Agroecology as an Approach to Resilient Agriculture and Food Systems

Lessons Learned and Ways Forward

1. Introduction

Numerous overlapping ecological, socio-political, and economic shocks and stresses acting across multiple scales have culminated in a polycrisis that threatens agriculture and food systems worldwide. As primary food producers, smallholder farming communities in the Global South are particularly vulnerable to adverse impacts – such as those caused by climate change, armed conflict, supply chain disruptions, or other disturbances.

In view of these setbacks, and despite early successes, achieving the Sustainable Development Goals (SDGs) appears increasingly unlikely unless substantial and fast-acting measures are taken to not only bounce back but also bounce forward[i] – transforming smallholder-based agriculture and food systems into more equitable, just, and resilient ones. Mounting evidence from research and rural development programmes suggests that agroecological approaches and principles hold considerable potential in this regard. Agroecology is increasingly recognized as a multiple-win strategy, simultaneously supporting climate adaptation and mitigation, biodiversity conservation, sustainable soil and water management, and improved food and nutrition security – thus contributing to synergies between the three Rio Conventions on climate (UNFCCC), biodiversity (CBD) and desertification (UNCCD). While its contribution to field and farm level ecological resilience is well established, evidence of broader ecological, social, and economic resilience at community, landscape, and food system levels remains limited.

The German Federal Ministry for Economic Cooperation and Development (BMZ) has been promoting agroecology as an inclusive pathway for transforming agriculture and food systems, through development cooperation and in partnership with German civil society. Between 2014 and 2023, BMZ commissioned agroecology-related projects with a total volume of EUR 3.65 billion. Its Core Area Strategy – Transformation of Agriculture and Food Systems[ii] clearly states the objective of promoting resilience to climate-related shocks and stresses inter alia through

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the potential of agroecological approaches as part of rural development initiatives. At the same time, civil society organizations and networks have been advancing agroecological agendas for many years. A regular Round Table on Agroecology and Organic Agriculture in Development Cooperation *(Runder Tisch Agrarökologie und Ökolandbau in der Entwicklungszusammenarbeit)* fosters exchange between BMZ, civil society, and the private sector. Within this dialogue, the interest emerged to systematically explore interlinkages between resilience and agroecology and formulate recommendations for strengthening them.

As a follow-up, BMZ, through GIZ's Sector Project Rural Development, commissioned an exploratory study. The objective was to examine how projects that apply agroecological approaches contribute to strengthening the resilience of rural communities and landscapes. The study reviewed published scientific research and other relevant publications and compiled experiences and practices from selected projects implemented across four continents **(Box 1)**.

The present Study Brief highlights key findings from the study, with a focus on the interconnections and synergies between resilience and agroecology. It also summarizes key levers for promoting these synergies in development cooperation projects and programmes and provides selected country examples as spotlights. The Study Brief is intended for policymakers, decision-makers, and practitioners involved in planning and implementing programmes in the fields of sustainable rural development and the transformation of agriculture and food systems.

2. Interlinkages between resilience and agroecology

To better understand the interlinkages between resilience and agroecology, it is important to introduce commonly used definitions of both concepts.

Resilience is the ability of systems to function in the face of disturbances.[iv] Within the context of smallholder-based agriculture and food systems in the Global South, it is understood as 'the ability of people and communities to react dynamically and appropriately to various acute crises and/or chronic stresses, to cushion them, recover from them and learn from them'.[v] This definition emphasizes the actors' abilities to anticipate stresses or shocks (anticipatory capacity), stabilize during crises (absorptive capacity), adapt to long-term change (adaptive capacity), and transform agriculture and food systems towards sustainability (transformative capacity). The four resilience capacities do not represent distinct categories but rather constitute overlapping stages in the process of strengthening resilience.

