adaptation, GCA, 2019). Figure 1 shows the different dimensions of agroecology and the evolution of its understanding(s) over time.

Figure 1: History of agroecology Dimensions of agroecology over time



(source: HLPE Report, 2019)

1.1.1 A scientific discipline

As a science, agroecology investigates the ecological processes and interactions in agricultural lands. In its beginnings in the 1920s–1930s, agroecological science was a natural science, investigating biological and physical processes at field level. The focus of agroecological science later broadened from field and farm levels to agroecosystems, including aspects of agronomy and intercultural processes of constructing knowledge and considering influences of agriculture on other ecosystems such as forests, wildlife habitats, wetlands, life in water and the surrounding landscapes. Since the 1990s–2000s, agroecological science has developed into an interdisciplinary approach investigating entire food systems and encompassing agronomy, ecology, sociology, food chains and economics. Henceforth, the approach has increasingly embraced a transdisciplinary focus, seeking to adopt a solution focus and to contextualize to "real-world" problems.

1.1.2 A set of practices

While there is no strict set of practices defined as being agroecological, the HLPE Report (2019) states that: "agricultural practices can be classified along a spectrum and qualified as more or less 'agroecological', depending on the extent to which:

i. they rely on ecological processes as opposed to the use of agrochemical inputs;
ii. they are equitable, environmentally friendly, locally adapted and controlled; and
iii. they adopt a systemic approach, rather than focusing only on specific technical measures."

Examples considered as agroecological practices in the HLPE report (2019) are: "diversification, mixed farming, intercropping, cultivar mixtures, habitat management for crop-associated biodiversity, biological pest control, improvement of soil structure and health, biological nitrogen fixation, and the recycling of nutrients, energy and waste as inputs to the production process". Further examples are "organic fertilization, split fertilization, reduced tillage, drip irrigation, integrated pest management and choice of cultivars resistant/tolerant to biotic stresses (diseases, insect pests and parasitic weeds), agroforestry, allelopathic plants, direct seeding into living cover crops or mulch, and integration of semi-natural landscape elements at field, farm and landscape scales" (GCA, 2019).

Agroecology contributes in many ways to climate change mitigation and adaptation. Agroecosystems where many agroecological practices are implemented are more resilient to extreme weather phenomena. Increased soil organic matter (carbon sequestration) and reduced use of mineral nitrogen fertilizers contribute to climate change mitigation (Sinclair et al. 2019).

Agroecology as a set of practices has a lot in common with organic farming. However, in contrast to agroecology, organic farming focuses on the agricultural aspects of agri-food systems and is regulated by clearly defined standards, which a farm must adhere to in order to be certified "organic". Therefore, also farms that are non-certified organic and hence considered conventional might still apply a wide spectrum of the above agro-ecological practices.

1.1.3 A social movement

Agroecology as a social movement emerged as an antithesis to approaches to agriculture that are increasingly disconnected from social, ecological and cultural bases of production. In this context, from the mid 1990's, a broader and more political definition of agroecology has developed. Social movements and peasant organisations around the world look at agroecology as a political framework to defend their rights and advocate for food systems, which focus more strongly on small-scale producers and on food sovereignty. In this context, agroecology is looked at as a political struggle that aims to challenge and transform power structures (GCA, 2019).

The goal of agroecology is to transform local food systems to ensure the economic viability of rural areas through short marketing channels and fair and safe food production. It supports various forms of (small-scale) food production and rural communities, as well as food sovereignty and social justice. This also includes the right to and control over access to land, seeds and water, as well as fair trade relations (GIZ, 2020).

1.1.4 A holistic approach

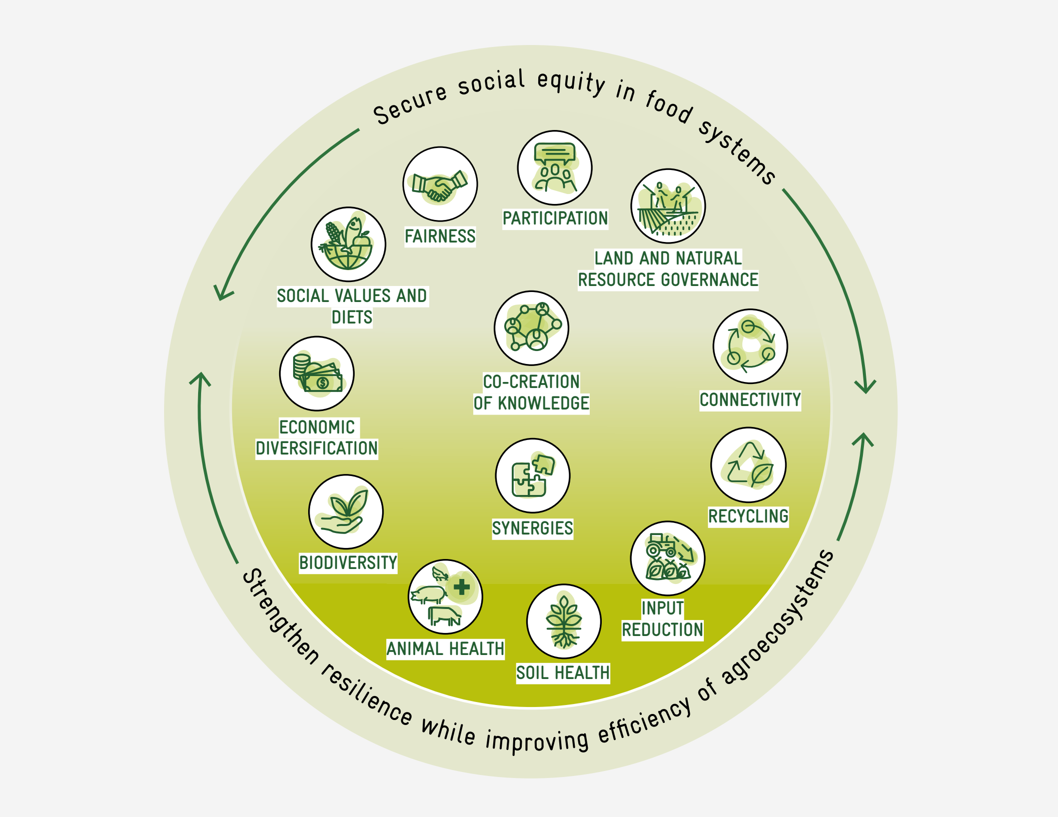
Today, agroecology is increasingly discussed as a holistic view on agriculture and food systems, integrating different perspectives and dimensions. The Food and Agriculture Organisation (FAO, 2024) describes agroecology as follows:

„ Agroecology is a **holistic and integrated** approach that simultaneously applies **ecological and social concepts and principles to the design and management of sustainable agriculture and food systems**. It seeks to optimize the interactions between plants, animals, humans and the environment while also addressing the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced. Agroecology is concurrently a science, a set of practices and a social movement and has evolved as a concept over recent decades to expand in scope from a focus on fields and farms to encompass the entirety of agriculture and food systems. It now represents a transdisciplinary field that includes the ecological, socio-cultural, technological, economic and political dimensions of food systems, from production to consumption."

1.2 When is something agroecological?

1.2.1 The 13 principles of agroecology as defined by HLPE, 2019

Figure 2: The 13 principles of agroecology with the simplified operational principles



(adopted from HLPE, 2019)

Agroecology is a dynamic, transdisciplinary and intersectoral approach, using principles as guidelines and building blocks. These principles are shown in → figure 2. Resulting from a multi-stakeholder process, FAO (2018) identified ten elements of agroecology to guide the transition towards sustainable agriculture and food systems. Based on these elements, the High Level Panel of Expert (HLPE, 2019) of the CFS elaborated the 13 agroecological principles, combining and consolidating scientific literature and summarizing the state of discussion. These 13 principles are now widely used and represent the point of reference within the international discussion. They are, for example, used as common basis of understanding within the international Agroecology Coalition. The member states and organisations of the Agroecology Coalition (see ↳ Chapter 4.2) declare their willingness to support a transformation process of their agricultural and food systems through agroecology and its 13 principles. ↳ Table 1 explains these 13 agroecological principles and gives some intervention examples for each principle. It also distinguishes the scale of application between field (FI), farm (FA) and food system (FO). The 13 principles are organised around three operational principles for Sustainable Food Systems: (1) improve resource efficiency, (2) strengthen resilience and (3) secure social equity/responsibility. The principles need to be applied and adapted to the local conditions, resulting in a variety of combinations and locally adapted interventions.

The vision of an agroecological transformation is to make global agricultural and food systems more resilient, fair and sustainable. The agroecological principles contribute, in different direct and indirect ways, to food and nutrition security. Agroecology draws on indigenous and local knowledge and enables its integration and contribution to modern technologies and scientific developments. As a bottom-up and territorial process agroecology enables sustainable and diverse land-use, increases resilience and contributes to local and regional rural development. It promotes diverse production systems and farming with nature and biodiversity. In addition to conserving the natural environment, it strengthens farms and the regional economy to become more resilient to crop failures and climate change and more independent from price fluctuations of imported goods such as fertilizer or seeds. The joint promotion of on-site product processing and distribution through local or direct sales channels creates additional and secure income opportunities with fair wages, especially for women and youth, boosting their economic status. Agroecological approaches are rooted in participation and empowerment by ensuring access to resources and markets for all, connecting producers and consumers more directly. The holistic approach provides perspectives for farmers, local communities, and global agrifood systems, as it allows producers and consumers to actively shape the future of their agricultural and food system (GIZ, 2023).

Table 1: The 13 principles in detail (adapted from HLPE, 2019; and interventions examples from Biovision, 2019)

PRINCIPLE	EXPLANATION	INTERVENTION EXAMPLES	SCALE OF APPLICATION*
IMPROVE RESOURCE EFFICIENCY			
1. RECYCLING	Preferentially use local renewable resources and close, as far as possible, resource cycles of nutrients and biomass.	• Nitrogen fixing cover crop and leguminous green manures, crop sown for mulch • Recycling domestic, municipal, industrial wastewater, use of desalinated water • Bioenergy from corn stalk, rice husk, slaughter waste, third generation biofuels, biogas from manure, organic agricultural waste • Measures to reduce food waste at consumption level	FI, FA
2. INPUT REDUCTION	Reduce or eliminate dependency on purchased inputs and increase self-sufficiency.	• Improved monitoring, precision agriculture to reduce synthetic fertilizer • Compost, manure, cow dung • Cover crop for weed suppression • Use of steam, UV treatments, LED lighting, insect sex pheromone, plant extract that attract insect pests to traps, neem spray, wood ashes	FA, FO
STRENGTHEN RESILIENCE			
3. SOIL HEALTH	Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and enhancing soil biological activity.	• Cover crops to reduce soil erosion, run-off, improve soil drainage, increase soil organic matter • Reduced tillage: conservation or no-till practices, direct seeding	FI
4. ANIMAL HEALTH	Ensure animal health and welfare.	• Species-appropriate husbandry • Improved monitoring, vaccines that reduce the need for antibiotics • Animal breeding using conventional, marker-assisted breeding or other breeding methods to reduce the use of external inputs	FI, FA

* Scale of application: FI = field; FA = farm, agroecosystem; FO = food system

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.	• Development of local breeds/varieties, local seed system, seed banks, participatory breeding • Conservation of forest fragments around agricultural lands • Flower strips • Sustainable shifting cultivation, management of heterogeneous landscape	FI, FA
6. SYNERGIES	Enhance positive ecological interaction, synergy, integration and complementarity among the elements of agroecosystems (animals, crops, trees, soil and water).	• Agroforestry: diversified farming system integrating crop production and trees • Integrated crop-livestock systems: fish-duck-rice system, silvopasture • Reforestation/restauration/ preservation of natural habitats with clear benefits for agricultural production, diversified land-use or alternate flowering at the landscape level to improve pollination services, • windbreaks, soil erosion control e.g. using hedgerows, half-moon, terracing, stone bunds, contour bounding, Zaï holes	FI, FA
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.	• Project exploring diversification of the production (temporal, nutritional), diversification of work type, access to markets, impact of access to local food on farmer's resilience. Other topics: interactions between agriculture and the wider economy, agritourism	FA, FO

SECURE SOCIAL EQUITY/RESPONSIBILITY			
8. CO-CREATION OF KNOWLEDGE	Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange.	• Farmer-to-farmer programmes, farmer's groups to share experiences, bottom-up models of technology transfer (participatory ICT tools), social media groups, community of practices • Farmer field schools, climate field schools, participatory research designs, integrate producer's knowledge of agricultural biodiversity and management experience (to research)	FA, FO

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.	• Diversification of crop production with a nutrition focus • Collective action targeting women, creating opportunities for commercialisation, participation in producer groups and education, developing higher levels of autonomy • Self-organisation, associations, capacity to stand for labour rights, land rights, strengthen self-empowerment	FA, FO
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.	• Policies making rural areas and professions more attractive for youth, structural transformation to boost youth labour demand, promote entrepreneurship and access to productive resources • Policies and programmes that promote inclusive market systems, fair trade, fair employment, fair treatment of intellectual property rights	FA, FO
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.	• Community-supported agriculture (CSA), re-localisation of food systems and markets within same territories, engagement of communities and businesses in sustainable operations, • New innovative markets, participatory guarantee schemes (PGS), e-commerce schemes • Local producer's markets/more traditional territorial markets, • Denomination of origin labelling and certification	FA
12. LAND AND NATURAL RESOURCE GOVERNANCE	Strengthen institutional arrangements to improve, including the recognition and support of family farmers, smallholders and peasant food producers as sustainable managers of natural and genetic resources.	• Payment for ecosystem services, biodiversity-friendly agricultural regulation and subsidies • Recognition of traditional rights over natural resources	FA, FO
13. PARTICIPATION	Encourage social organisation and greater participation in decision-making by food producers and consumers to support decentralised governance and local adaptive management of agricultural and food systems.	• Support multi-stakeholder policy dialogues (integrate CSO/farmer's organisations' demands) • Evidence-based policy planning, support and strengthen science-policy interfaces • Self-organisation, associations, capacity to stand for labour rights, land rights, strengthen self-empowerment	FO

1.2.2 Internationally agreed exclusion criteria

Based on international and multi-stakeholder discussions, the Agroecology Coalition (see ↳ chapter 4.2) developed an "Agroecology Assessment Framework" allowing to assess the level of alignment of projects, initiatives, or portfolios to the 13 principles. As part of this process 10 red lines were identified and included into the framework. These red lines are seen as minimum requirements and a criterion for exclusion. In order to be considered agroecological, a project cannot:

1. focus on the introduction of GMOs and associated genome-editing technologies,
2. focus on the promotion of synthetic fertilisers and pesticides,
3. focus exclusively on promoting large scale single cash crop production at the expense of diversified strategies,
4. focus exclusively on productivity resulting in avoidable destruction of vital eco systems and their functions and services,
5. promote regulations and/or actions that hamper and/or destroy local and farmer-managed seed systems,
6. focus on large-scale intensification of animal production,
7. exclude or actively discriminating against women and other marginalised groups,
8. focus exclusively on promoting highly processed or industrially produced food (with low nutrient value),
9. promote extractive raw material production that depletes local resources over time,
10. promote approaches that violate rights, including customary rights, ignoring prior informed consent or results in population displacement and/ or land grabbing.

↳ AGROECOLOGY FINANCE ASSESSMENT TOOL

This is a tool to evaluate projects/initiatives/calls for proposal for their support to agroecological transformations by rating their contribution to the implementation of each of the 13 principles of agroecology

1.2.3 FAO's 10 elements of agroecology, 2018

The 13 principles are aligned with the 10 elements of Agroecology (↳ figure 3) approved by the United Nations Food and Agriculture Organisations (FAO)'s Council in 2019, after a consultation process carried out between 2015 and 2017 and culminating with an International Symposium of Agroecology in 2018, and finally approved in 2019 (see below). The principles and elements are overlapping and correspond with each other as shown in table 2. In some monitoring systems and tools, the principles and elements are shown in parallel (e.g. in the Agroecology Criteria Tool).

Table 2: Set of 13 agroecological principles and the 10 elements

10 ELEMENTS OF AGROECOLOGY FROM FAO, 2018	13 AGROECOLOGICAL PRINCIPLES FROM HLPE, 2019
↳ Recycling	1. Recycling
↳ Efficiency	2. Input reduction
	4. Animal health
↳ Diversity	5. Biodiversity
	7. Economic diversification
↳ Resilience	7. Economic diversification
↳ Synergies	5. Biodiversity
	6. Synergies (managing interactions)
	3. Soil health
↳ Co-creation and sharing of knowledge	8. Co-creation of knowledge (embracing local knowledge and global science)
↳ Culture and food traditions	9. Social values and diets
↳ Human and social values	9. Social values and diets
	10. Fairness
↳ Circular and solidarity economy	11. Connectivity
↳ Responsible governance	12. Land and natural resource governance
	13. Participation

(source: Biovision, 2019)

↳ UN Food and Agricultural Organisation 10 elements of agroecology, 2018.