Box 1. Study outline and methodology

The qualitative study was conducted by FAKT Consult for Management, Training and Technologies. It examined projects and programmes as well as activities of partner farms and community development initiatives implemented by five organizations (GIZ, KfW, Misereor, Demeter, and INKOTA-netzwerk)[iii] in the Global South. Projects were selected based on two criteria: (i) they represent an agroecological approach that goes beyond working with individual farmers and agroecological practices at the farm level and (ii) resilience is directly or indirectly addressed. Participation in the study was voluntary and based on the interest and willingness of organizations active in the above-mentioned Round Table to contribute to the study and make their project documents accessible. An iterative methodology was applied, comprising: (i) the establishment of an analytical framework; (ii) a review of selected research papers and grey literature on resilience and agroecology; (iii) the screening of project documents; and (iv) semi-structured interviews with key informants from a subset of projects. The findings were synthesized along three resilience pathways and six levers that strengthen resilience outcomes through agroecological approaches.

Agroecology is an integrated approach from agricultural production to consumption, which incorporates ecological, socio-cultural, technological, economic and political dimensions.[vi] The exploratory study followed the 13 agroecological principles defined by the High Level Panel of Experts on Food Security and Nutrition (HLPE)[vii] that provide guidance for agroecological transformations. Agroecological projects can work at different levels from farm to society level.[viii] At the farm and landscape levels, the gradual transformation of food systems takes place through resource-conserving production practices and farm management approaches based on closed production cycles. Particularly important is the use of territorial approaches that take into account agricultural ecosystems, where landscape functions are considered and enhanced whenever possible. In addition to maintaining and enhancing biodiversity in agricultural ecosystems – across species, functional diversity, and genetic resources – agroecology also seeks to diversify on-farm incomes and opportunities for value addition. For this transition to occur, societal changes at large are equally important. Furthermore, agroecology encourages the creation of fair, diversified, and preferably local food systems grounded in social principles such as participation, natural resource governance, and the co-creation of knowledge. In this context, the focus lies on strengthening the institutional enabling environment, supporting social organizations that involve producers and consumers, fostering broader participation in decision-making processes, and facilitating the horizontal exchange of knowledge.

Resilience in agri-food systems and rural areas emerges when social and ecological structures and processes can absorb shocks, when relevant agri-food system actors – particularly farmers – are able to organize themselves to manage these processes, and when they build learning and adaptive capacities to respond effectively to disturbances.[ix] Both agroecology and resilience adopt systemic approaches and share key conceptual components, such as the principles of diversity, connectivity, learning, and governance. This indicates a high potential for agroecological approaches to contribute to resilience through practices, activities, and development strategies related to these principles, which were explored in the study **(Box 2)**.

Box 2. Overview of projects

What was analysed?

The study covered a total of 61 projects in 26 countries across the Global South. Of these, 38 projects were reviewed based on available project documents, and 30 were analysed in greater detail through interviews and written feedback. Most projects support sustainable agriculture, rural development, and food and nutrition security, though only a few explicitly address resilience or agroecological transitions. The portfolio is diverse, varying in the type of assistance (financial or technical), funding volume (< 0.5 to > 220 million EUR), duration (<4 to >10 years), and target groups (200 to > 500,000 households). Stakeholders are similarly diverse, with farmers and rural households being most prominent, followed by public, civil society, and research actors, while private sector involvement is limited.

Resilient to what?

The study also assessed the types of shocks and stresses faced by the projects in their contexts. The most frequently mentioned were climate-related shocks, with over 20 projects citing droughts and floods, and several others reporting storms, extreme temperatures, or irregular rainfall. Economic pressures were pointed out by at least five projects, particularly rising input costs and inflation linked to geopolitical conflicts. Pests, diseases, and supply chain disruptions added further strain, while out-migration, land scarcity, and ageing farming populations were cited as key socio-economic challenges. Rural communities are thus increasingly exposed to a mix of shocks and stresses that threaten livelihoods and food and nutrition security.

How do projects strengthen resilience?

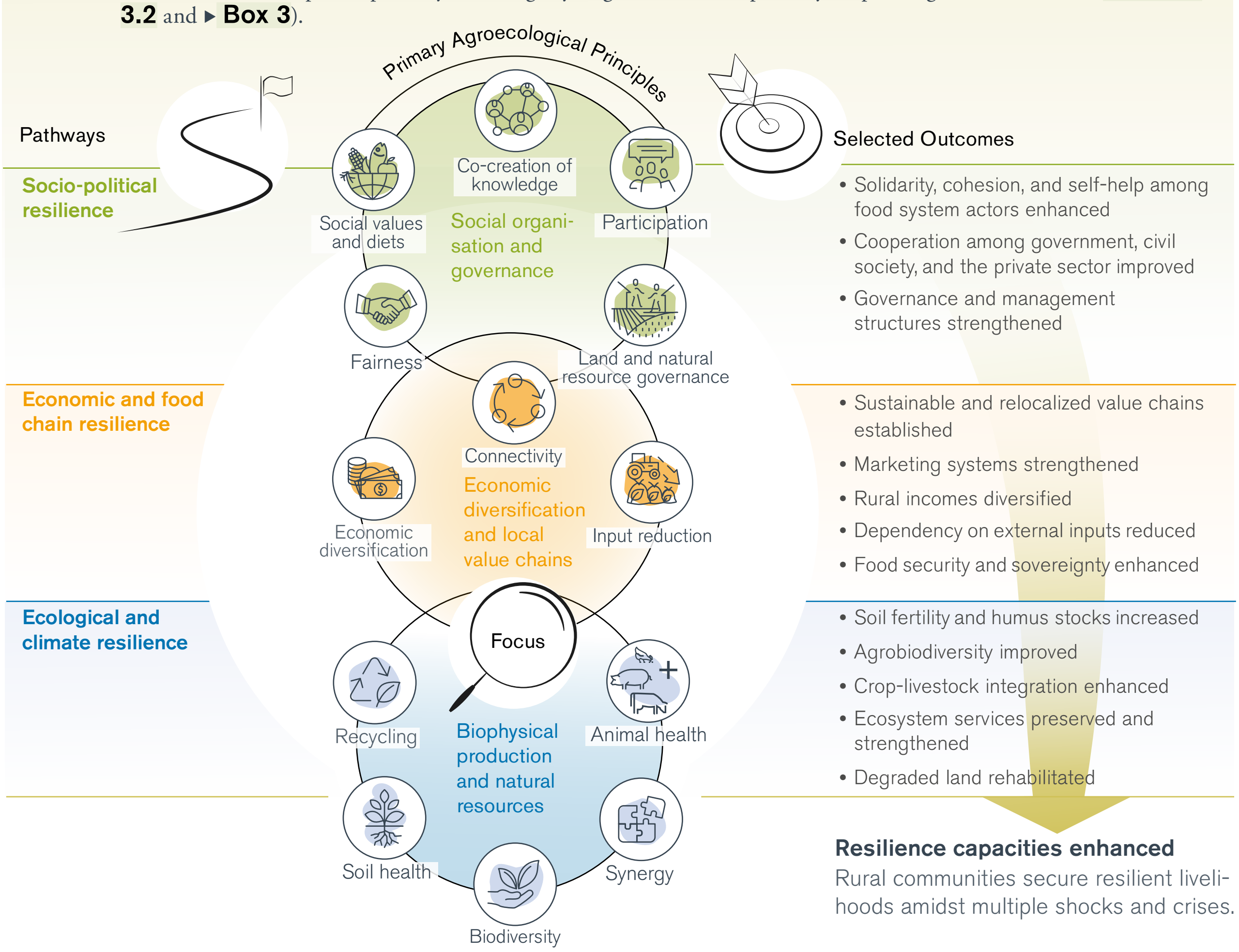
The study showed that the projects implement measures consistent with agroecological principles. The most frequently addressed were economic diversification (95% of projects), soil health (92%), and input reduction (87%), all of which were reported to provide tangible and immediate resilience benefits: diversification stabilizes incomes and diets, input reduction lowers costs and dependency on volatile external markets, and improved soil health enhances fertility, water retention, and yields under climate stress. Less frequently applied principles such as recycling, animal health, and fairness were still present in 58% of projects. Although their direct effects were less pronounced, they often contributed indirectly through synergies with other principles. However, as the projects have not consistently monitored resilience outcomes as part of their design, there is a lack of empirical data on which specific resilience capacities are being enhanced and to what effect.