The UN Food and Agricultural Organisation is a specialised agency that leads international efforts to defeat hunger. The global FAO initiative "Scaling Up Agroecology", as well as the "Friends of Agroecology" support the transformation of agriculture and food systems through capacity building and policy advise.

↳ Agroecology Criteria Tool (ACT).

The Agroecology Criteria Tool (ACT) methodology is based on the analytical framework by Gliessman on the 5 levels of food system change and is embedded within the 10 elements of agroecology by FAO. It provides a structured and graphically intuitive way to identify the focus and agroecological character of an initiative or project.

1.3 What are the transition levels of agroecology?

To put the principles of agroecology into practice and to design a holistic approach for food systems transformation there is a need for awareness of the level of integration layer. One project or programme alone cannot realize a systems transformation. It requires collaborative action across different levels and fields of expertise.

Steven Gliessman (2016) has developed a framework for classifying **five levels of food system change.** While the first three levels describe steps that farmers can take on their farms for integrating agroecology, two additional levels go beyond the farm to the broader food system and the societies in which they are embedded. All five levels together can serve as a roadmap that outlines in an almost stepwise manner a process for transforming food systems. Gliessman (2016) describes the five levels in this way (↳ figure 3):

Level 1: Increase resource efficiency in order to reduce the use of scarce, costly and/or environmentally harmful external inputs. At this level, farmers seek to use fewer inputs to reduce costs and negative impacts of use, while maintaining or even increasing levels of production. Examples for level 1 measures are: improved seeds, optimum planting density, drip irrigation, more efficient pesticide and fertiliser application, precision agriculture.

Level 1 refers to the following examples: Integrated Pest Management (IPM), sustainability standards (global GAP), education and safeguards on pesticides and antibiotics or local knowledge exchange.

Level 2: Substitution of conventional inputs and practices by agroecological alternatives. At this level of transition, external input-intensive and environmentally degrading inputs and practices are replaced by inputs and practices which are more renewable, based on natural products and more environmentally sound. One example for a level 2 approach is organic farming. Examples for measures include nitrogen-fixing cover crops and rotations to replace synthetic nitrogen fertilizers, the use of natural controls of pests and diseases, the use of organic composts for fertility and soil organic matter management. At this level, the basic agroecosystem is usually not altered.

Level 2 refers to the following examples: soil protection and rehabilitation, climate resilient cropping methods, crop diversity, organic farming, or the integration into existing development approaches.

Level 3: Redesign of agroecological systems so that they function on the basis of ecological processes. At this level, there are more fundamental changes in the overall system. The focus is on preventing problems before they occur, and key yield-limiting factors are addressed. Optimize biological synergies that enhance key functions across agroecosystems by a careful design of diversified systems. Synchronize activities at the landscape scale. Examples for level 3 measures are increasing farm diversity by ecology-based rotations, multiple cropping, agroforestry and the integration of animals with crops.

Level 3 refers to the following examples: landscape restoration, Sustainable Land Management (SLM), participatory land use and spatial planning, ecosystem-based adaptation (EbA) or nutrient cycling at the local level.

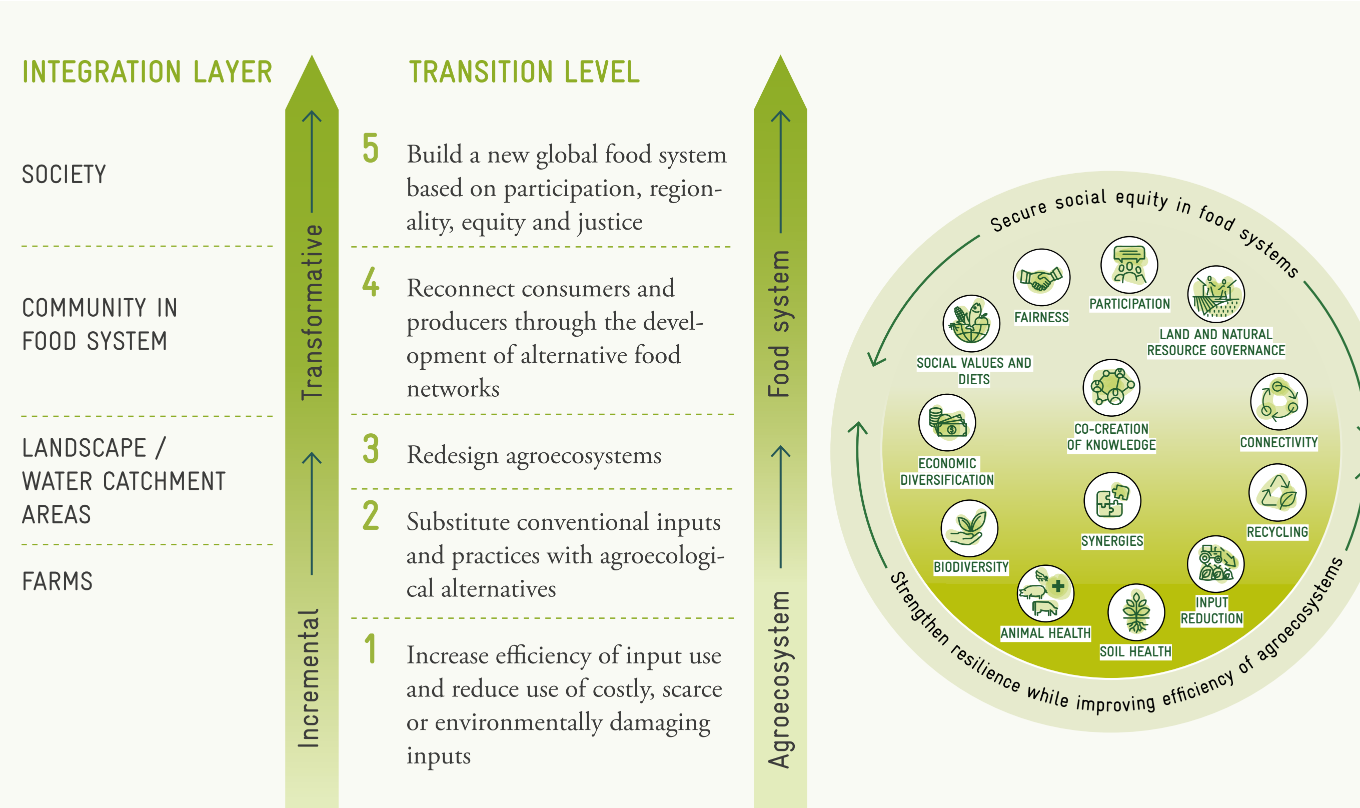
Level 4: Re-establish a more direct connection between food producers and consumers and develop alternative food networks. This level of transformation aims at reconnecting producers and consumers, by prioritizing local markets and short food circuits, supporting local economic development by creating virtuous cycles, and establishing more equitable and sustainable markets. Consumers at local level start valuing the locally grown and processed food. Consumers' preference for locally grown food develops into a "food citizenship" pushing for food system change. Food is grounded in more direct producer-customer relationships, communities of growers and eaters form alternative food networks around the world. Examples for level 4 approaches are the current food re-localization movement, networks of farmers' markets, community supported agriculture schemes, consumer cooperatives, and other more direct marketing arrangements that shorten the food chain.

Level 4 refers to the following examples: following food sovereignty, food losses, post-harvest losses, locally based food systems, improving ecological footprint while maintaining high nutritional quality.

Level 5: Build a new global food system, based on equity, participation, fairness, justice and regionality. This level of transformation aims at protecting and improving rural livelihoods, equity and social well-being (dignity, inclusion and justice), building autonomy and adaptive capacities, empowering people and communities to overcome poverty, hunger and malnutrition, while promoting human rights (right to food, and stewardship of the environment), and addressing gender and rural youth inequalities. It requires changes in beliefs, values and ethical systems. It brings about a paradigm shift focused on how agriculture and food systems of the future can help to reduce ecological footprints and recognize there are limits to growth. Examples for level 5 approaches are the encouragement of social organisation and greater participation and decision-making of food producers and consumers, thus supporting decentralised governance and local adaptive management of food and agricultural systems, and support to policies that put agroecology front.