3. Main findings

3.1 Resilience pathways

The study proposes **three resilience pathways (Figure 1)** to conceptualize the link between resilience and agroecology. These pathways illustrate how practices aligned with agroecological principles lead to outcomes that strengthen overall resilience or specific resilience capacities. Each pathway is defined by a cluster of agroecological principles and their associated resilience-enhancing outcomes. Together, they provide an analytical and conceptual tool for designing strategies and interventions that build resilience through agroecology in project and programme planning and implementation.

Figure 1. Resilience pathways linking agroecology and resilience for project design and implementation. Agroecological principles are associated with specific pathways, although synergies exist across pathways depending on context (see ▸ **Section 3.2** and ▸ **Box 3**).



The **ecological and climate resilience pathway** encompasses the biophysical, production, and natural resource dimensions of resilience building. It brings together practices and processes with strong evidence of enhancing resilience at farm and landscape levels. Five agroecological principles are associated with this pathway: recycling, soil health, animal health, biodiversity, and synergy.

For instance, soil health measures – such as improving fertility, managing soil structure, and controlling erosion – are widely implemented and reported by the projects, with strong evidence of enhancing organic matter, water retention, and overall productivity. Several projects achieved notable improvements on formerly degraded land, enabling the cultivation of higher-value or more diverse crops, reversing desertification, and increasing the availability of productive land. These effects contribute to **adaptive resilience capacities** when they stabilize farm productivity, and to **transformative resilience capacities** when they restore degraded landscapes and ecosystems (**Spotlight Ethiopia**). Similarly, measures to protect and enhance biodiversity and synergies among plants, animals, and soils were observed to strengthen ecosystem stability and climate resilience.

The **economic and food chain resilience pathway** is linked to the principles of economic diversification, input reduction, and connectivity. Projects applying these principles generate outcomes such as diversified rural incomes, improved food and nutrition security, and greater food sovereignty (**Spotlight Uganda**). Diversification strategies – such as intercropping, agroforestry, and small-scale processing – enable households to prioritize family consumption, while generating surpluses for markets. Projects also promote cooperative marketing and Participatory Guarantee Systems, which expand local marketing opportunities, align supply and demand, and buffer farmers against market failures. Input reduction strategies – such as substituting external chemicals with locally produced organic inputs – reduce production costs, increase autonomy, and stabilize incomes. In some projects, community seed banks safeguard local landraces during droughts, enhancing both economic and ecological resilience. These strategies primarily strengthen **absorptive** and **adaptive capacities**, but when new businesses (e.g. bio-input production, cooperative processing) or decentralized resource systems emerge, they also contribute to **transformative capacities**.

The **socio-political resilience pathway** integrates the principles of co-creation of knowledge, social values and diets, land and natural resource governance, fairness, and participation. Projects in this domain strengthen resilience by fostering solidarity, enabling self-help mechanisms, and promoting inclusive, participatory multi-stakeholder collaboration. For example, farmer field schools, participatory training platforms and community-led experimentation facilitate the exchange of practices, collective problem-solving and local innovation. In West Africa, collective initiatives around land and

Spotlight Ethiopia

In the Ethiopian lowlands, climate change and unsustainable land-use practices have turned rivers seasonally fed by highland rainfall from lifelines into erosive forces that degrade land and undermine agropastoral livelihoods. Civil war and migratory pests have compounded these stresses, weakening coping mechanisms and limiting adaptive capacities. The *Capacity Development for Strengthened Drought Resilience in the Ethiopian Lowlands* programme implemented by GIZ on behalf of BMZ pursues a transformative landscape and food-system approach. The programme supports local communities in restoring their productive potential through the reclamation of degraded river valleys using water-spreading weirs and stone walls. Agroecological principles applied across all three resilience pathways ensure the sustainable and equitable use of reclaimed land, generating resilience gains from absorptive to transformative capacities.

Spotlight Uganda

Agriculture in peri-urban Kampala and neighbouring districts has long faced persistent challenges, including water shortages, human and animal diseases, and economic disruptions from the COVID-19 crisis. For over 30 years, Misereor's *Strengthening Sustainable Agriculture* project has supported the efforts of local partner organizations to enhance the economic resilience of smallholder farmers through diversification, connectivity, and input reduction. Farmers, organized in marketing groups that also serve as savings groups, have expanded into multiple income-generating activities – including vegetables, flowers, mushrooms, organic wine, and livestock – planned collectively to ensure stable supply and create financial buffers. These measures strengthen absorptive capacities by enabling farmers to cope with shocks, and enhance adaptive capacities through new production strategies, market linkages, and reduced-input practices.

water governance help reduce conflicts over scarce resources while ensuring more equitable access. Other projects emphasize fairness and participation by strengthening the roles of women and marginalized groups in decision-making. These interventions enhance **anticipatory and adaptive capacities** of communities while also laying the groundwork for longer-term **transformative change**.

Gender dimensions cut across all three resilience pathways. Women are often among the most vulnerable to shocks, yet they play decisive roles in agriculture and food systems. Because they often engage in a wider range of food system activities than men, women contribute significantly to outcomes linked to economic diversification, participation, and social values and diets. Following BMZ's 3R approach[x], interventions under *rights* include, inter alia, the recognition of women's land rights. *Resources* are strengthened through equal access for women to production inputs, knowledge, technology, land, and basic services. Regarding *representation*, women are empowered to actively advocate for their needs within groups and vis-à-vis decision makers and are supported in gaining representation in relevant groups and organizations. They are also encouraged to become multipliers – for instance as trainers or in leadership positions within producer organizations. Addressing gender roles and relations is therefore both a necessity and a powerful lever for resilience building.

3.2 Synergies among pathways

It is important to note that the attribution of principles to resilience pathways, as outlined above, is indicative rather than prescriptive. Depending on context, principles primarily associated with one pathway may only be realized when principles from another pathway are also applied **(Box 3)**. This means that the resilience of agriculture and food systems is most effectively strengthened through a systemic combination of principles and intermediary outcomes across pathways.

3.3 Time in resilience building

An important aspect of resilience building is the capacity to evolve over time. It takes considerable time for farmers and other local food system actors to develop resilience capacities as part of the transition to agroecology. They must cultivate sets of socio-ecological practices at the farm, community, landscape, and food system levels to buffer shocks, strengthen local socio-economic self-organization, and build capacities for learning and adaptation. A first step often involves piloting experiential learning processes to identify, test, implement, and scale agroecological innovations, typically at smaller scales. Many benefits unfold only over longer periods, and farmers or communities that have practiced agroecology for an extended time often experience significantly greater gains than beginners. However, if shocks are too severe (e.g. floods), previous resilience gains can be almost completely lost. Overall, a long-term orientation is essential for transforming food systems through agroecology.

3.4 Key takeaways

The study offers important insights to help refocus ongoing projects and design new ones that better apply agroecological principles for transitions to resilient agriculture and food systems:

Box 3. Synergies of principles across pathways

Agroecological principles are not strictly tied to resilience pathways. For example, the realization of field- or farm-level principles such as soil health or input reduction may be hampered by the non-realization of overarching, food system-level principles such as land and natural resource governance. Farmers may be reluctant to invest labour and resources in soil improvement if land tenure is insecure. The same holds true if negative incentives, such as subsidies for external inputs like agrochemicals, prevail. In such cases, the motivation to increase self-sufficiency by substituting agroecological alternatives for conventional inputs may be limited. To identify which combination of agroecological principles across pathways best strengthens resilience, context analyses should be conducted involving farmers, local communities, policymakers, and other stakeholders to ensure interventions are feasible and aligned with local realities.