Level 5 refers to the following examples: formulation of agricultural and food policies, multi-actor partnerships, dialogue forums, South-South and South-North exchanges, and international agricultural research, local traditional knowledge.

Figure 3: Transition levels and integrations layers

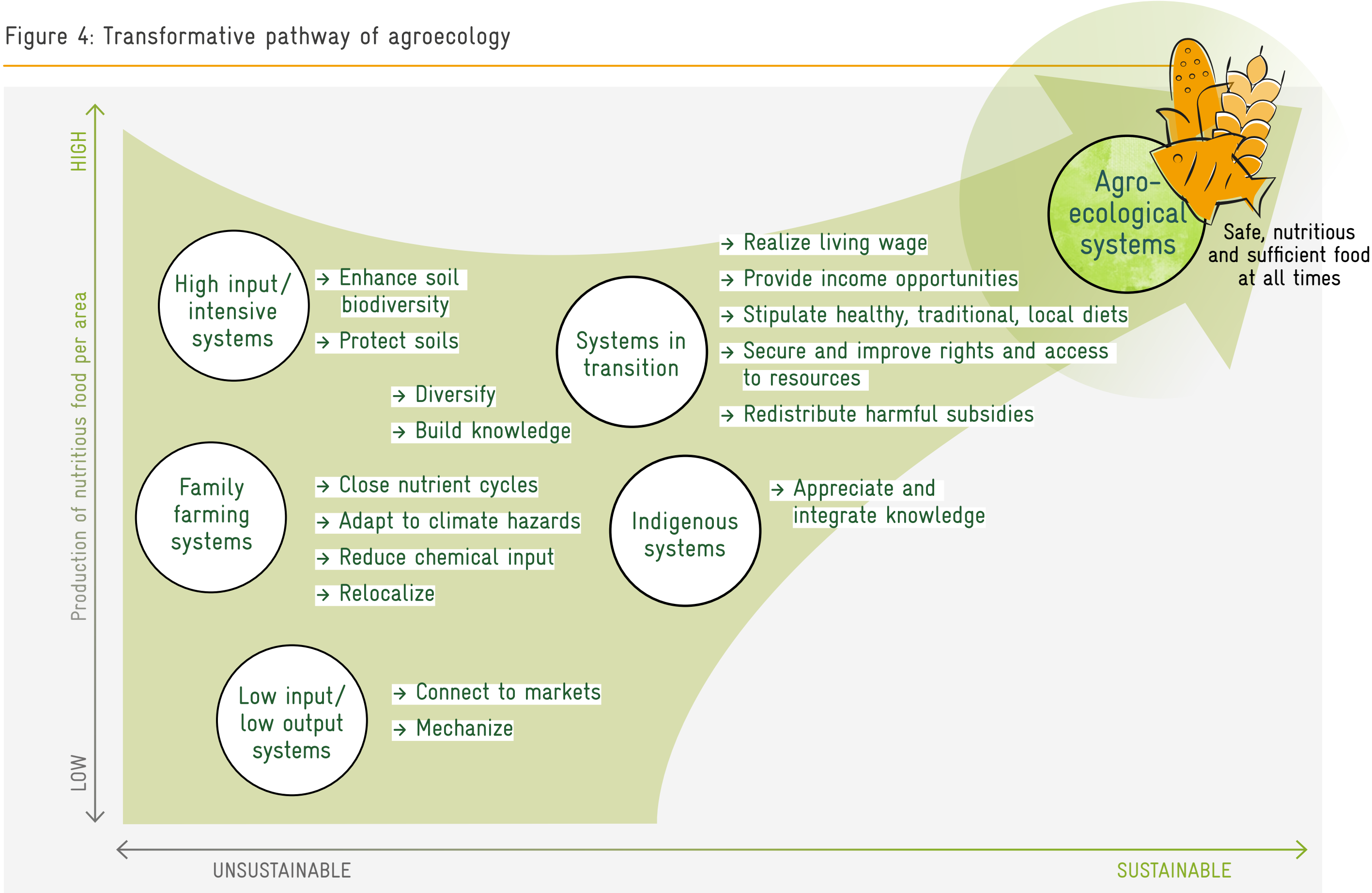


(source: adapted from HLPE, 2019)

The principles can be associated with an integration layer and correspond with certain transition levels more strongly than with other levels. To design a systemic and transformative, agroecological pathway more than one principle needs to be considered, which leads to multiple level action towards transformation.

Transformative processes can be best explained by their pathway and by the levers of transformation they are contributing to (↳ figure 4). Using the principles as guidelines, solutions can be tailored to the local needs and situation. Theses sets of measures are also effective in different timescales: In short term (such as increasing yields through context-specific agroecological practices, cost savings through reduced use of chemical inputs, new income opportunities and more stable income through local markets and business models, or access to new markets in the case of organic agriculture), or medium term (e.g. at farm level: nutrient recycling and circular economy; at a landscape level: by increasing soil biomass, water retention capacity as well as reduction of nutrient losses, restoration / reduction of pressure on ecosystem; at a society level: networking amongst farmers, as well as between producers and consumers, participation in political decision-making processes, creation of income and employment opportunities in rural areas). In the long term the measures address e.g. the promotion of regional nutrient cycles, regional markets and local value creation, protection and restoration of ecosystem services (e.g. water resources, pollinator services, carbon sequestration, plant health, soil protection) and supporting policies.

Figure 4: Transformative pathway of agroecology



(Source: Own illustration, adapted and modified based on the International Assessment of Agricultural Knowledge, Science and Technology for Development — Summary for policy makers Latin America and Caribbean (IAASTD — SDMLatin AmericaCaribbean), 2009.)

→ GIZ Factsheet (2024). Agroecology – From Principles to Transformative Pathways

This collection of five best practice examples in rural development shows the potential of agroecology and illustrates how transformative pathways are shaped differently by different sets of agroecological principles.

2.

AGROECOLOGY ADDRESSES KEY ISSUES OF RURAL LIVELIHOODS

The following chapter provides scientific evidence on tried and tested agroecological approaches and offer insights on the impact on the economic situation of farmers as well as gender and youth.

2.1 Enhancement of farmers economic situation through agroecology

Agroecology is a vehicle for achieving decent livelihoods for everyone throughout the food system. Empiric research in different parts of the world shows that agroecology as a practice can significantly improve the economic situation of farmer households (Altieri 2000, D´Annolfo et al. 2017, Paracchini et al. 2020, Jahi Chapell and Bernhart 2018, Madsen, S., Bezner Kerr, R., LaDue, N. et al. 2021).

Frequently observed impacts are:

- Higher yields and higher labour productivity (after a transition phase)
- Improved economic resilience due to increased diversification (e.g. in case of price fluctuations or crop or animal diseases)
- Increased absolute income due to reduced input costs (e.g. through using fewer synthetic fertilizers, pesticides and seeds), less need for credits to purchase inputs, and less spending on food (due to higher yields).
- Higher prices (if consumers are willing to pay a higher price for ecologically produced food)

- Agroecology can lead to improved nutrition (in terms of quality as well as quantity), not only because of the production diversification but also because of the resulting increased incomes. Of course, impacts depend upon the geographic contexts and the initial situation of the farms.

These impacts depend in particular on the geographical contexts and the initial situation of the farms.

↳ GIZ Factsheet (2024). On the Economic Potential of Agroecology.

This factsheet looks the economic impact of agroecological measures. It incorporates learnings from scientific literature, experiences and evidences created on the ground.

2.2 Addressing gender inequality and youth perspectives

The existing gender inequalities and gender gaps in food systems have been subject of extensive research. With the principles of social values and of fairness, agroecology aims at contributing to gender equality. The approach also underlines the importance of agency (being able to choose) and women's empowerment.

The HLPE report (2019) lists four key dimensions of addressing gender in the context of agroecology:

1. Recognize women's central roles in agricultural and food systems, taking into account the often higher labour demands in holistic agricultural management systems, and seek greater income equity for those providing labour.
2. Develop interventions that provide strategies and tools to deliver nutrition-sensitive agriculture, including next-generation agriculture and food systems on the firm foundation of women´s knowledge of crop production, food processing and food provision practices.
3. Support farmer-led initiatives that advocate for women's empowerment and address gender inequality, especially through agroecological and other innovativ approaches.
4. Reorient institutions and organisations to explicitly address gender inequalities.