- All **agroecological principles enhance resilience capacities**, but combining several creates synergies that yield even greater resilience benefits for rural communities and landscapes.
- Considering individual principles, **economic diversification**, and to a lesser extent input reduction and synergy, are the most effective for enhancing resilience capacities.
- Projects and programmes that link **agroecological approaches with value chain development** strengthen economic resilience more effectively than those focusing on agricultural production alone.
- The **co-creation of agroecological knowledge** is critical for developing resilience capacities, as it fosters shared learning and innovation and supports inclusive, context-specific agroecological development.
- **Resilience-building** efforts mainly target absorptive and adaptive capacities, while transformative capacity is primarily strengthened through multi-level and multi-stakeholder approaches. Anticipatory capacities, such as crisis preparedness or early warning, have so far received less attention.
- **Time matters** in building resilience through agroecology: Resilience develops within 6 – 9 years at farm and community level but usually takes longer at watershed and landscape level.
- The **involvement of the private sector** is underexplored but holds great potential for effective resilience building (**Spotlight Dominican Republic**).

Spotlight Dominican Republic

The Demeter-certified company Savid Dominicana in the Dominican Republic is the world's largest producer of organic bananas. Originating from monocultures in the 1980s, it gradually transitioned to organic and Fairtrade-certified production based on agroecological principles. Today, climate extremes, fungal diseases, and volatile markets make banana farming increasingly challenging. In response, Savid continues to advance its transformative pathway towards an increasingly self-sufficient and climate-resilient production system. Key measures include reducing water and carbon footprints through efficient irrigation and solar energy, producing organic fertilizer via on-farm biofermentation, and diversifying production with crops such as plantain, coconut, and mango alongside livestock. Forest corridors are also preserved and restored. Together, these strategies have strengthened resilience from absorptive to transformative, as shown by reduced vulnerability to economic shocks, such as the global decline in banana prices, and to natural disasters, as Hurricane Franklin in 2023 caused far less damage than on conventional farms.

4. Ways forward – Levers for fostering resilient agriculture and food systems through agroecology

The study identified six interconnected levers for strengthening resilience capacities through agroecology in project and programme implementation. These levers can provide decision-makers with guidance on portfolio strategies and partner organizations with practical recommendations for project design, planning, implementation, and monitoring to strengthen resilience through agroecology (**Figure 2**).

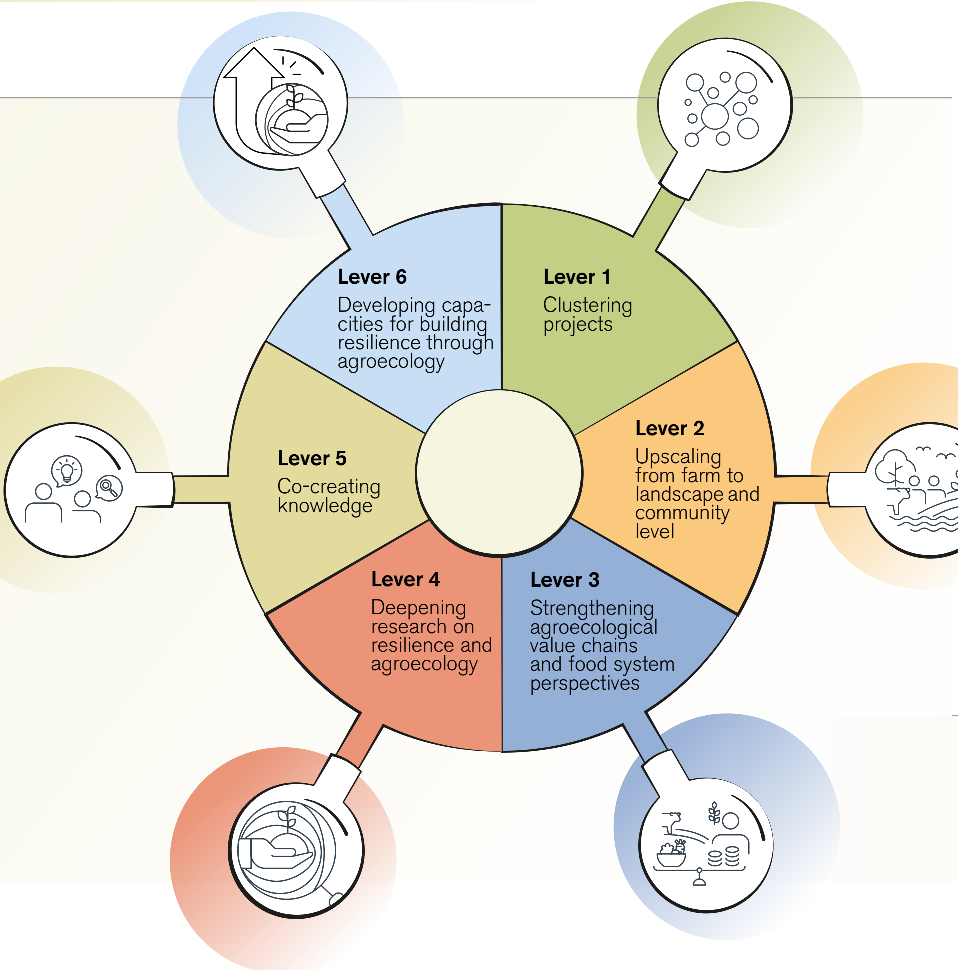


Figure 2.
Six interconnected levers for strengthening resilience capacities through agroecology

Lever 1 Clustering projects. While stand-alone projects address only a limited number of resilience capacities and agroecological principles, **project clusters applying multi-level and multi-stakeholder approaches** can address a broader range of principles and harness complementarities and synergies, thereby enabling more holistic, sustained, and targeted resilience building along defined pathways.

- Encourage multi-stakeholder cooperation for **collective agroecological transition efforts**, with a focus on community and landscape levels. In this way, individual actors can contribute to a holistic development approach within project clusters, even if their own work addresses only a few agroecological principles.
- Strengthen **cross-sectoral and multi-stakeholder collaboration and complementarity** at the territorial level (e.g. landscape or region) to strategically address different agroecological principles. Involve civil society and the private sector to ensure their engagement as long-term partners.
- Advocate for **multi-level financing** and encourage **long-term funding** by the international community.
- **Pool and share agroecology-based resilience knowledge** within clusters and beyond, engaging research, knowledge systems, and capacity development.

Lever 2 Upscaling from farm to landscape and community level. Ecological resilience to withstand water-related risks, such as droughts and floods, can most often not be achieved at farm level alone, thereby limiting the effectiveness of farm-level interventions. Agroecological approaches at the landscape level – integrated into watershed management, land-use planning, and agroecological clusters (**Spotlight India**) – help buffer water-related risks and foster social cohesion by ensuring equitable access to resources, especially for women and marginalized groups.

Spotlight India

In the Indian state of Andhra Pradesh, soil degradation and recurring climate extremes, from heat waves to severe cyclones, are undermining the resilience of smallholder farming. Disruptions of government price schemes and shortages of inputs and labour during the COVID-19 pandemic further destabilized rural households, with women particularly affected. The *Andhra Pradesh Community Managed Natural Farming* programme, co-funded by KfW on behalf of BMZ, supports farming households, especially women farmers, in adopting the Universal Principles of Natural Farming. These principles largely mirror agroecological principles linked to the ecological and climate resilience pathway, with emphasis on soil health and input reduction. Women Self-Help Groups, organized in agroecological clusters or blocks, have been pivotal in scaling up the programme, strengthening particularly adaptive and transformative resilience capacities across millions of farming households.

- Strengthen **landscape approaches for watershed management** and combine them with disaster risk reduction and economic diversification in policy frameworks as well as in funded projects and programmes, thereby enhancing social and ecological resilience while generating economic benefits.
- Ensure an **active role for communities** exposed to shocks, stressors, and crises in shaping and implementing area-wide resilience strategies tailored to local contexts.
- **Transfer promising transformative solutions** like large-scale agroecosystem and landscape restoration to strengthen resilience in drylands.

Lever 3 Strengthening agroecological value chains and food system perspectives. Agroecology builds resilience more effectively when farm-level practices are linked to value chains and food systems. Applying economic instruments to develop agroecological value chains strengthens local economies through improved market integration and increased income generation. In turn, resilience gains extend beyond farms to households, communities, and food systems.

- Promote **diversification of farming systems**, product ranges, marketing channels, and income sources as a cross-cutting strategy to withstand stresses and shocks (**Spotlight Nicaragua**).
- **Support micro, small, and medium-sized enterprises** in developing agroecological business models, for example through public-private partnerships, value links, and microfinance, particularly within agroecology clusters.