Furthermore, in most parts of the world cultural gender roles determine task division. Therefore, women are often confronted with a double burden of work ("productive and reproductive work"), as men generally take less responsibilities for care and household tasks. This high workload for women can also hinder them from participating in trainings or agricultural training programs and from engaging in different kinds of organisation (Momsen, 2010).

Moreover, women might not be included in decision-making related to the spending of household income (e.g. how it will be reinvested in agriculture). A further obstacle to empowering women in agriculture is the fact that (government) agricultural extension services are predominantly offered by and catered for men.

According to Mestmacher and Braun (2020), strategies to address women's needs include the specific targeting of women, for example by:

- Supporting opportunities for women (education and training, producer groups, commercialisation)
- Strengthening self-empowerment initiatives
- Creating gender appropriate spaces
- Promoting gender balance in agroecology leadership
- Awareness raising on gender inequalities among both men and women
- Supporting women to get ownership of land and other relevant resources and infrastructure (e.g. greenhouses, solar panels)
- Improving care facilities in the countryside

With the rural exodus of young people towards urban areas in search of better living opportunities in many parts of the world, an important question for the future development of sustainable food systems is how to support the youth. The agroecological principles of participation and fairness emphasise the need for policies making rural areas and professions more attractive for young people, structural transformation to boost youth labour demand, as well as the promotion of entrepreneurship and access to productive resources for young people. Agroecological approaches seek to identify and address the needs and interests of young people with a focus on their education, access to land, credit and information. Strategies for engaging young people in agroecology are similar to the strategies used to involve women: addressing them in income generation activities and including them in the steering structures of collective action. Information and Communication Technology, training programmes and the funding of innovative business ideas/start-ups to promote agroecology can provide an entry point for strengthening youth involvement.

↳GIZ Factsheet (2023). Jobs perspectives in agroecology – More employment, better income

This factsheet looks at the challenges and opportunities of agroecology and rural employment. In includes some examples and experiences into the discussion.

3.

BARRIERS TO AN AGROECOLOGICAL TRANSFORMATION

There are several barriers to agroecological transformation. Below, you will find some of the most prominent ones – adapted from the report “From uniformity to diversity” of the International Panel of Experts on Sustainable Food Systems (IPES-Food, 2016), the background paper on Agroecology of GCA (2019) and the discussion paper “The Politics of Knowledge” by the Global Alliance for the Future of Food (2021).

- **Concentration of power:** “Food systems in their current form allow value to accrue to a limited number of actors, thus reinforcing their economic and political dominance, […]“ (IPES, 2016). This power allows them to influence the paradigms, policies and incentives that determine these systems. Concentration of power reinforces all the obstacles discussed below.
- **Export orientation and the “feed the world” narrative:** Globalisation, new opportunities for trade and the paradigm of a strong link between GDP-growth and development have been a key cause (and effect) of the specialisation and industrialisation of agriculture. Free trade and a parallel draw-back of state interventions as an expected means to deliver food security by producing large amounts of cheap uniform commodities have favoured the profit-oriented private sector. Agroecology pursues multi-cropping systems where diverse agricultural practices and forms of land use coexist. Although the productivity of each of the elements might not be as high as it would be when produce on its own, the total productivity of the system is usually higher (HLPE, 2019; Leippert et al., 2020). Since agricultural performance is usually assessed based on productivity criteria per crop or animal species and unit of land, agroecology fares worse than intensive systems. Accordingly, doubts are raised as to whether agroecological approaches are a viable option to ensure food security for the world population. However, the cost of the negative impacts of industrial agriculture are not reflected in the food price – these are the so-called “negative externalities”.
- **Externalisation of negative impacts:** Intensive farming usually causes negative externalities such as biodiversity loss, soil and water pollution, and soil degradation. Agricultural performance is most often assessed without considering these externalities. Therefore, investment decisions by farmers and other food system’s stakeholders are distorted: many impacts of agricultural systems are not accounted for in markets and are not factored into costs and decisions on production. These negative ecological impacts are usually not penalised nor reflected in the products’ price. On the other hand, the positive ecological impacts of agroecological approaches are rarely rewarded.

- **Unfavourable Policies:** Policies often favour industrial/conventional agriculture and agribusiness (e.g. by providing incentives such as fertilizer subsidies) (HLPE, 2019) which hinders the adoption of agroecological and other sustainable agricultural practices. Public support to agroecology is still low, with FAO estimating that only 8% of its work in 2018-2019 contributed to agroecological transformation (FAO, 2018). Moreover, free trade agreements can negatively impact smallholders' livelihoods, as they must frequently compete with cheap imported agricultural goods.
- **Fragmentation of actors:** "[…] Highly compartmentalised structures govern the setting of priorities in politics, research and business" (IPES, 2016). Agroecological approaches often involve the integration of components that lie e.g. in the responsibility of different ministries responsible for agriculture, forestry, water, the environment and gender issues. Hence, support of agroecological approaches requires the close collaboration of stakeholders across sectors – which is not always a given. Another challenge is the integration across scales. "While there are prodigious national and regional commitments to restoration that invoke agroecological practices, […] translating these to actions on the ground is more challenging. A key bottleneck […] is the lack of policy structures, instruments, processes, or social capital at the local landscape scale." (GCA, 2019).
- **Investment in Research:** Raising the productivity of a narrow range of crop varieties and livestock breeds has been the central priority of most policy and research programmes. Investment in research on agroecological approaches has been limited so far. As a result, there are not only less breeds, varieties, technologies and techniques that have been analysed and optimised for their use in agroecology, but there is also less evidence on the performance of agroecological practices, which makes it difficult to compare them with other approaches and thus impairs their uptake.
- **Linear and top-down generation and dissemination of knowledge:** The GCA (2019) states that "linear scaling models assume [...] that the discovery of new technology happens in research projects led by scientists, followed by pilots that test and refine the technologies [...] before being widely disseminated through scaling up and out." This transfer of externally generated technology marginalises local knowledge systems and hinders transversal generation of knowledge. This paradigm dominates in agricultural science study programs until today. As a result, future agricultural extension staff might not be capable to co-create knowledge with farmers, a key element of agroecology.
- **Short-term thinking:** Short-term results are usually more attractive to politicians, investors and many farmers. However, given the time needed to rebuild soil health and fertility and to reap the benefits of enhanced resilience, agroecological systems' advantages are not short-term, which makes them less attractive for many.

4. KEY REQUIREMENTS AND POLICY RECOMMENDATIONS FOR AN AGROECOLOGICAL TRANSFORMATION

Based on the key constraints for the adoption of agroecological approaches, the GCA (2019) has mapped out key requirements for an agroecological transformation (summarised below).

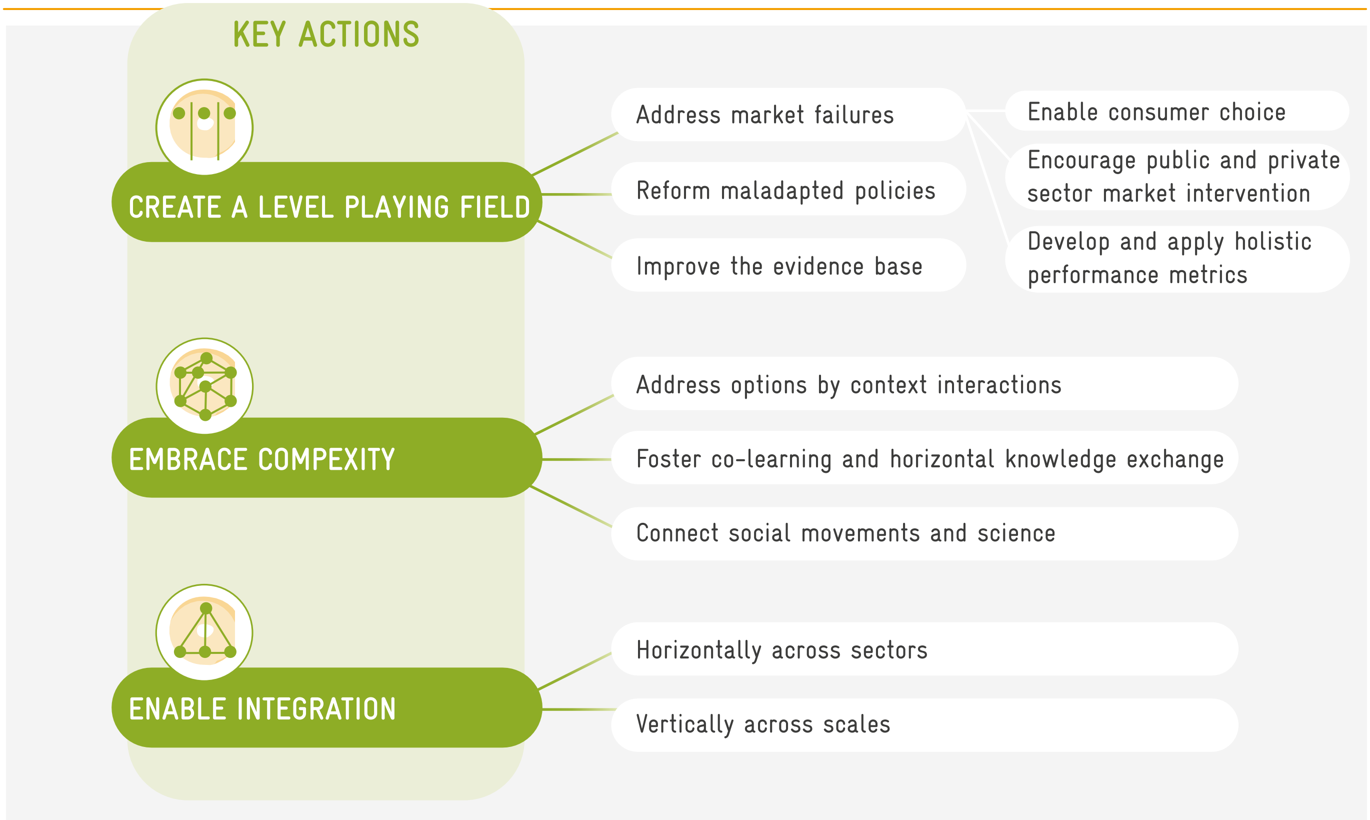
4.1 Key requirements

4.1.1 Markets and policy

- **Value ecosystem services and develop reward systems for farmers who adopt agroecological approaches that either reduce negative or enhance positive externalities** (true cost accounting coupled with compensation): establish a policy scheme to compensate farmers for the provision of agri-environmental services, supporting those who adopt or maintain farming practices that help meet environmental and climate goals.
- **Reform policies, provide incentives for sustainable and/or penalize unsustainable production:** Review policies that might have a negative impact on the adoption of agroecological practices and reform them as necessary. Develop cross-ministerial policies that encourage the agroecological transformation by coupling incentives for socially and ecologically sustainable production with penalisation of negative externalities.
- **Prioritise agroecologically produced food** in public sector expenditures e.g. public procurement of food for public institutions such as schools and hospitals.
- **Strengthen local market channels:** The willingness of consumers to support sustainable approaches through their consumption choices increases with a closer connection between producers and consumers (Mestmacher & Braun, 2020).
- **Label agroecological products:** establish certification schemes that label agroecologically produced food so it can be easily identified by consumers and thus help to build trust.
- **Support small-scale producer organisations to enable them to interact at eye level with other food system stakeholders.** By facilitating the self-organisation of smallholder farmers in producer organisations – such as cooperatives and associations – farmers can negotiate better terms of trade and reach wider markets.

- **Adjust performance metrics to improve evidence:** Develop and adapt comprehensive performance metrics for agricultural systems that consider social, economic and ecological impacts to increase public and private investments in research on agroecological approaches.

Figure 5: Some of the actions that can enable the adoption of agroecological practices at scale to build resilience in farming and food systems



(Source: GCA, 2019)

4.1.2 Research and knowledge generation

Agroecological approaches emphasise the importance of specific, locally adapted solutions and of using and generating local knowledge. From this, they derive the need to reconfigure research and agricultural extension, considering three key dimensions:

- **Context specificity:** Stakeholder engagement for identifying local solutions and testing their suitability for upscaling is crucial in developing context-specific yet adaptable agroecological options. Here, gender aspects require especial attention as peasant women are often the carriers of knowledge on indigenous plants and herbs, biopreparations, seed production and storage. This knowledge needs to be considered and strengthened by scientists and agricultural advisors (Momsen, 2010).

- **Co-learning and horizontal knowledge sharing:** Bridging different approaches to knowledge in social movements and among scientists is vital as practical and cultural relevance can be combined with scientific rigor. The co-creation of knowledge requires multi-stakeholder-engagement in innovation platforms that allow for collaborative knowledge generation, sharing and ownership. Farmer-to-farmer dissemination of successful practices is encouraged, rather than using hierarchical technology transfer modalities. The Natural Farming (NF) approach in Andhra Pradesh (India), for example, constitutes the successful implementation of multi-stakeholder partnerships and co-learning.
- **Create appropriate institutional conditions:** This presupposes an integral anchoring of agroecology in the teaching at university level and the provision of sufficient financial and personnel resources for good public extension service and research. At the same time, the development and independent work of smallholder organizations should be strengthened to facilitate farmer-to-farmer knowledge sharing and the exchange of seeds, equipment, etc.

4.1.3 Multisectoral collaboration

Enabling integration horizontally (across sectors) and vertically (across scales) is another key requirement for agroecological transformation:

- **Develop instruments that enable inter-ministerial cooperation**, as done by the Prime Ministerial Orders in Rwanda to implement a national forestry strategy and action plan, or the development of national instruments in India, Nepal, Peru or Ethiopia. (Future Policy, 2020b)
- **Develop policy implementation arrangements at local landscape level** to translate national policies supporting agroecology to actions on the ground and to spread agroecological approaches. (Future Policy, 2020a)

4.2 International support mechanisms: Agroecology Coalition

One of the results of the international process of policy development was the foundation of the Agroecology Coalition (AEC). The AEC or "Coalition for Food Systems Transformation through Agroecology" was founded as part of the UN Food Systems Summit (UNFSS) 2021 as a coalition of the willing and has been growing steadily ever since.

Over 50 countries and regional institutions joined the coalition, including the African Union and the European Union. As a multi-stakeholder platform, the AEC also has over 220 organizations (as of June 2024) as members, with prominent multilateral organisations such as FAO and IFAD, but also many non-governmental organisations including farmers' associations, research organizations, indigenous peoples' organizations as well as philanthropists and civil society. By joining, members declare their commitment to promoting the transformation of agricultural and food systems through agroecology and its 13 principles (according to the HLPE report, 2019). The AEC reports voluntarily to the CFS.

The strategy "Accelerating Food Systems Transformation through Agroecology" – Agroecology Coalition Strategy 2024 – 2030 of the coalition is the first strategy and thus also the reference framework for the functioning and working methods of the international multi-stakeholder platform. The strategy also sets out goals and measures for the years 2024 – 2030, as well as the monitoring, coordination and governance structure.

The aim of the AEC is to accelerate an agroecological transformation of the agricultural and food systems in the member countries. In order to realize this vision, the AEC has the task of facilitating and supporting joint activities of the members. Here, the AEC primarily assumes the role of a facilitator or catalyst and represents the leading collective voice of the members. At the same time, the AEC is also a knowledge broker and supporter in order to increase the impact and benefits for members. The AEC also convenes regional, national meetings to strengthen synergies between members or to increase the reach of the exchange.

The members of the AEC have identified four strategic goals for the years 2024 – 2030:

1. facilitating the exchange of knowledge on agroecology and creating further evidence. This includes formal, scientific, local, indigenous, traditional, customary, etc. knowledge.
2. encourage more investment in agroecology by international organizations, governments, philanthropy, public and private donors and investors.
3. advocate for and strengthen supportive policies for agroecology, as an advocate and collective voice.
4. support and promote market access for agroecology, in particular dynamic local, territorial, national and regional markets and inclusive business models.

The permanent secretariat of the AEC is hosted by CIAT/Bioversity. Decisions are made by the Steering Committee, which consists of 10 representatives of the various regions (4 in total) and the various stakeholder groups (6 in total) within the coalition. The secretariat plays a supporting and coordinating role. The work takes place in five working groups: (1) research and innovation, (2) policies to promote agroecology, (3) investment in agroecology, (4) communication, (5) implementation in practice. The strategic goals are implemented in the working groups.

➥ International Agroecology Coalition "Coalition for Food Systems Transformation through Agroecology".

The AEC or "Coalition for Food Systems Transformation through Agroecology" was founded as part of the UN Food Systems Summit (UNFSS) 2021 as a coalition of the willing and has been growing steadily ever since. It is the leading and collective voice on Agroecology.

4.3 Policy recommendations of the Committee on World Food Security (CFS)

In 2021, the CFS has provided a set of high-level policy recommendations as part of its Global Strategic Framework for Food Security and Nutrition (GSF) as summarised below. The recommendations provide the 133 CFS Member States with voluntary guidance in line with the key requirements of the GC A. They offer consolidated recommendations and orientation to policy makers.

4.3.1 Recommendation on policy foundations

Lay or strengthen the policy foundations for agroecological and other innovative approaches.

This includes for example:

- The development of context-specific policies and plans to move towards sustainable agriculture through inclusive processes that involve all relevant stakeholders, particularly women, youth, and indigenous peoples.
- Re-directing public policies, budgets, public and private investments towards agroecological approaches.

4.3.2 Recommendation on measurement and monitoring

Establish, improve and apply comprehensive **performance measurement and monitoring frameworks** to encourage the adoption of agroecological approaches:

- Apply performance metrics and indicators based on science, the SDG indicators and other complementary frameworks, which include both agriculture and food systems.
- Undertake holistic assessments of the environmental impact of food systems as well as of employment and labour conditions.
- Encourage differentiated data collection including factors like gender or farm size.

4.3.3 Recommendation on sustainable agricultural and food systems

Foster the transition to resilient and diversified sustainable agriculture and food systems through agroecological approaches. This includes for example:

- Raising awareness about the importance of diversified production systems integrating multiple production components.
- Strengthening public policies, responsible investment and research, especially if it is targeted towards small scale producers or women and coherent with the conservation and sustainable use of biodiversity.
- Promoting healthy diets as well as an integrated One Health approach and animal welfare standards.
- Raising awareness on the risks of pesticides and actively promoting alternatives, while supporting the integration of biodiversity.
- Strengthening local, national, and regional markets, including e.g. innovative public procurement.

- Harnessing digital technologies to enhance sustainable agriculture or to strengthen direct links between consumers and producers, especially in the context of small-scale producers.

4.3.4 Recommendation on research

Strengthen research, innovation, training, and education and foster knowledge co-creation, knowledge sharing and co-learning on agroecological approaches. Examples are among others:

- Strengthen and enable transdisciplinary research as well as knowledge creation and sharing within an inclusive, participatory, bottom-up and problem-oriented manner, while giving value to local and indigenous knowledge.
- Promote advisory and agricultural extension services and strengthen training programmes to e.g. promote women extension agents as well as to include e.g. ecological and environmental-friendly alternatives.
- Support capacity development for producers as well as policy makers on agroecological approaches suited to their contexts and needs and linked with social protection programmes.
- Promote sharing of experiences and co-learning amongst countries and regions on moving towards sustainable agriculture and food systems through agroecological approaches.

4.3.5 Recommendation people empowerment

Strengthen institutions for stakeholder engagement, create an enabling environment for empowering people most at risk of food insecurity and address power inequalities in agriculture and food systems:

- Support inclusive, transparent, participatory, and democratic decision-making mechanisms at all levels in agriculture and food systems.
- Create and strengthen producers', consumers', labour and other relevant stakeholders' associations, across the food value chain, to build capacities, foster knowledge exchange and to facilitate the use of social media and digital networking.

- Promote the empowerment of women, particularly small-scale food producers by supporting collective action, negotiation, leadership skills as well as increasing access to education and resources.

↳ UN Committee on World Food Security (2021). Policy Recommendations on Agroecological and Other Innovative Approaches.

The policy recommendations aim to provide guidance to members and stakeholders in strengthening agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition.

4.3.6 Examples of agroecological policies

The design of agroecological and systemic policies is challenging. More and more governments are now facing multiple challenges simultaneously and need to find systemic and integrated approaches to shape their agricultural and food systems more sustainably. This is the reason why the international Agroecology Coalition (↳ Chapter 4.2) has a policy working group and fosters peer-to-peer exchange. Similarly, the Food Policy Forum for Change organised peer-to-peer exchanges and other activities mainly targeting policy shapers and makers in Sub-Saharan Africa. The results of the Agroecology Dialogue Series as well as of other events and discussions, best-practices examples and lessons learned are frequently published and accessible online.

↳ FAO Agroecology Knowledge Hub

FAO Knowledge Hub on Agroecology bundles and connects existing knowledge to foster a global dialogue and scaling up Agroecology. It contains information, examples, and several examples of policies and national strategies worldwide

↳ Food Policy Forum for Change

The results of the Agroecology Dialogue Series as well as of other events and discussions, best-practices examples and lessons learned are frequently published and accessible online.

5.

GLOSSARY

Agrobiodiversity: The variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fishing. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agroecosystems (agricultural, pastoral, forest and aquatic) as well as the diversity of the agroecosystems.

Agroecology: „Agroecology is a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems. It seeks to optimize the interactions between plants, animals, humans and the environment while also addressing the need for socially equitable food systems within which people can exercise choice over what they eat and how and where it is produced. Agroecology is concurrently a science, a set of practices and a social movement and has evolved as a concept over recent decades to expand in scope from a focus on fields and farms to encompass the entirety of agriculture and food systems. It now represents a transdisciplinary field that includes the ecological, socio-cultural, technological, economic and political dimensions of food systems, from production to consumption." (FAO, 2024)

Agroecology elements: The 10 elements are a consolidated guide for policymakers, practitioners and stakeholders in planning, managing and evaluating agroecological transformation published by the FAO. The elements were formulated in a global multi-stakeholder consultation process.

Agroecological principles: Building on the FAO 10 elements of Agroecology, the High Level Panel of Experts on Food Security and Nutrition (HLPE) elaborated a consolidated list of 13 principles, combining and reformulating principles from principal sources and discourses to produce a minimum, non-repetitive but comprehensive set of agroecological principles. They are organized around three operational principles for sustainable food systems: improve resource efficiency, strengthen resilience and secure social equity/responsibility.

Agroforestry: A collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems both ecological and economical interactions between the different components are present.

Biodiversity: Variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.

Biological nitrogen fixation: Describes the biological process in which rhizobia bacteria convert elemental nitrogen in the air to organic nitrogen. Rhizobia are small heterotrophic soil bacteria capable of forming symbiotic nodules on the roots of leguminous plants and fixing atmospheric nitrogen.

Biological pest control: It is an alternative to chemical pest control, which uses living organisms to control a particular pest. The natural enemy chosen might be a naturally occurring parasite, predator, or disease that attacks the harmful insect. It is most efficient when used in combination with integrated pest management and other non-chemical techniques of pest control.

Climate Smart Agriculture: An approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA has three main objectives: Sustainable increment of agricultural productivity and incomes; Adaptation and increased resilience to climate change; and Reduction and/or elimination of greenhouse gas emissions, where possible.

Community supported agriculture: A grass-root movement that connects farmers and consumers. The farm is supported by local consumers who purchase prepaid shares of the farm's output. These shares are delivered or collected periodically throughout the growing season.

Diversification: Agricultural diversification or more specifically agroecological diversification refers to the increase of species variety within a farming system. Diversification techniques include agroforestry systems, intercropping (spatial diversity), crop rotations (temporal diversity), crop–livestock systems or fish polyculture farming. An increased biodiversity offers a range of production, socio-economic, nutrition and environmental benefits. It can increase productivity and resource-use efficiency by optimizing biomass and water harvesting. At the same time, economic diversification can strengthen not only ecological but also socio-economic resilience when new market opportunities are fostered.

Ecological compensation: Employed to mitigate adverse effects of exploitation of natural resources and land-use changes on biodiversity and ecosystem services by compensation through investment in natural capital in another geographic area. Compensation measures usually consist of restoring or establishing, and thereafter managing natural values, such as nature reserves, wetlands or recreational areas. Referring to the mitigation hierarchy, ecological compensation should be the last measure to employ. This means aversion and minimization of land use change and on-site biodiversity restoration should always be preferred over ecological compensation.

Ecology: Refers both to a scientific discipline and to political movements concerned with protection of the environment.

Ecosystems: A community of plants, animals and smaller organisms that live, feed, reproduce and interact in the same area or environment. It is a dynamic complex of animals, plants and microorganisms and their non-living environment interacting as a functional unit and depending on one another. If one part is damaged it can have an impact on the whole system. Humans are an integral part of ecosystems. Ecosystems can be terrestrial or marine, inland or coastal, rural or urban. They can also vary in scale from global to local. Examples of ecosystems include forests, the open oceans, coasts, inland water bodies, wetlands, drylands, desert, cultivated lands, etc. Ecosystems interact among each other, and their conditions are dynamic.

Ecosystem Services: The benefits people derive from nature. Services can be provided by natural eco-systems (e.g. tropical forests) or by modified ecosystems (e.g. agroecosystems). While there is no single categorization of ecosystem services, the Millennium Ecosystem Assessment (MEA) proposes a widely accepted classification: provisioning, regulating, supporting and cultural ecosystem services.

Ecosystem services valuation: The process of expressing a value of a particular good or service in a certain context, usually in terms of something that can be counted (often money), but also through methods and measures from other disciplines (sociology, ecology, etc.).

Externalities: A consequence of an action that affects someone other than the agent undertaking that action and for which the agent is neither compensated (when positive) nor penalized (when negative) through the markets. Externalities can be positive or negative.

Food and Nutrition Security: Exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Food Justice: Justice is concerned with ensuring that people get what is due to them, setting out the moral or legal principles of fairness and equity in the way people are treated, often based on the ethics and values of society. Food Justice refers to fair and equal access to food within a society and across the food system.

Food Re-localisation: Describes an increased consumption of local food by members of civil society. It is an ongoing and growing trend in wealthier countries. Community-supported Agriculture is a concept fostering food re-localisation. It is associated with many positive effects, such as improved health outcomes, increased social coherence and aims at fostering local rural development.

Food Sovereignty: The right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. The initial set of seven principles of food sovereignty included: (i) food as a basic human right; (ii) the need for agrarian reform; (iii) protection of natural resources; (iv) reorganization of food trade to support local food production; (v) reduction of multinational concentration of power; (vi) fostering of peace; and (vii) increasing democratic control of the food system.

Food Systems: "All the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socio-economic and environmental outcomes" (HLPE 8, 2014). The three constituent elements of food systems are: food supply chains, food environments and consumer behaviour. (HLPE 12, 2017)".

Forest and Landscape Restoration: The restoration of degraded landscapes by identifying and implementing practices that restore a balance of the ecological, social and economic benefits of forests and trees within a broader pattern of land uses.

Incremental: Any method of achieving a goal by means of a series of gradual increments, or small steps.

Integrated pest management: (Also Integrated Pest Control) A broadly-based approach that integrates several practices to suppress pest populations below the economic injury level, i.e. where the costs outweigh the benefits. It is based on careful consideration of all available pest control techniques and combines economic justification with minimal risks to human health and the environment. Integrated pest management emphasizes the growth of a healthy crop with the least possible disruption to agroecosystems and encourages natural pest control mechanisms.

Intercropping: The combination of different complementary plant species in a spatial pattern, within the same row or in alternating rows. This increases spatial diversity and plant diversity.

Market failures: The economic situation defined by an inefficient distribution of goods and services in the free market. In market failure, individual incentives for rational behaviour do not lead to rational outcomes for the group. In other words, each individual makes the correct decision for him or herself, but those prove to be the wrong decisions for the group (Winston, 2006). Example: Not costing pollution, not valuing the maintenance of soil organic carbon.

Mixed farming: Depend on external (such as weather or market price) and internal factors (such as soil properties or farmers' ingenuity). There is wide variation in mixed systems. They are categorized in three groups: on-farm versus between-farm mixing, mixing within crops and/or animal systems and diversified versus integrated systems.

Multi-cropping: Includes both intercropping and cultivar mixtures – systems where more than one species is grown simultaneously.

Organic farming: An agricultural system that uses ecologically based pest control and biological fertilizers derived largely from animal and plant wastes and nitrogen-fixing cover crops.

Organic fertilisation: Fertilisation which recycles organic waste or material from residual sources of agricultural, industrial and communal activities. Relevant organic sources are animal manure and organic waste from urban and industrial activities. Organic waste is defined as biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants. Residues include products such as sewage, digestate, products derived from manure, etc.

Permaculture: A set of design principles centred on whole systems thinking, simulating, or directly utilizing the patterns and resilient features observed in natural ecosystems. It uses these principles in a growing number of fields from regenerative agriculture, rewilding, and community resilience.

Perverse policy incentives: A perverse incentive is an incentive that has an unintended and undesirable result that is contrary to the intentions of its designers. Perverse incentives are a type of negative unintended consequence.

Precision agriculture (also high-technology farming): Uses ubiquitous and inexpensive computational power, software (GIS), and satellite location systems (GPS). Satellite location systems together with remote sensing enable the precise application of herbicides and pesticides where they are needed instead of widespread usage. Furthermore, precision agriculture equipment enables variable-rate fertilizer and yield assessment. Under precision farming, agriculture has changed from a high labour and low capital intensive to a low labour and high capital-intensive industry.

Recycling of nutrients: Usage of organic fertilizer and reconnection of the nutrient flow between livestock and plant production, enabling farmers to decrease their dependency on imported or purchased mineral fertilizer. With finite fossil fuels and finite reservoirs of phosphorus, a systematic approach and nutrient recycling becomes crucial for agriculture. Nutrient recycling is mainly focused on nitrogen and phosphate. However, organic sources contain high levels of organic matter, which is also essential for maintaining soil fertility.

Reduced tillage (also conservation tillage): A form of non-inversion tillage that retains significant amounts of plant residues on the surface as soil cover. By allowing water to percolate and by protecting the soil from erosion, loss of water and fertile soil is prevented. In no-till systems the soil is not disturbed before planting the new crop.

Resilience: The capacity of social-ecological systems to cope with a hazardous event, trend, or disturbance by responding and re-organizing in ways that maintain the systems' essential function, identity, and structure. At the same time, the capacity for adaptation, learning, and transformation is maintained.

Socio-biodiversity: The concept of socio-biodiversity describes the sustainable use of natural resources by traditional population groups which contributes both to the conservation of biodiversity and the protection of the communities concerned. This can be achieved by managing the collection of resources in natural or semi-natural ecosystems.

Sustainability: A system's ability to remain diverse and productive through-out time. The term originates from the field of ecology but has globally spread as the guiding principle of sustainable development. In this context, sustainability refers to the endurance of biological, political, cultural and economic systems and their interactions through-out time.

Sustainable agriculture: Farming which meets society's present (food and textile/bioenergy) needs, without compromising the ability of current or future generations to meet their needs. According to J. Pretty (2007) the key principles of sustainable agriculture are "1) to integrate biological and ecological processes such as nutrient cycling, nitrogen fixation, soil regeneration, allelopathy, competition, predation and parasitism into food production processes, 2) to minimize the use of those non-renewable inputs that cause harm to the environment or to the health of farmers and consumers, 3) to make productive use of the knowledge and skills of farmers, thus improving their self-reliance and substituting human capital for costly external inputs, and 4) to make productive use of people's collective capacities to work together to solve common agricultural and natural resource problems, such as for pest, watershed, irrigation, forest and credit management."

Transdisciplinary Science: Science that has 1) A problem focus (research originates from and is contextualized in "real-world" problems); 2) An evolving methodology (the research involves iterative, reflective processes that are responsive to the particular questions, settings, and research groupings involved); and that focuses on 3) collaboration between transdisciplinary researchers, disciplinary researchers, and external actors with interests in the research.

Transformation: In comparative political science, transformation is the process of fundamentally changing a (political) system and, if necessary, also the social and economic order.

Transition: A transition is a change in a system, occurring over a period of time, in a specific location. It is often referred to as a "gradual, pervasive shift from one state or condition to something different". It includes political, socio-cultural, economic, environmental and technological shifts in values, norms and rules, institutions and practices.

True-cost accounting (**also referred to as full cost accounting, total value or total impact**): Type of cost-and-benefit-analysis of business and/or policy decisions that brings together non-market goods, such as environmental and social assets, into the development equation. To this end, aspects such as ecosystem services or health (among others) must be given a monetary value. The ultimate purpose is not to monetize nature or people, but rather to translate invisible resources (such as intellectual, human, social and natural assets that are not captured in historic financial accounts) into a common currency for strategic decision-making on impact and dependencies that affect overall value creation.

Trade-off: A situational decision that involves diminishing or losing one quality, quantity or property of a set or design in return for gains in other aspects. In simple terms, a trade-off is where one thing increases, and another must decrease.

→ Dictionary of Agroecology (dicoAE)

Discover the terms associated with agroecology defined in the dictionary

6.

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