Spotlight Nicaragua

In northern Nicaragua's dry corridor, prolonged drought and extreme heat driven by climate change threaten rural livelihoods and food security. The *Promoting Food Security by Building Resilience in Rural Communities* project (INKOTA) supports vulnerable smallholder families – especially women farmers – by advising on agroecological practices and raising environmental awareness. Building adaptive resilience required long-term engagement, but practices such as crop diversification, soil fertility improvement, and livestock integration ultimately proved effective. Over time, these measures reduced risks of crop failure and income loss, while contributing to healthier diets, safer water, and better health, thereby strengthening household and community resilience.

- Provide dedicated **support to women and youth** in agri-food business development – including agroecology brands – through tailored financial instruments (e.g. credits, microfinance) and customized business support services.
- Align project approaches to **strengthen fair trade and solidarity mechanisms**, not only between the Global South and the North, but also regarding socio-cultural standards within countries and along entire value chains, to promote healthy, equitable and affordable diets.

Lever 4 Deepening research on resilience and agroecology. The study identified important gaps in research and data on the positive effects of agroecological practices and projects on resilience at community, landscape, and societal levels. Further research is therefore needed to better understand the complex effects and interlinkages involved. Several key avenues exist for advancing knowledge on the resilience impacts of agroecology.

- Develop practice-oriented **indicator frameworks for monitoring and evaluation**, particularly to analyse and track the direct and interrelated effects of agroecological principles on resilience beyond the farm level. Such indicators could be guided by the proposed resilience pathways and encompass all resilience capacities.
- Advance the co-creation of knowledge and innovation through **transdisciplinary and action research** – from local watersheds to the national scale – that integrates evidence from different knowledge systems (academic, indigenous, and local) in ways that strengthen the resilience of participating communities and stakeholders.

Lever 5 Co-creating knowledge. The co-creation of knowledge is a central entry point for creating learning spaces that enable reflection on agri-food practices and on past shocks and stresses as a basis to develop future agroecological resilience strategies. It also provides an opportunity for engaging new and relevant actor groups in agroecological development processes for resilience.

- Conduct **participatory status quo and scenario analysis** with local farming and food actors, together with research partners, before planning a project or programme at respective territorial levels and use the results for planning. Base the analysis on the three resilience pathways to develop a context-specific understanding.
- Integrate **collaborative learning with farming communities, researchers, and project implementors** into project activities to enable knowledge co-creation, inclusive participation, and locally adapted innovations for resilience. This approach helps to better integrate indigenous and local knowledge into ongoing research and to identify innovations that benefit local systems.
- Ensure **women's active participation** in land and resource governance as well as in cross-cutting decision-making processes. Use dedicated formats for working with women's groups to ensure that their perspectives are fully understood and integrated within the knowledge co-creation process.

Lever 6 Developing capacities for building resilience through agroecology. Effective anchoring and clustering of agroecology for resilience require multi-level capacity development. As both concepts are complex – and even more so when combined – competencies are needed across organizations, governance levels, and sectors. Capacity development should build on analyses of policy and governance frameworks and assessments of institutional and community readiness for resilience building.

- Strengthen collaboration among development partners in **preparing agroecology country profiles.** These profiles can serve as a basis for partner organizations to identify entry points for enhancing resilience through agroecological approaches in line with their respective mandate and focus.
- Enhance **knowledge on resilience in agroecological projects and programmes** by integrating resilience capacity analyses into cluster and project planning, for instance as part of safeguards, gender, and vulnerability assessments. This can support the formulation of suitable indicators for monitoring resilience building.
- Based on country profiles, capacity assessments and context analyses, design and implement comprehensive capacity development programmes for key actors in the relevant agriculture and food systems.

Endnotes

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Published by:
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

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Bonn and Eschborn, Germany

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Design/layout:
now [nau], communicative visual design, Frankfurt/Main

Illustration credits:
Cover © Agroecology Fund/Victoria Uwemedimo

November 2025

Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH