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# COMMITTEE ON WORLD FOOD SECURITY

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**"*Making a Difference in Food Security and Nutrition*"**

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## HLPE-FSN REPORT (2025) ON BUILDING RESILIENT FOOD SYSTEMS

HLPE REPORT 20

# BUILDING RESILIENT FOOD SYSTEMS

CFS COMMITTEE ON WORLD FOOD SECURITY
HLPE High Level Panel of Experts

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# FOREWORD

The world is facing multiple crises that require policymaking based on scientific evidence, to help navigate current complexities. Climate disruptions, biodiversity loss, land and water degradation, conflicts, persistent inequalities and economic shocks are increasingly undermining the capacity of food systems to ensure food security and nutrition for all. It is in this context that the High Level Panel of Experts on Food Security and Nutrition (HLPE-FSN) presents the report, *Building resilient food systems*.

The HLPE-FSN serves as the independent science–policy interface of the United Nations Committee on World Food Security (CFS), the foremost inclusive, international and intergovernmental platform dedicated to advancing food security and nutrition. The HLPE-FSN brings to the CFS comprehensive analysis, grounded in diverse evidence and interdisciplinary perspectives, to inform inclusive policy dialogue and decision making on the most pressing and complex challenges facing food systems today. This allows the panel to connect long-term structural trends with grounded, context specific realities and scientific data.

Since its establishment 15 years ago, the HLPE-FSN has worked to identify and analyse key issues affecting food security and nutrition and to anticipate future challenges through a forward thinking lens. Its mandate is founded upon the conviction that transparent, independent and inclusive science is essential to the design of effective, equitable and sustainable food policies. The HLPE-FSN prepares reports on issues selected by the CFS through a comprehensive process of analysis, consultation and peer review that ensures the legitimacy of its findings and recommendations.

Today, we need science to bridge scales, sectors and knowledge systems. This is particularly vital in moments of crisis. In addition to its annual reports, which are part of the CFS four year work plan (informed by the Critical, emerging and enduring issues note), the HLPE-FSN has also prepared "issues papers", developed rapidly in response to urgent global crises (such as the impacts of COVID-19), that have provided timely, clear and actionable insights at moments when uncertainty was widespread and policy guidance was urgently needed. In 2025, the HLPE-FSN has also prepared two background notes, *Strengthening responsible investments and finance for food security and nutrition*, and *Tackling climate change, biodiversity loss and land degradation through the right to food*. The ability to respond quickly while maintaining analytical depth remains a hallmark of the HLPE-FSN's contribution to global governance.

The HLPE-FSN presents actionable policy recommendations to the CFS, which serve as a starting point for the CFS policy convergence process. Based on recent scientific advances, the HLPE-FSN brings a change of perspectives and approaches. This was the case with the HLPE-FSN 2020 report, Building a global

narrative towards 2030, which calls for integrating the dimensions of sustainability and agency into the definition of food security. It is also the case in this 20th HLPE-FSN report, released in the year that marks the 15th anniversary of the panel. This milestone is both symbolic and significant: It reflects the enduring value of the HLPE-FSN's mandate and underscores the importance of this resilience focused report at a time when the world urgently needs joined up thinking, bold policy direction and collective action.

This report sits at the very heart of the HLPE-FSN and CFS activities and, indeed, at the core of the international community's efforts to deliver on the right to food. It responds to the call for deeper transformation and resilience in food systems that has echoed since 2008, was repeated in the United Nations Food Systems Summit (UNFSS) in 2021, and again in its follow up stocktaking moments – UNFSS+2 (2023) and UNFSS+4 in (2025). These global dialogues have made clear that building food system resilience is essential to addressing the interconnected global challenges to achieving the Sustainable Development Goals.

This report offers a framework for resilience that is rooted in solidarity, social and environmental sustainability, and shared responsibility, laying out pathways that support the most vulnerable, while enhancing the adaptive capacity of communities, institutions and ecosystems. It is a wake-up call to stop treating food systems as fragmented policy domains, divided between agriculture, value chains, trade, environment, health and social protection. For too long, these areas have been studied and governed in isolation, despite being facets of the same prism: a system that is complex, precious and fragile.

As shown in this report, socioecological interdependencies require deeper consideration in relation to the resilience of food systems and can shed a different light on trade offs: We do not have to choose between nourishing people and protecting the planet.

The report calls for changing our perspectives regarding resilience, which requires strengthening and diversifying all components of food systems against uncertain and unforeseen future shocks and stresses. It strongly calls for an integrated approach and policy coherence between short-term responses and long-term preparedness, between the various nodes of the food system, and between environmental and economic interventions. It also highlights the importance of reevaluating current policies in light of resilience. These and other actions recommended in the report can foster equitably transformative resilience within food systems and simultaneously improve human and planetary well-being.

Like all HLPE-FSN publications, this report was developed through a scientific, transparent and inclusive process, involving wide ranging consultations, integrated and diverse forms of knowledge and expertise, and a rigorous external peer review.

I would like to express my deep appreciation to all those who contributed to this collective effort: the members of the HLPE-FSN Steering Committee, all the experts from institutions around the world who provided valuable feedback on earlier drafts, and the peer reviewers whose thoughtful insights helped refine and strengthen the final report. On behalf of the Steering Committee, I extend our sincere gratitude to the drafting team of experts, led by Alison Blay Palmer, whose pro bono contributions were instrumental in shaping this thorough and timely analysis. Special thanks also go to the HLPE-FSN Secretariat, especially Paola Termine, for their tireless support throughout the process.

We hope this report will inform bold policies and inspire collective action across sectors, scales and societies, towards resilient food systems that nourish both people and the planet.

諏訪明子

Akiko Suwa-Eisenmann
Chairperson of the HLPE-FSN

# ACKNOWLEDGEMENTS

The HLPE-FSN of the Committee on World Food Security (CFS) expresses its sincere gratitude to all those who contributed valuable inputs and thoughtful feedback during the two online consultations open to the public and to experts of the Rome based agencies who participated in the technical workshop held in Rome on 6 March 2025. As independent, collective, scientific undertakings responding to mandates from the CFS, HLPE-FSN reports rely on these contributions to strengthen their legitimacy and scientific robustness. The insights shared throughout the consultations were instrumental in supporting the integration of diverse forms of knowledge and expertise.

Fifty nine contributions were received at the first open consultation on the scope of the report. The second consultation, on the "V0" draft of the report, engaged 62 contributors from over 29 countries, from across public and private sectors, representing a wide range of disciplines. Many of these contributions reflected collaborative efforts by teams, highlighting the deep level of engagement and collective reflection.

The HLPE-FSN also expresses its gratitude to all the peer reviewers for their invaluable feedback on the "V1" draft of the report. The HLPE-FSN peer reviewers are listed in the HLPE-FSN website, at https://www.fao.org/cfs/cfs-hlpe/en.

The HLPE-FSN also wishes to acknowledge the following individuals who contributed to this report in various capacities: Jane Battersby-Lennard, Larissa Bombardi, Robin Gifford, Ryan Isakson, Jonas Jaccard, Jean Marc Louvain, Elisabeth Miltenburg, Danya Nadar, Jonathan Peuch and Barbara Van Dyck, as well as Patricia Balvanera, who wrote the text box on Cocina Colaboratorio.

The HLPE-FSN also wishes to thank Dianne Berest for her meticulous editing of the English version, the FAO translation team for their work in translating the executive summary into the six official United Nations languages, Acolad for the translation, graphic design and layout of the report and Ryan Antooa for his creative work on selected figures.

It is important to emphasize that HLPE-FSN reports are recognized as global public goods. All the experts involved contribute their time and expertise on a pro bono basis, and the entire process is made possible through voluntary funding. The HLPE-FSN gratefully acknowledges the donors who have generously provided their essential support, which also fully safeguards the HLPE-FSN's independence. Since its establishment in 2010, the HLPE-FSN has received monetary and in kind support from the countries of Australia, China, Ethiopia, Finland, France, Germany, Ireland, Monaco, New Zealand, Norway, the Russian Federation, Slovakia, Spain, Sudan, Sweden, Switzerland and the United Kingdom of Great Britain and Northern Ireland, and from the province of Quebec and the European Union.

# ABBREVIATIONS

| | |
|---|---|
| AGRUPAR | Participatory Urban Agriculture Project |
| APCNF | Andhra Pradesh Community Managed Natural Farming |
| CFS | Committee on World Food Security |
| COP | Conference of the Parties |
| COVID-19 | coronavirus disease 2019 |
| CSA | community supported agriculture |
| ETR | equitably transformative resilience |
| FAO | Food and Agricultural Organization of the United Nations |
| FSN | food security and nutrition |
| GSFP | Ghana School Feeding Programme |
| HLPE-FSN | High Level Panel of Experts on Food Security and Nutrition |
| IPES-Food | International Panel of Experts on Sustainable Food Systems |
| LGBTIQ+ | lesbian, gay, bisexual, transgender, intersex and queer |
| MHEWS | multihazard early warning systems |
| MST | Landless Workers Movement |
| MTST | Brazilian Homeless Workers Movement |
| NMI | Nashipay Maasai Initiatives |
| PANTHER | participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law |
| PNAE | National School Feeding Programme (Brazil) |
| RECAU | Carioca Network of Urban Agriculture |
| SME | small and medium-sized enterprises |
| TSURO Trust | Towards Sustainable Use of Resources Organization |
| UN | United Nations |
| UNDRIP | United Nations Declaration on the Rights of Indigenous Peoples |
| UNDROP | United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas |

# EXECUTIVE SUMMARY

In the current context of cascading environmental, political and economic challenges, awareness is growing of the need to increase food-system resilience. Increasing uncertainty, coupled with rising levels of food insecurity, demands a shift towards structures and systems that can better mitigate shocks and stresses. Action is needed now to bring about equitably transformative resilience (ETR) in food systems to realize the right to food for all and ensure planetary well being for generations to come. ETR should happen before, during, and after crises.

To this end, the Committee on World Food Security (CFS) requested that the High Level Panel of Experts on Food Security and Nutrition (HLPE-FSN) develop a report leading to a set of focused and action-oriented policy recommendations to build resilient food systems in the face of growing vulnerabilities. The resulting report, *Building resilient food systems*, is based on the most recent academic literature, scientific findings and policy debates.

This report provides evidence that diverse and equitable food systems can improve the livelihoods and food security of those most affected by shocks and stresses, by enabling agency and capacity development, grounded in communities' values and building upon socioecological interdependencies. The report recommends pathways to realize ETR, ensuring that food systems remain within planetary boundaries and, at the same time, ensuring food security and nutrition (FSN) for all in the face of shocks, stresses and differential vulnerabilities.

**Resilience** is generally defined as the capacity of a system to continue functioning despite shocks and stresses. The recommendations of this report go beyond bouncing back and call for food system shifts that strengthen agency and enabling capacities, building upon values and socioecological interdependencies on the path to ETR.

**Shocks** are abrupt, short-term, sometimes unforeseen events that negatively impact people and ecosystems. Examples of shocks include extreme weather events, geopolitical conflicts and disease outbreaks in animals, plants or humans. **Stresses** are longer-term conditions or processes, frequently linked to inequitable development, that reduce capacities to deal with risks such as homogenization and concentration in the food systems or water scarcity due to climate change. In this context, **risk** is the likelihood of negative impacts occurring because of shocks and stresses that affect communities, households or individuals, as well as the environment. The potential negative impact of a risk depends on the magnitude, nature and extent of the hazard; on individual and collective exposure to the hazard; and on the vulnerabilities and response capacities of the socioecological systems impacted. Shocks and stresses are either exacerbated or tempered by social, environmental and economic interconnections.

In each food system component, the magnitude of the impact depends on both the strength of the shock and the vulnerability of the whole system, including how the shock can be buffered. **Vulnerability** has been defined by the IPCC in 2014 as "the propensity or predisposition to be adversely affected … including sensitivity or susceptibility to harm and lack of capacity to cope and adapt". This report looks more

deeply into vulnerability, recognizing **differential vulnerabilities**, such as unequal access to resources, education and ultimately food, due to a combination of historical, structural conditions, uncertainty and various stresses, as well as recent socioecological inequities. These differential vulnerabilities result in differentiated impacts of shocks. Numerous factors influence the level of differential vulnerability, including poverty, weak governance, corporate asymmetries, gender, racial and class inequality, marginalization and socioeconomic exclusion, climate change, political instability, unplanned and rapid urbanization, overexploitation and poor natural resource management. Stresses amplified by differential vulnerabilities worsen the impact of shocks on those most exposed. For example, global disruptions, such as zoonotic diseases (e.g. COVID-19), climate change and economic shocks have different repercussions depending on the livelihoods, socioecological conditions and level of self-sufficiency of households, communities and regions.

Addressing differential vulnerabilities requires a long-term vision with a combination of structural, systemic and enabling approaches to resilience that can help build capacity and prioritize the values of the individuals, communities and territories that are most vulnerable and exposed to risks and uncertainties. In addition, redundancies can add to continued functionality in the face of shocks and stresses. Likewise, **diversity** in food production, distribution and consumption can improve issues of inequitable availability of and access to food and provide a breadth of adaptability options. Increased diversity and redundancy in ecosystems, markets, available seeds and livelihood sources, for example, are associated with increased resilience.



## FROM BOUNCING BACK TO EQUITABLY TRANSFORMATIVE RESILIENCE

Most approaches to resilience emphasise the ability of a system to withstand disturbances and **bounce back** to a predisturbance status, focusing on how individuals and system components resist, absorb, adapt, recover and prevent shocks and stresses. While these approaches are crucial to understanding the return to predisturbance conditions, they fall short of acknowledging and acting upon the historical and structural factors that make food systems, their components and actors most vulnerable. Resilience, understood as a capacity to **"bounce forward"**, recognizes the need to support food-system transformation to a different state by enabling agency, capacity building and the exercise of local values and by building on socioeconomic and environmental interdependencies. This perspective acknowledges that, without substantial change, food systems may bounce back to what was a suboptimal situation, prone to more shocks and stresses.

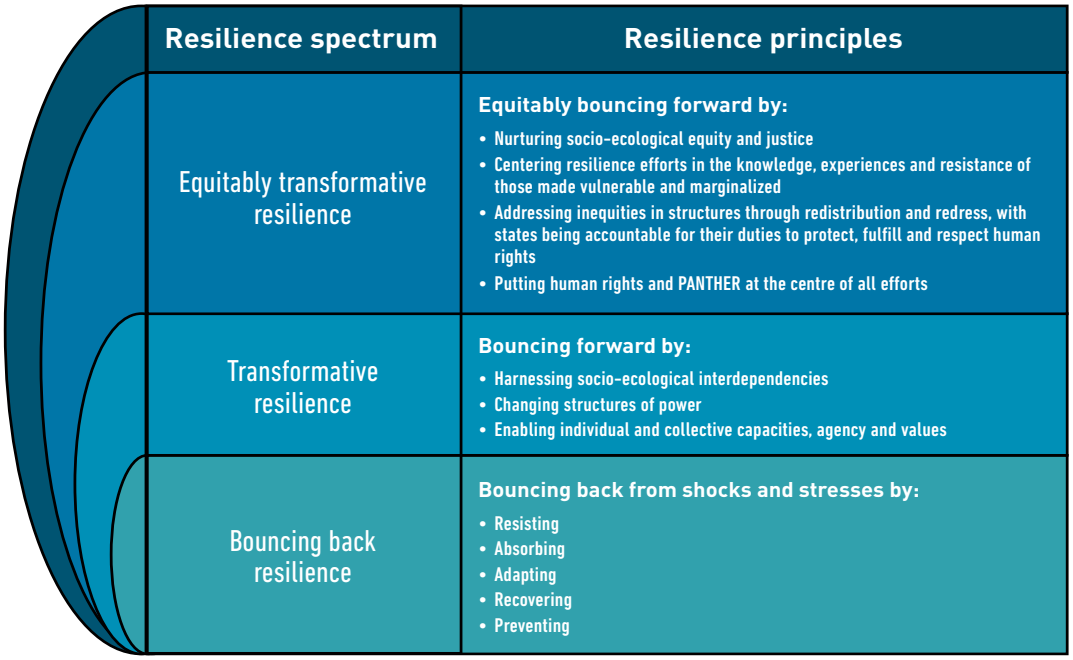
This report introduces the notion of ETR to guide the direction of change, emphasizing that bouncing forward is about transforming food systems such that they specifically nurture equity and justice and realize human rights, while remaining within planetary boundaries. This is in line with the visions of the CFS and the HLPE-FSN.

Equitably transformative resilience exists when institutions, policies, people, ideas and practices uphold the capacity of individuals, communities, nature and socioecological processes to prevent, absorb, adapt and transform in the context of multiple uncertainties compounded by structural and contingent shocks, stresses and differential vulnerabilities. Equitably transformative resilience goes beyond short-term responses to enable bouncing forward in equitable ways that address the structural and systemic causes of differential vulnerabilities, redressing the unequal distribution of power, capabilities, resources, rights and duties; while harnessing socioecological synergies so that food systems are less prone to shocks and stresses in the future (Figure 1).

FIGURE 1

EQUITABLY TRANSFORMATIVE RESILIENCE.

Resilience spectrum moving from bouncing back, through transformative bouncing forward, to equitably transformative resilience (ETR).




*Note:* PANTHER: participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law.
*Source:* Authors' own elaboration.

## PATHWAYS TO EQUITABLY TRANSFORMATIVE RESILIENCE

Planning and action towards ETR must happen long before the occurrence of a shock and should address the underlying stresses facing individuals, communities, food systems and the environment. Progressing along the path to ETR, key questions arise including: How can policies help build food systems that respect planetary boundaries, equity and human rights so they can better withstand future shocks and stresses? How can policies also address the root causes of the differential vulnerabilities and risks of individuals, communities and ecosystems?

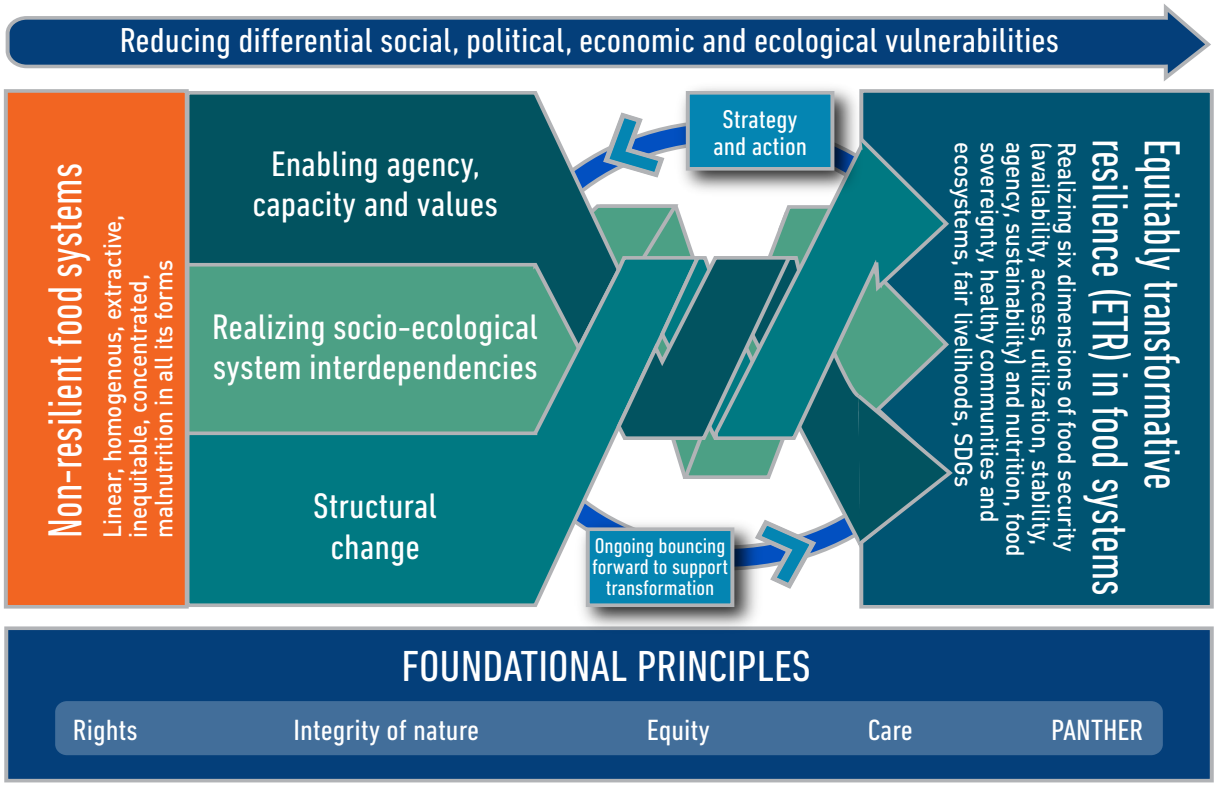
Reducing the underlying stresses will help communities respond meaningfully when shocks occur, minimizing the need for coping strategies that could have long-term detrimental effects on individuals or households, such as selling assets or compromising nutrition. Successful ETR interventions are holistic, operate simultaneously in many parts of the food system, and create diversification and redundancy across multiple actors. This report offers guidance on how to achieve different aspects of ETR by enabling the agency and capacity development of the most vulnerable. This entails realizing socioecological-system interdependencies and bringing about structural change through an ongoing process of bouncing forward, supporting transformation with strategy and action. This will provide the basis not only for the transformation of food systems towards equitable resilience, but also for the realization of the six dimensions of food security.[1] These efforts must aim to realize human rights, bring about structural shifts to address differential vulnerabilities, and build on socioecological interdependencies (Figure 2). They should also operationalize the principles of participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law (known collectively as the PANTHER principles). The recommendations proposed in this report are organized around the following themes: 1) governance and policy coherence; 2) emergency preparedness, contingency planning and foresight; 3) diverse systems for ETR; 4) knowledge systems and processes.

1 The HLPE-FSN identifies six dimensions of food security: availability, accessibility, utilization, stability, sustainability and agency.

FIGURE 2

**EQUITABLY TRANSFORMATIVE RESILIENCE IN FOOD SYSTEMS (THEORY OF CHANGE).**

Transforming non resilient food systems into systems with equitably transformative resilience (ETR), founded on principles of human rights, the integrity of nature, equity, care and the PANTHER principles requires enabling the agency and capacity development of the most vulnerable, grounded in their values.




*Note:* PANTHER: participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law.
*Source:* Authors' own elaboration.

## 1. GOVERNANCE AND POLICY COHERENCE



From the local to the global, governance structures can ensure socioecological complementarities that are linked across scales. Decision-making processes within governance can support structural reforms and transformations within food systems that recognize socioecological interdependencies and improve policy coherence. One example is One Health, an integrated approach that recognizes the close links between human health, animal health, and environmental health. There are also multiple examples at the local level. For example, the city of Quito, Ecuador, is using a city region approach to capture synergies between urban, peri urban, and rural spaces. In Baltimore, the United States of America, food policy groups integrate context specific governance at the local scale to help manage stresses and shocks as they work to build FSN. State governments can also use policy to support the inclusion of ETR principles into decision making. One example of this is community natural farming in Andhra Pradesh, India.

Another important step is ensuring that declarations and rights-based frameworks, such as the United Nations Declarations on the Rights of Indigenous Peoples and the United Nations Declaration on the Rights of Peasants, are fully realized and reflected in national policies and at subnational levels. National legislation that formally recognizes, for example, the rights of communities, including the protection of their traditional livelihoods (such as India's Forest Rights Act) help Indigenous and forest-dependent communities gain legal access to traditional lands that sustain ecologically sensitive food production. The Forest Rights Act

also builds resilience by preserving biodiversity and includes tribal communities in the development of policies and programmes.

Multiscalar policy and governance can also secure access to land as a foundational requirement to build long-term food-system ETR for smallholder farmers, ecosystems and the communities they nourish. In Kenya, pastoralists have been working collectively with organizations to support climate resilient grazing practices, while respecting and strengthening Indigenous Peoples' rights. A project in Kenya, Rights-based and Agroecological Initiatives for Sustainability and Equity in Peasant Communities, puts an emphasis on empowering peasants to know their rights and engage in policy processes, such as legislative reviews. This is one example of initiatives across Africa that link land rights with FSN.

Transforming the way food systems are financed is vital for ETR, including reducing the indebtedness of vulnerable people and countries, increasing public funding for food system transformation, and promoting equitable public–public and public–private partnerships for the long-term process of building ETR. Access to low-interest credit and community managed financial resources is an important component in the ability of individuals, businesses and communities to respond to shocks (for instance, in Türkiye, pre COVID-19 credit restrictions, cash-flow issues and minimal investment in R&D hampered the resilience of businesses).

Social protection is a critical policy instrument for building resilience as it contributes to absorptive, anticipatory, adaptive and transformative capacities. By building long-term capacity and agency, promoting equity and supporting the realization of rights, social protection enhances the capacity of the vulnerable and marginalized to withstand shocks and stresses by not only bouncing back, but bouncing forward. Social protection systems play a critical role in absorbing the impacts of crises and can systematically incorporate anticipatory action approaches ahead of forecasted shocks. Social protection can also support climate adaptation and mitigation efforts by: increasing the adoption of climate adaptive agricultural practices and technology, enabling the diversification of income sources and livelihoods so they are less sensitive to climate variability, contributing to natural resource management and ecosystem restoration, and easing the impact of climate-mitigation policies by ensuring fairness and equity in the shift to a greener economy. Social protection programmes such as cash transfers can provide protection against immediate deprivation, prevent further economic decline and promote long-term investment in elements of human development, such as health, education, skill building, asset creation and livelihoods. A systems approach that aligns social protection with climate, nutrition and employment policies, and embeds right-based, gender-responsive and accountability mechanisms, drives transformative change. In this respect, expanding coverage of social protection and improving the reliability and adequacy of delivery remain foundational priorities on the road to ETR.

Extreme climate events continually jeopardize agricultural production and put a growing number of communities and individuals around the world in a situation of food insecurity. Public food stocks, more transparency on private stocks, and curbing speculation on food commodities are relevant policy tools that can improve resilience, stabilize prices, maintain access to foodstuffs in times of crisis and control market volatility. The three-level food-storage strategy (local, national and regional) of the Economic Community of West African States consists of physical grain stocks and financial reserves to respond to different levels of crisis. The regional reserve has been used 19 times since 2017 to support six countries in the region with a total of 55 000 metric tons of cereals. The stocks contribute to regional resilience during economic, climate, health and security shocks by reducing the burden of crises on human and financial resources. As shocks increase, the physical and financial reserves will need to be expanded and will also need to be integrated with other social protection programmes to best contribute to regional food security and resilience.

Public procurement uses public laws, regulations and funds to support various dimensions of FSN within the context of socioecological interdependencies. Public procurement includes everything from stockholdings to school feeding programmes and can propel food systems towards equitable transformation. School feeding programmes reach 418 million children worldwide, making them one of the most widely used ways of providing social protection. Improving FSN for children, while providing more stable markets and livelihoods for local farmers, can reduce stresses and increase overall resilience when shocks occur (e.g. in Ghana, Japan and Kenya). Laws to solidify equitable access to institutional markets for family farmers, traditional communities and women help bring about structural changes that enable ETR. For example, Brazil Law No. 11.947/2009 establishes that at least 30 percent of the federal resources allocated to the National School Feeding Programme must be used to directly purchase products from family farming and rural family entrepreneurs or their organizations. This helps ensure consistent funding, operational support and inclusivity. The National School Feeding Programme provides daily meals to 40 million students and helps ensure year-round access to nutritious food, emphasizing local, minimally processed foods.



## 2. EMERGENCY PREPAREDNESS, CONTINGENCY PLANNING AND FORESIGHT

Addressing overlaps and connections between acute and chronic food insecurity is essential to develop more proactive and effective responses. Conflict, economic shocks and weather extremes interact with each other and with underlying vulnerabilities (such as poverty) to drive and amplify food crises.

In situations where shocks exceed preparedness capacity, **humanitarian relief** is essential for addressing urgent needs and protecting lives. This requires the equitable, efficient and safe distribution of aid to all affected communities, with particular attention to those who may be marginalized due to gender, age, disability, ethnicity or displacement, while simultaneously safeguarding agricultural livelihoods and production systems from the impacts of shocks. The humanitarian community has increasingly recognized the need for more sustainable and coordinated approaches to humanitarian relief. Addressing food crises requires policies that not only alleviate immediate symptoms but also tackle root causes so that ETR can be achieved and long-term vulnerability can be reduced. Such policy action includes, for example, the adoption of the Framework for Action for Food Security and Nutrition in Protracted Crises, the reform of the Integrated Food Security Phase Classification system so that it can better promote actions to pre empt famine, and the implementation of the structural policies suggested by the HLPE-FSN regarding acute food insecurity in conflict settings.

Food and nutrition crises are often predictable, meaning that effective foresight, contingency planning and emergency preparedness can minimize the harm these crises cause and protect FSN. Both short- and long-term approaches are required to identify how to bounce back and bounce forward. **Foresight** efforts can facilitate planning and strategizing to equitably transform our food systems for resilience. A better understanding of what the future might hold can help to guide decisions today and better prepare people and systems for potential impacts of anticipated hazards (such as increasing climate or environmental stresses, political strife, etc.). **Preparedness** and **contingency planning** are important elements of disaster risk reduction strategies and polices, which are "aimed at preventing the creation of disaster risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience". Relevant systems and mechanisms – including multihazard early warning systems, supply chain and logistics networks, social protection mechanisms and coordination platforms – must be strengthened to enable swift mobilization and efficient distribution of emergency food supplies and associated logistics. These actions must be anchored in broader sectoral policies in agriculture, health and infrastructure, and must

be accompanied by investment in data collection and transparent information.

## 3. DIVERSE SYSTEMS FOR EQUITABLY TRANSFORMATIVE RESILIENCE

Diversity in socioecological systems contributes directly to resilience. Having redundant, overlapping, complex pathways, functions and components enhances a system's capacity to continue to function in the face of shocks and stresses. The strength and diversity of ecosystems, cultures and geographies are sources of opportunities which can be harnessed through more interconnected systems to achieve ETR. Indigenous foodways, diverse food-production systems and sources, diversified markets and consumer environments provide a range of nutritious foods. Conversely, increased dietary diversity can not only improve nutritional outcomes, but the demand for such diversity also drives diversity in production systems and in supply chains. It supports on-farm agrobiodiversity and ecosystem biodiversity, therefore enhancing resilience. **Indigenous Peoples' foodways** are grounded in complex, interconnected biocultural systems and can underpin policy development and decision-making processes

Examples of integrating Indigenous Peoples' knowledge include initiatives in the Peruvian Andes, in Wellington (New Zealand), and in the Haida Gwaii (Canada).

Initiatives across the world have highlighted how putting **gender** as a central consideration for resilience helps reduce risk and vulnerability for women and their families. In India, for instance, the Self-Employed Women's Association supports resilience building through increased access to financial services, training and market access.

**Diverse food production** and practices can steer food systems towards local consumption and strengthen territorial food security. Such diversified systems also foster plant and soil diversity and help enhance the capacity of ecosystems to respond to shocks and stresses. They also support agency and capacity development, grounded in local values and a deep understanding of ecosystems. Transformative applications of **agroecology**, as in Andhra Pradesh (India) and Chimanimani (Zimbabwe), embody and deploy locally based science, practices and social movements so that all the components contribute to the overall success of the system. Such food systems centre on the integrative relationship between the knowledge of Indigenous Peoples/traditional knowledge (e.g. locally adapted crop varieties) and sciences (e.g. plant biology). They employ scale- and time-relevant technology (e.g. the development of natural inoculants) to support existing production and farmer to farmer knowledge sharing and improvements. All of this relies on, and is founded upon, local implementation and change, and on the agency and rights of farmers to produce, sell and consume in ways that support their culture, health and well-being. Diverse food-production systems, such as trees and **forests** (e.g. Kenya, Sri Lanka), **small-scale fisheries and pastoralism** (e.g. Ethiopia, India, Italy, Kenya, Tunisia), are central to community diets and livelihoods for billions of people worldwide. These systems can contribute to climate change mitigation and adaptation, improve biodiversity and reduce vulnerabilities through stewardship. Hence, policies should focus on enhancing the resilience of these systems in the face of climate change and other shocks.

Policy responses to the COVID-19 pandemic and the consequences of the war in Ukraine have provided insights into the **benefits of territorial markets**. Research from five African countries found that relying on distant markets at the onset of COVID-19 was associated with lower dietary quality and higher food prices during the pandemic. Research found that food prices in import dependent countries – where food is disconnected and distant from the fields where it is grown – were disproportionately impacted by price inflation during the pandemic. In addition, the war in Ukraine has brought to light the risks of relying on wheat and fertilizer exported by a small number of countries.

These lessons point to the importance of diversified market linkages as they can reduce vulnerability to economic shocks and stresses and address corporate asymmetries. Nested markets that incorporate a range of levels – from households to

the territorial scale – offer the most cost effective and bioculturally appropriate pathway to build access to affordable and fresh foods such as fruits, vegetables, eggs and dairy in support of FSN; while national and international markets can be relied on as needed for dried staples that cannot be produced within the territory. Diversity in the scale (particularly small and medium-sized) and type (social and commercial) of food enterprises can support a shift in power within supply chains, as well as offering greater flexibility in response to shocks (e.g. "O Circuito" in Brazil, Alta Guajira in Colombia, Antananarivo in Madagascar, Singapore, and community supported-agriculture in Germany).

Getting food to **consumers** requires investment in hard and soft infrastructure that supports healthy food environments in rural, peri-urban and urban areas. Hard and soft infrastructure that makes territorial markets increasingly functional is critical for resilience, to address both long-term stresses and immediate shocks. For example, local food infrastructure such as community gardens, urban farming and peri-urban farms is important to address food insecurity in marginalized communities. Other needed infrastructure includes cold chains, roads, scale-appropriate processing facilities and diverse retail environments. Local governments and other actors can increase the resilience of local communities by investing in scale-appropriate cold chains, processing facilities and retail environments (e.g. street food in South Africa, solidarity kitchens in Brazil, dietary guidelines in Mexico).

Resilience needs to be approached holistically, at all steps of food systems. At consumption level, **food environments** can facilitate access to diverse foods, enabling consumers to better withstand specific shocks. Food-environment policies that promote nutrient dense foods must be pursued in tandem with increasing their availability and accessibility, achieving policy coherence. Building ETR in food environments is complex as it is impacted by interrelated policy from multiple scales. For example, policies and programmes can promote diets and eating habits that are nutritionally balanced and that strengthen physical, social and mental health. However, for these efforts to be successful, nutrient-dense and culturally appropriate foods must be affordable and accessible for households (in terms of preparation time and affordability). These shifts must come in tandem with lowering the intake, promotion and sale of ultra processed foods and an increase in diverse nutritious food production.

Reducing food loss and waste and recognizing the benefits of circular food systems can reduce stress on food systems, increasing their resilience. It requires a worldview that values food beyond being a commodity. Addressing food loss and waste requires material and infrastructural investment; the development of motivation, preferences and worldviews that reinforce circularity; and education to develop the specific abilities and skills required to prevent and reduce food loss and waste.

## 4. KNOWLEDGE SYSTEMS AND PROCESSES

**Knowledge systems,** comprising the production, validation, dissemination and utilization of knowledge, are key to fostering agency as well as connection to nature and ecological processes. In order to achieve this, knowledge systems should incorporate local practices, research, innovation, collaboration and education.

One very important aspect of resilience is better quality-data, forecasting, modelling and remote sensing. In particular, weather forecasting, notably the prediction of extreme events (a vital aspect of resilience), is based in science, data and models. Weather forecasting makes it possible to alert people in harm's way in a timely fashion, so that they can prepare, adapt or escape. The capacity to collect and analyse weather-related and other data must be maintained.

Important questions to consider in building better knowledge co-creation processes to build ETR are: What knowledge? Whose knowledge? Innovation for whom? Moving towards more diverse and inclusive knowledge-production systems and processes where local, experiential and place-based knowledge is brought into dialogue with science, on an equal footing, is vital to building

ETR. Democratizing research, respecting and building on the knowledge of farmers, Indigenous Peoples, women, consumers and food providers can help rethink **research** so it sustains traditional knowledge systems. Participatory scientific research is needed to address the rapidly changing factors brought about by global change. Knowledge should be developed that enables productive systems, livelihoods and consumer environments to withstand the shocks and stresses threatening them. It needs to be complemented by the development of food skills and problem-solving capacities of communities and individuals. Investing in these knowledge systems empowers communities to respond collectively in the face of shocks with the necessary tools and capacities throughout the ETR building process (e.g. transdisciplinary research in the Ecuadoran Andes and participatory farmer-research networks).

Responsible and diverse forms of **innovation** are important in ETR as they can lead to the development of new practices, norms, markets and institutional arrangements that reduce exposure to risk and build adaptive capacity, often challenging existing structures. Innovation for ETR goes beyond the linear technology transfer approach, involving more diverse, complex and ongoing processes of social learning and innovation, through networks of actors engaged in knowledge dialogues embedded in local circumstances. Innovation processes such as social innovation and collaborative participation focus on the potential to support marginalized groups.

Agricultural **technologies** can diversify production methods and act as tools to share resources and knowledge, to analyse data faster and to facilitate access to food in remote communities or extreme environments. These technologies are wide ranging and can include, for example, applications to support food recovery or estimate food loss, remote-sensing technologies to analyse crop yield, and controlled-environment agriculture, which may lengthen growing seasons and facilitate access to diversified fruits and vegetables in contexts where outdoor growing is not possible. However, guardrails for technology are equally important to mitigate unintended long-term consequences and the risk of contributing to non resilient food systems. For example, it is vital to uphold farmers' rights to exchange seeds and heritage animal stock. Indigenous Peoples' traditional seeds and livestock breeds have evolved over generations to be more resilient to local climate conditions and disease, and this knowledge must be respected and protected.

With the rise of technologies such as artificial intelligence and machine learning, blockchain and associated crypto products, and various forms of automation through robotics driven by artificial intelligence, new and unexpected ways in which food systems can be disrupted or improved are coming to light. As with all technological innovations, care must be taken to ensure that the products of technology are not exploitative and that there is robust competition between firms so that farmers, small businesses and consumers continue to have options.

# CHAPTER 1
# INTRODUCTION


Farmer posing in front of seed bags stored at a warehouse after Ebola outbreak, Tauropanneh Town, the Republic of Sierra Leone, February 2016.

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## KEY MESSAGES

- **Hunger, food insecurity and undernutrition** increased during the COVID-19 pandemic, with roughly 9 percent of the global population estimated to have faced hunger in 2023.
- To achieve the right to food for all, including food security and nutrition, food systems must be made **more resilient** to both short-term shocks and longer-term-stresses.
- Food systems are exposed to **rising risks and volatility** from many sources. Food systems also contribute to both environmental degradation and inequities that cut across the entire food system. To address these challenges, policymakers and other actors must look beyond short-term interventions and create conditions for equitably transformative resilience (ETR) in support of all dimensions of food security and nutrition.
- **Addressing inequities** can increase resilience and reduce shocks and stresses to food systems in the long-term.
- By more explicitly **addressing the root causes of differential food system vulnerabilities, the CFS can facilitate exchange and convergence** on the policy measures needed to enhance the resilience of local, national, regional and global food systems, focusing, in particular, on those who are disproportionately exposed to shocks and stresses.

# 1.1 HLPE-FSN SCOPING

In its multiyear programme of work (2024–2027), the Committee on World Food Security (CFS) requested that the High Level Panel of Experts on Food Security and Nutrition (HLPE-FSN) develop a report to provide guidance on building resilient food systems. The specific context set by the CFS was the following:

Global challenges to food security and nutrition, such as the COVID-19 pandemic, conflicts, extreme weather events due to climate change, natural disasters, loss of biodiversity and land degradation, reveal structural vulnerabilities of agriculture and food systems. These shocks and stresses may disrupt food value chains and, when combined with other factors such as financial or economic crises, may lead to unaffordability and/or unavailability of healthy food. There are also deep inequalities and unsustainable practices in the current food distribution and marketing systems.

There is wide recognition of the weaknesses and vulnerabilities of agriculture and food systems, and growing calls to improve their functioning so that they are able to respond to current and future challenges, seeking to diversify sources of inputs, production, markets, supply chain and actors, supporting the creation of small and medium-sized companies, cooperatives, consortiums and other groups to maintain diversity in the agriculture and food value chains (CFS, 2023, p. 13).

Given the increased frequency of shocks to food systems in recent years and the growing risks from a range of stresses, it is imperative to explore more deeply how to support resilience in food systems. This report provides evidence regarding how food systems can be more capable of recovering, adapting and transforming in the face of shocks and stresses – as well as withstanding future shocks in more equitable and sustainable ways. **A key conclusion of this report is that addressing inequities can reduce shocks and stresses in the longer term**.

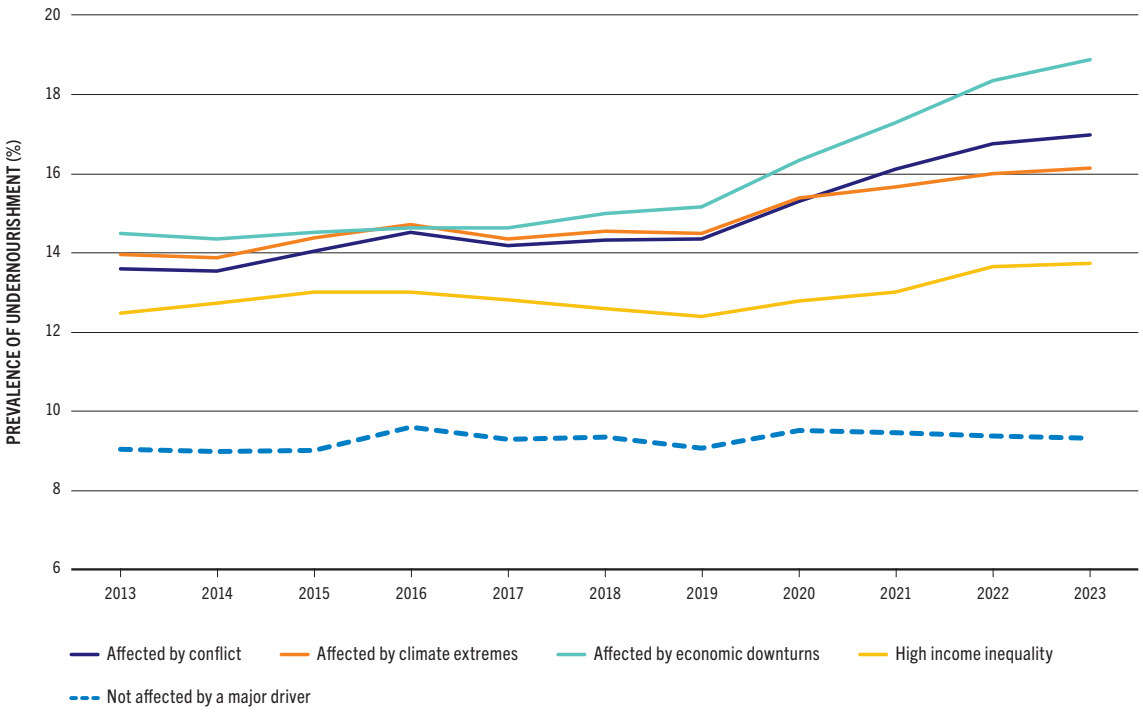
Understanding the different types of vulnerabilities of agriculture and food systems, and their implications for the diverse actors involved, will enable the CFS to facilitate exchange and convergence on the policy measures needed to enhance the resilience of local, national, regional and global food systems. State, civil society and public sector actors from local to global levels must work together to realize the equitable transformation of food systems.

## 1.2 FOOD SYSTEM SHOCKS AND STRESSES

The sharp increase in hunger and food insecurity during the COVID-19 pandemic persists today. It is estimated that between 713 and 757 million people (roughly 9 percent of the global population) have faced hunger in 2023 (FAO *et al.*, 2024a). Multiple burdens of malnutrition continue, including a slower reduction in child stunting, high prevalence of micronutrient deficiencies and increasing adult and child overweight and obesity globally. Figure 3 shows that the main drivers of the prevalence of undernourishment are economic downturns, conflict, climate extremes and income inequality. When broken down by global regions, food insecurity is most severe in Africa, while women are more severely or moderately food insecure than men in all regions of the world (Figure 4).

FIGURE 3

TREND IN THE PREVALENCE OF UNDERNOURISHMENT FOR COUNTRIES AFFECTED BY THE MAJOR DRIVERS OF UNDERNOURISHMENT AND FACING HIGH INCOME INEQUALITY, 2013–2023

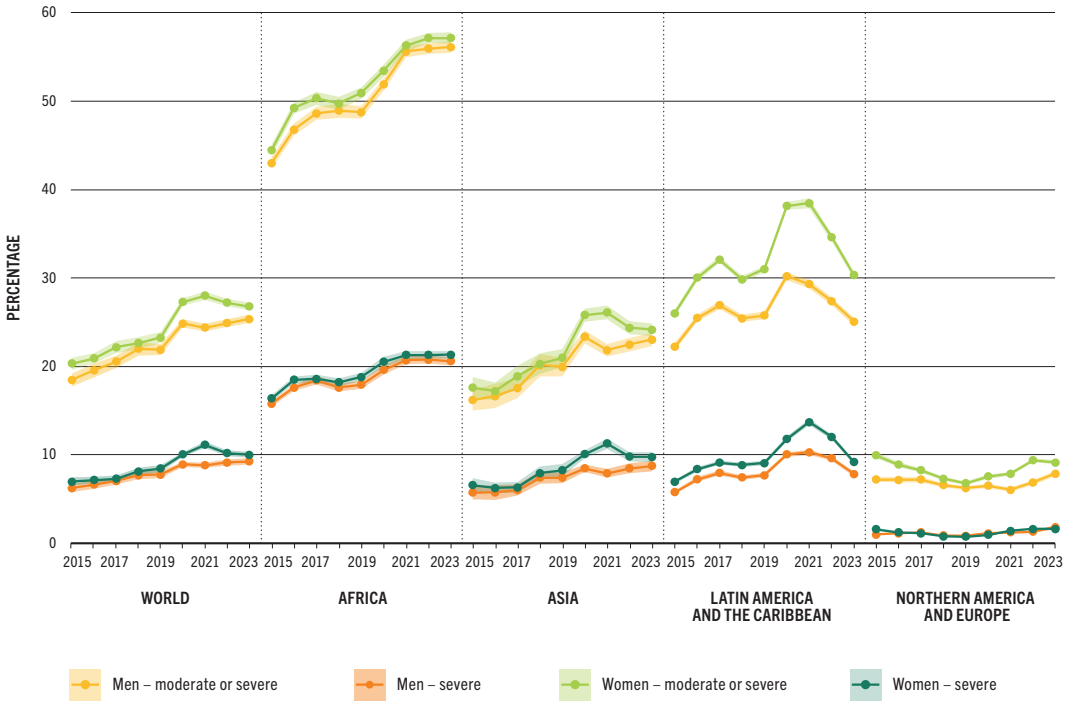



*Source:* FAO, IFAD, UNICEF, WFP and WHO. 2024. *The State of Food Security and Nutrition in the World 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms.* Rome, FAO. https://doi.org/10.4060/cd1254en

While current food systems are exposed to rising risks and volatility from many sources, they in turn amplify the risks threatening them by contributing to greenhouse gas emissions, environmental degradation, loss of biodiversity and inequity. To address these challenges in the short and long term, countries must increase the robustness and adaptability of their food systems and create conditions for ETR.

FIGURE 4

TRENDS IN THE PREVALENCE OF FOOD INSECURITY AMONG WOMEN AND MEN, DIFFERENTIATED IMPACTS DURING COVID-19




*Source:* FAO, IFAD, UNICEF, WFP and WHO. 2024. *The State of Food Security and Nutrition in the World 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms.* Rome, FAO. https://doi.org/10.4060/cd1254en

The HLPE-FSN report *Food security and nutrition: building a global narrative towards 2030* (HLPE, 2020a) notes that "policy approaches and actions ... will require critical policy shifts and support for enabling conditions that uphold the six dimensions of food security" (p. 5). To address the shocks and stresses affecting food systems, these policy shifts must embrace and catalyse synergistic transformations, complexity and interactions across sectors, and the broader context of food security and nutrition (FSN). They must be grounded in diverse policy solutions (HLPE, 2022) that address underlying, differential vulnerabilities and structural causes.

## 1.3 VULNERABILITIES OF FOOD SYSTEMS, COMMUNITIES AND ACTORS: MOVING RESILIENCE TOWARDS EQUITABLY TRANSFORMATIVE RESILIENCE

In the current context of cascading environmental, political and economic food system uncertainty, policymakers and decision-makers are increasingly recognizing the need to build resilience to shocks and stresses of many kinds. **Shocks** are abrupt, short-term, sometimes unforeseen events that impact ecosystems or human well-being, such as extreme weather events, geopolitical conflicts and disease outbreaks in animals, plants or humans (UNSDG, 2020; FAO, 2021a; Zurek *et al.,* 2022). **Stresses** are longer term conditions or processes, frequently linked to inequitable development, that reduce the capacity to deal with risks. Shocks and stresses are impacted by and can result in differential vulnerabilities

that are reflected in relatively more or less resilience to shocks and stresses (see Chapter 2) (HLPE, 2020a; Zurek *et al.,* 2022). According to the United Nations Common Guidance report (UNSDG, 2021), these vulnerabilities include poverty, weak governance and risk monitoring, gender inequality, marginalization and socioeconomic exclusion, climate change, political instability, unplanned and rapid urbanization, overexploitation and poor natural resource management (United Nations and World Bank, 2018; UNDRR, 2015; UNDRR, 2023). In this context, **risk** is the likelihood of negative impacts of shocks and stresses on communities, households or individuals. The potential negative impact of risks depends on the magnitude, nature and extent of the hazard; the exposure to the hazard; and the vulnerabilities and capacities of the socioecological systems impacted (UNSDG, 2020; FAO, 2021a).

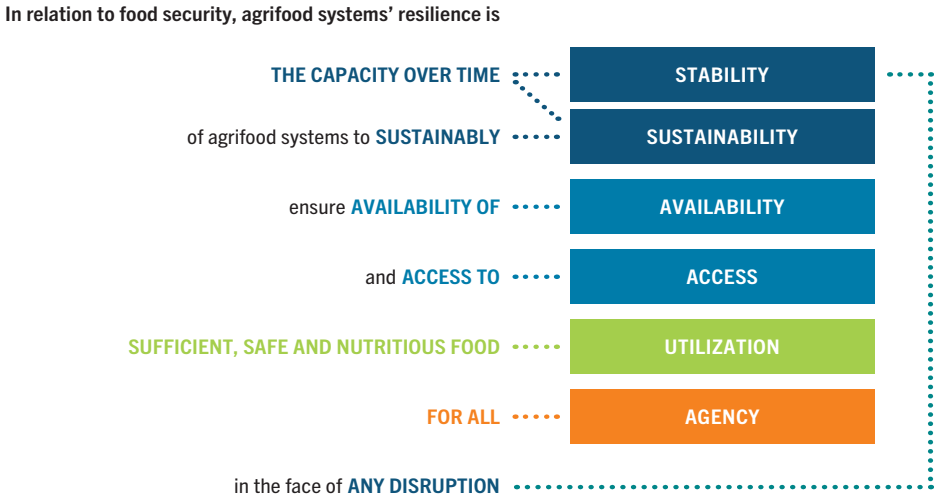
For each component, and at each step or scale, the strength of the impact depends on the strength of the shock and the vulnerability of the system, territory or actor that is impacted, including how and whether the shock can be buffered. **Vulnerability** is, "The propensity or predisposition to be adversely affected … including sensitivity or susceptibility to harm and lack of capacity to cope and adapt" (IPCC, 2014, p. 5). It is frequently a combination of historical, structural conditions; socioecological inequities; and the uncertainty and stresses that affect food system-components (FAO, 2021a; Zurek *et al.,* 2022; Rigg *et al.,* 2016; Millar, 2017). **Differential vulnerabilities** are the result of unequal access to resources, education and, ultimately, food (Schipanski *et al.,* 2016). While homogenization, globalization and concentration can improve efficiency through specialization, these forces can also increase the vulnerability of production systems (Clapp, 2025). For example, substituting traditional foods with global commodities can undermine positive synergies at local scales by increasing production system specialization and interdependencies and increasing the transmission of external shocks (FAO, 2021a).

## 1.4 FROM BOUNCING BACK TO EQUITABLY TRANSFORMATIVE RESILIENCE IN FOOD SYSTEMS

Although the concept of resilience is increasingly used, it is defined in different ways. In the context of some scientific discussions, the notion is used to characterize ecosystems that continue to exist, despite unexpected changes, due to the persistence of the relationships within them (Holling, 1973). The concept is also applied to socioecological systems within different disciplines, often focusing on the capacity of a system to withstand and adapt to disturbances to continue fulfilling its functions (Tendall, 2015). Accordingly, the resilience of a system depends on its capacity to fulfill its functions despite disturbances and to restore its initial equilibrium over the short term. We call this definition of resilience "bouncing back" as it focuses on "rebounding" from a crisis or disaster to return to the previous state. Applied to food systems, bouncing back resilience is often defined by the systems' capacity to provide food security over time despite disturbances (Tendall *et al.,* 2015). The Food and Agricultural Organization of the United Nations (FAO) has further defined this resilience as "the capacity over time of agrifood systems, in the face of any disruption, to sustainably ensure availability of and access to sufficient, safe and nutritious food for all, and sustain the livelihoods of agrifood systems' actors" (FAO, 2021a, p. 6) explicitly linking it to the six dimensions of FSN identified by the HLPE-FSN (2020), as shown in Figure 5.

Resilience of food systems is also described as including, for example, robustness, recovery and reorientation (Zurek *et al.,* 2022). Different from "bouncing back", a transformative approach to resilience was proposed in Holling's 1973 work, focusing on the capacity of actors and systems to retain essential functions, structures and feedback while changing and transforming.

FIGURE 5
## FOOD SYSTEM RESILIENCE




**Source: FAO elaboration based on HLPE. 2020, Figure 1.**

*Source:* FAO. 2021a. *The State of Food and Agriculture 2021. Making agrifood systems more resilient to shocks and stresses.* Rome, FAO. https://doi.org/10.4060/cb4476en

In relation to food system resilience, this "bouncing forward" perspective is noticeable in the emphasis on resilience as a capacity to transform in the face of shocks (FAO, 2021a). In this line of thought, food systems require five resilience capacities: to prevent, anticipate, absorb, adapt and transform (FAO, 2021a). Such framings point to different potential approaches to building resilience, with "bouncing back" focused on short-term changes, while the transformative approach adopts a longer-term perspective to food system resilience that requires changes, adaptation and the capacity to transform the way a system operates. We call this definition of resilience "bouncing forward".

Building on this transformative perspective, this report discusses the need to qualify the direction of transformation by addressing differential social and ecological vulnerabilities as a key pathway to building resilience and reducing impacts. We call this forward looking, long-term and qualified definition of resilience equitably transformative resilience (ETR). For countries to successfully build ETR into their food systems, it is critical that they address differential vulnerabilities caused by underlying structural inequities. Ensuring FSN for all, particularly those most affected by shocks and stresses, must also be informed by the recognition of the interconnectedness between ecological and social processes, the combination of structural actions with systemic and bottom up interventions, the respect of rights and the principles of equity. To that end, policy

can intertwine the many positive synergies of food systems that address the individual, the community, and regional, national and global contexts and relations to achieve lasting resilience through capacity building. Policy can address structural changes and support individuals and communities in consolidating their agency and capacity to equitably adapt and transform food systems.

## 1.5 WHY A FOOD SYSTEMS APPROACH?

Food systems include all the elements (environment, people, inputs, processes, infrastructures, institutions, histories and geographies) and activities that relate to the production, processing, distribution, preparation and consumption of food, as well as the outputs of these activities, including socioeconomic and environmental outcomes (HLPE, 2014). Food systems include all these elements and activities across scales – from homegrown food to community and territorial food systems, to global food supply chains.

Adopting a food systems perspective is useful as it provides a window into different categories of risks and entry points for change and helps countries and communities understand how impacts propagate from one component of the food system to another. For instance, climate change and environmental degradation can affect growing conditions and, thus, decrease yields. This, in turn, can cause cascading effects on markets and on consumption, affecting FSN (HLPE, 2025). Restrictions on trade and on the movement of food, such as those seen during the COVID-19 pandemic, can affect distribution, reducing food availability. Economic crises can reduce incomes or result in higher prices of production inputs, food and other products and services. The financial strain created by higher prices can constrain food budgets for low-income households, threatening FSN.

Understanding these interconnections makes it possible to identify entry points for resilience building and signals the importance of understanding the opportunities to facilitate capacity building and agency, grounded in the values of those most affected and founded on the realization of human rights and the rights of nature, with a view to activating equitable transformation. The complexity of a food systems lens can also point to synergistic opportunities for longer term equitable transformation. Equitably transformative resilience building can include policies that facilitate the development of robust territorial food markets with strong links between small-scale producers, processors, distributors, retailers and consumers. Such policies can also include public procurement mechanisms and social security schemes that strengthen flexibility, autonomy and the right to food for all people. Reflecting on these complex considerations underlines the need to include equity as the pathway to address differential vulnerabilities.

## 1.6 REPORT OVERVIEW

Given the heterogenous environmental, political and economic conditions around the world, it is not possible to provide specific prescriptions for all situations. As such, this report examines the vulnerabilities faced by food systems around the world and their underlying causes; describes the concept and rationale for building ETR in food systems, presenting examples from different regions; and provides guidelines to build ETR that can be applied in diverse contexts. The report is organized as follows:

**Chapter 1** provides a brief overview of key concepts and definitions, including an introduction to ETR in food systems as fundamental to achieving long-term resilience.

**Chapter 2** describes the context and structures that underpin differential vulnerabilities, and the challenges and responses needed to address shocks, including economic crises, conflicts and environmental shocks. The chapter shows how shocks and stresses are differentially experienced by individuals, communities and ecosystems.

**Chapter 3** provides a deep dive into the rationale for ETR in food systems. It elaborates the

multiple understandings of resilience beginning with mainstream resilience thinking, described as bouncing back, which aims to restore predisturbance status. However, given the nature of shocks, stresses and structural vulnerabilities, achieving multidimensional goals – including FSN for all, healthy ecosystems and the realization of human rights – requires the adoption of a forward looking approach to transform in an equitable way towards food systems that address structural problems rather than simply mitigating or minimizing risk. We call this resilience approach equitably transformative resilience (ETR). Such resilience interventions will prepare countries to respond successfully to future shocks and help mitigate stresses across the food system.

**Chapter 4** provides current and historical examples from around the world that illustrate how individuals, communities, organizations and governments are making their food systems more resilient. A key question in this regard is how ETR can help build food systems that respect planetary and social boundaries and are able to better respond to future shocks and stresses by addressing the root causes of ongoing vulnerabilities and risks.

**Chapter 5** concludes the report, providing policy and programming guidance, using principles of equitable transformation to address governance and policy coherence; address emergency preparedness, contingency planning and foresight; support diverse systems for ETR; and enable knowledge systems and processes. This chapter ends with an overview regarding the process of assessment and monitoring.

# CHAPTER 2

# SHOCKS, STRESSES AND DIFFERENTIAL VULNERABILITIES IN FOOD SYSTEMS

Vine pit landscapes where semicircular stone walls protect each vine planted in volcanic soil, Lanzarote Island, the Kingdom of Spain, April 2025.

©FAO/Lis Sánchez.

## KEY MESSAGES

- **Shocks** (short-term and abrupt events that negatively impact human and ecosystem well-being) and **stresses** (long-term conditions linked to global change and inequitable development) are pervasive in food systems and appear to be increasing in frequency and intensity.
- **Environmental food system pressures**, including climate change, biodiversity loss, land-use change, land and soil degradation, invasive species, pandemics and pollution, all contribute to the **transgression of planetary boundaries** and undermine the Earth's capacity to safely manage these processes.
- The **vulnerability** of people and communities to food system shocks and stresses is greatly influenced by systemic inequities, within and between countries and regions. This leads to what is defined as **differential vulnerability**.
- The **impacts of shocks and stresses** on food systems are not uniform and depend on food system structures and differential vulnerabilities. Global disruptions, such as zoonotic diseases (e.g. COVID-19), climate change and broad economic shocks, have different repercussions depending on income, livelihoods, nutrition, socioecological conditions and the level of autonomy and self-sufficiency of regions, communities and households.
- Stresses can **amplify** the impact of shocks on affected communities differently, due to differential vulnerabilities in income, gender, geographies and other considerations.
- Environmental, economic, health, social and political shocks and stresses pose significant threats to FSN. These crises are often foreseeable, and with effective **foresight, contingency planning and emergency preparedness,** their impacts can be significantly reduced.
- Both immediate- and long-term strategies are essential to not only recover from disruptions but also to bounce forward better. Each type of disruption requires tailored policy responses.

# 2.1 SHOCKS, STRESSES AND VULNERABILITIES



As discussed in the HLPE-FSN 2020 report, *Food security and nutrition: building a global narrative towards 2030*, transforming food systems requires addressing systemic and immediate barriers to realizing FSN. This chapter provides an overview of the systemic and structural factors that shape differential vulnerability in food systems.

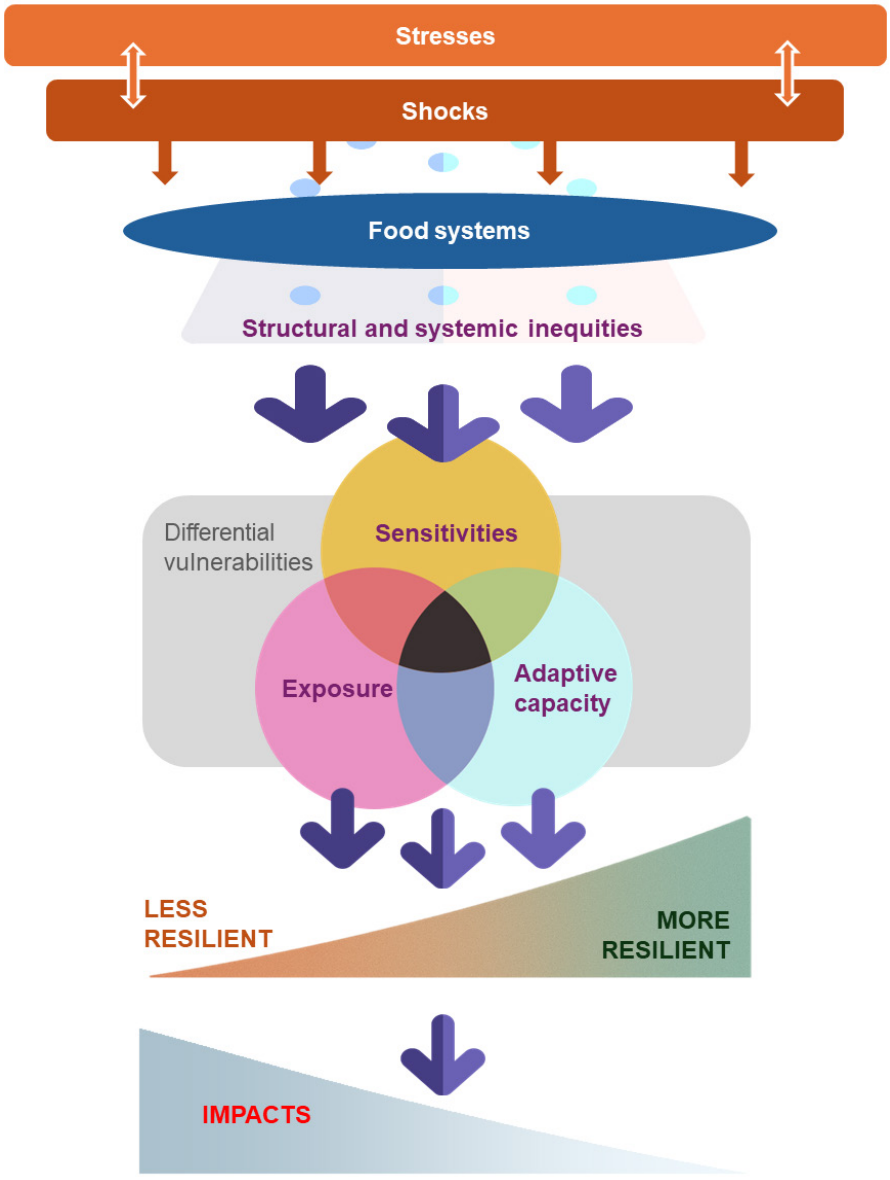
Vulnerability is widely understood in the environmental change literature to be a combination of exposure, sensitivity and adaptive capacity (Smit and Wandel, 2006). In this report, **differential vulnerability** (Thomas *et al.,* 2019) means that susceptible individuals (particularly women, children and marginalized people, households or communities) have differential **exposure** and **sensitivity** to shocks and stresses, and unequal adaptive capacity.

Drawing on insights from the climate-change literature (IPCC, 2022; FAO, 2024), Figure 6 conceptualizes differential vulnerability as being shaped by exposure, sensitivity and adaptive capacity. These three factors are, in turn, impacted and mediated by broader physical, social, economic, environmental and political structures, conditions and capacities (Ford *et al.,* 2010). Each individual, household or community experiences a unique combination of exposure, sensitivity and adaptive capacity, shaped by their position (such as socioeconomic status) within these wider systems, leading to differential vulnerabilities. High levels of exposure and sensitivity to stresses and shocks, with little adaptive capacity, leads to high vulnerability. By contrast, higher adaptive capacity helps reduce

FIGURE 6

## DIFFERENTIAL VULNERABILITIES OF PEOPLE, COMMUNITIES AND ECOSYSTEMS LINKED TO FOOD SYSTEMS

Differential vulnerabilities of people, communities and ecosystems linked to food systems – ranging from less to highly vulnerable and more to less resilient – depending on exposure, adaptive capacity and sensitivities, all in the context of structural and systemic inequities including environmental, social, economic and political considerations.




*Source:* Authors' own elaboration adapted from: FAO. 2024. *The unjust climate – Measuring the impacts of climate change on rural poor, women and youth.* Rome.

the effects of exposure and sensitivity, reducing vulnerability and fostering ETR.

We use the term "differential vulnerability" in explicit recognition of the fact that vulnerability is much more than a function of chance or individual conditions, resulting instead from a combination of contextual, historical, structural conditions and socioecological inequities (FAO, 2021a; Zurek *et al.*, 2022; Rigg *et al.*, 2016; Joakim and Wismer, 2015; Millar, 2017; Tucker *et al.*, 2015). When people, communities and food systems are exposed to stresses and shocks, their capacity to respond and bounce back (or bounce forward) is significantly structured by inequity across scales. Inequity manifests in overt discrimination and in unequal access to resources and decision-making power at the

household, community and territory levels. Resources include, but are not limited to, markets, credit, knowledge, governance and relations. It is important to note that short-term shocks (e.g. abrupt violence, war, conflict or extreme weather events) can have long-term, structural impacts on land, waterways and other food related infrastructure, further exacerbating existing vulnerabilities. Assessing the consequences of violence, conflict and other shocks and stresses, including by gathering information from people living in such contexts, can support the design of interventions to address their situations and contribute to the establishment of efforts towards peace (Brück *et al.,* 2016).

Vulnerability is inherently contextual to specific people in particular places (Tucker *et al.,* 2015) and is structured by an underlying set of conditions (Joakim and Wismer, 2015) that mediate how stresses and shocks are experienced and shape the available adaptation responses (Ford *et al.,* 2010). Differentiated exposure to shocks may result for example, from settlement patterns where marginalized groups are forced to settle on fragile lands that may be more exposed to drought, flooding or landslides (UNDRR, 2015). Communities also face differentiated exposure to stresses (UN, 2020; Zurek *et al.,* 2022). When people, communities and food systems are exposed to stresses and shocks, their adaptive capacity and ability to bounce back, bounce forward or move towards ETR is also significantly impacted by multiscale inequities that shape the entitlements, agency and resources available to different people.

Many shocks and stresses affecting food systems are related to the transgression of the planetary boundaries that "define the safe operating space for humanity with respect to the Earth system and are associated with the planet's biophysical subsystems or processes" (Rockström *et al.,* 2009), such as biogeochemical processes of nitrogen and phosphorous, climate change, freshwater use, biodiversity loss, land use change, land and soil degradation, pandemics and chemical pollution. To be more comprehensive and integrative, the framework of planetary boundaries has been modified to include socioeconomic processes that define safe and just boundaries for people and the planet (Rockström *et al.,* 2023).

Human activity has exceeded safe limits for six of the nine planetary boundaries. Boundaries for biosphere integrity and biogeochemical flows have been fully transgressed, while climate change, land-system change, novel entities and freshwater use are in the zone of increasing risk (Richardson *et al.,* 2023; Campbell *et al.,* 2017; Steffen *et al.,* 2015). Between 1960 and 2015, global agricultural production increased more than threefold, driven by technological advances and resulting in the extensive use of land, water and other natural resources (FAO, 2017). This expansion of agricultural production is a key driver of planetary boundary transgressions, significantly impacting land system change, freshwater use, and climate change. Competing demands for economic growth and environmental integrity increasingly threaten food system resilience and access to natural resources, especially for vulnerable populations (Meybeck *et al.,* 2024).

Environmental, economic, health, social and political shocks and stresses pose significant threats to FSN. These crises are often foreseeable, and with effective foresight, contingency planning and emergency preparedness, their impacts can be significantly reduced. Both immediate- and long-term strategies are essential not only to recover from disruptions but also to bounce forward. Each type of disruption requires tailored policy responses (see Chapter 5 for recommendations):

- Supply chain disruptions (e.g. trade barriers, transport blockages): Governments can mitigate these disruptions by maintaining food stocks, facilitating scale appropriate trade focused on territorial resilience for affordable access to local, culturally appropriate food and establishing strategic transport routes.
- Production shocks (e.g. climate related events): Investment in open access, no-cost climate adapted technologies and

agroecological production, as well as access to affordable productive resources is essential.

- Economic shocks (e.g. inflation): Scaling up social protection programmes, such as cash transfers and school feeding, can help maintain access to food.

Strategic foresight can guide the equitable transformation of food systems to enhance resilience. Strengthening systems such as early warning mechanisms, territorial supply chains and networks, social protection programmes, and coordination platforms is critical. These systems must be capable of rapid response and efficient distribution of emergency food supplies, and they should be integrated into broader sectoral policies in agriculture, health and infrastructure.

When crises exceed preparedness capacities, humanitarian aid becomes vital. This aid should be distributed equitably, efficiently and safely, with special attention to marginalized groups, including considerations of gender, age, ability, ethnicity and displacement. The 2016 Grand Bargain at the World Humanitarian Summit emphasized the integration of humanitarian, development and peacebuilding efforts. This requires enhancing the capacity and agency of local institutions; building equitable governance structures; and better coordination between humanitarian aid, development aid and climate finance directed towards ETR in food systems. Laborde and Phillips (2025) consider that food crises should not be viewed as the outcome of political decisions taken within or outside the affected territory that limit availability and accessibility, but rather crises of public financing with repercussions on the price of food and, therefore, its affordability. In this scenario, a reduction of countries' external debt or the issuance of new debt via financial instruments (such as debt for development swaps and green bonds) could be used by states to address the financial stress, along with – as stated before – coordination between humanitarian aid, development assistance and climate finance directed at food systems.

The next sections explore key structural factors that expose people, communities and ecologies to shocks and stresses and point to where we need to enable capacity and agency, grounded in values founded on the realization of human rights and the rights of nature, while building on socioecological interdependencies to build ETR in people and in the planet.

## 2.2 CLIMATE, WEATHER AND ENVIRONMENTAL SHOCKS AND STRESSES

### 2.2.1 LAND DEGRADATION AND BIODIVERSITY LOSS

Land is "the foundation for food production and providing clean water and shelter … [and] can contribute to social equity and cultural identity" (Tomalka *et al.*, 2024, p. 10). Unfortunately, the integrity of land systems and ecological resilience have been degraded by large-scale, single crop food production, which entails the overuse, pollution and neglect of soil and below-ground biodiversity (Fakhri, 2025), as well as precipitous declines in aboveground biodiversity and the decline of water quality and availability. Land degradation affects 1.2 billion people and 1.5 billion hectares globally (UNCCD, 2023), pushing households to intensify land use, which accelerates degradation and reduces soil fertility – a cycle that further reduces households' options to act in their own best interests. Land degradation lowers crop yields and diminishes food quality and nutrient value, compromising FSN and triggering poverty, conflicts and migration (Lal, 2009). In turn, degraded soils require more synthetic fertilizers, which contaminate soil and water and encourage further detrimental land use conversion. Added to the problem of degraded soil is the destruction of grasslands and forests. Deforestation is linked to the expansion of intensive agricultural production and has resulted in a net forest loss of 0.8 million km² worldwide (Tomalka *et al.*, 2024; UN, 2022).

Converting land to pasture and cropland results in biodiversity loss and reduces and fragments ecosystems, affecting all types of non-domesticated species and negatively impacting ecosystem services. Biodiversity loss also impoverishes food webs (the interactions between food chains within an ecosystem), impacting resilience in both natural and socioecological systems as people are increasingly disconnected from the land (Allen *et al.,* 2022; Beery *et al.,* 2023). In agroecosystems, biodiversity impacts include the loss of genetic diversity within crop and livestock species, non-crop species (pollinators, beneficial insects, mycorrhizae, nitrogen fixing bacteria and other microbiome species).

There is currently a spectrum of production methods. On one end of the spectrum are food systems that promote uniformity using

## BOX 1
## POLLINATOR LOSS

As 43 of the 82 major crops of the world are highly dependent on pollinators, the loss of pollinators is one of the crises facing food systems (Klein *et al.,* 2007), as their absence limits crop productivity (Reilly *et al.,* 2020). The main causes of pollinator loss are: agricultural intensification, which promotes landscape homogenization by destroying natural ecosystems; and the use of pesticides, which kill or disorient insect pollinators or eliminate alternative flowering plants that sustain pollinator populations when crops are not in flower (Klein *et al.,* 2007). Native pollinators are also displaced by invasive or introduced pollinators that are not as effective at pollinating native crops (Aizen *et al.,* 2008; Morales *et al.,* 2017). In addition, both native and introduced pollinators are threatened by invasive pests and diseases such as the Varroa destructor, a mite which is destroying the productivity of bee hives in Mexico and other countries (Peña-Chora *et al.,* 2023). For many countries in the Global South that rely on export crops and commodities, the loss of pollinators is particularly damaging due to reduced crop yields and subsequent income loss. Agroecological practices recommend increasing agrobiodiversity to enhance landscape heterogeneity, restore or transform degraded agroecosystems and increase resilience capacity. Increasing biodiversity must include increasing functional diversity in ecological networks, including for pollinators, and should be a recommended action (Espinosa-García, 2022; Pauler *et al.,* 2025; Priyadarshana *et al.,* 2024).

Sources: Klein, A.M., Vaissière, B.E., Cane, J.H., Steffan Dewenter, I., Cunningham, S.A., Kremen, C. and Tscharntke, T. 2007. Importance of pollinators in changing landscapes for world crops. Proceedings of the Royal Society B: *Biological Sciences*, 274(1608): 303–313. https://doi.org/10.1098/rspb.2006.3721; Aizen, M.A., Morales, C.L. and Morales, J.M. 2008. Invasive Mutualists Erode Native Pollination Webs. *PLoS Biology*, 6(2): e31. https://doi.org/10.1371/journal.pbio.0060031; Morales, C.L., Sáez, A., Garibaldi, L.A. and Aizen, M.A. 2017. Disruption of Pollination Services by Invasive Pollinator Species. In: M. Vilà and P.E. Hulme, eds. *Impact of Biological Invasions on Ecosystem Services*. pp. 203–220. Cham, Springer International Publishing. https://doi.org/10.1007/978-3-319-45121-3_13; Reilly, J.R., Artz, D.R., Biddinger, D., Bobiwash, K., Boyle, N.K., Brittain, C., Brokaw, J. *et al.,* 2020. Crop production in the USA is frequently limited by a lack of pollinators. *Proceedings of the Royal Society B: Biological Sciences*, 287(1931): 20200922. https://doi.org/10.1098/rspb.2020.0922; Espinosa-García, F.J. 2022. The role of phytochemical diversity in the management of agroecosystems. *Botanical Sciences*, 100(Special): S245–S262. https://doi.org/10.17129/botsci.3075; Peña Chora, G., Toledo-Hernández, E., Sotelo Leyva, C., Damian Blanco, P., Villanueva Flores, A.G., Alvarez-Fitz, P., Palemón Alberto, F. and Ortega-Acosta, S.Á. 2023. Presence and distribution of pests and diseases of Apis mellifera (Hymenoptera: Apidae) in Mexico: a review. *The European Zoological Journal*, 90(1): 224–236. https://doi.org/10.1080/24750263.2023.2182920; Pauler, C.M., Homburger, H., Lüscher, A., Scherer-Lorenzen, M. and Schneider, M.K. 2025. Ecosystem services in mountain pastures: A complex network of site conditions, climate and management. *Agriculture, Ecosystems & Environment*, 377: 109272. https://doi.org/10.1016/j.agee.2024.109272; Priyadarshana, T.S., Martin, E.A., Sirami, C., Woodcock, B.A., Goodale, E., Martínez - Núñez, C., Lee, M. *et al.,* 2024. Crop and landscape heterogeneity increase biodiversity in agricultural landscapes: A global review and meta - analysis. *Ecology Letters*, 27(3): e14412. https://doi.org/10.1111/ele.14412

commercial bee pollination, pesticides and synthetic fertilizers, instead of managing ecosystem services through pollination, nutrient cycling and pest and disease control (Box 1). Monocultures of genetically uniform crops or livestock can foster disease and the spread of pests, displace locally adapted varieties of animal or plant species, reduce agricultural biodiversity, increase invasive species, and undermine local knowledge and farmer stewardship of the agroecosystem, leaving food systems more vulnerable (Allen *et al.,* 2022; Sietz *et al.,* 2022). These long-term effects are associated with the differential vulnerability of agricultural systems to shocks and stresses. On the other end of the spectrum, traditional agroecological methods of, for example Indigenous Peoples, tend to conserve biodiversity and soil fertility and foster landscape integrity (Gliessmann *et al.,* 2022; González-Jácome, 2022). The systems along this gradient require different interventions to maintain or transition to resilient states conducive to ETR (Barrios *et al.,* 2020; Sietz *et al.,* 2022).

## 2.2.2 CLIMATE AND WEATHER SHOCKS

Climate change exerts systemic environmental stresses at a planetary scale with long-term impact. The entire global food system, from seed to waste heap is both impacted by and impacting climate change. Current greenhouse gas concentrations are driving the planet towards a 3 °C projected rise in global temperatures by the end of the century (UNEP, 2023; Richardson *et al.,* 2023). Extreme weather events associated with climate change have increased and are disrupting ecosystems and food systems differently across regions and countries. Some places are experiencing more frequent, extreme heat waves, cold shocks and droughts, further exacerbating by uncontrolled fires; while others are suffering catastrophic floods, landslides, hurricanes or cyclones; and some places are experiencing both (Seneviratne *et al.,* 2021; Freudenreich, Aladysheva and Brück, 2022). For example, in the Sahel, climate change is projected to impact local crops, such as sorghum, with up to 5 percent decreases in yield at 2 °C warming. Overall, suitable growing areas for crops are threatened in between 21 to 78 percent of cropland area in Sub-Saharan Africa in 1.5-4°C warming scenarios (Heikonen *et al.,* 2025). By 2050, climate change, under a high emission scenario, is projected to render 10 percent of currently suitable land unsuitable for major crops and livestock, increasing to 34 percent by 2100 (IPCC, 2022). In Africa, agricultural productivity has declined by 34 percent since 1961, due largely to climate change, with future warming expected to shorten growing seasons and increase water stress (IPCC, 2022).

Climate change amplifies environmental pressures across the board (e.g. biodiversity loss, increased water scarcity, desertification, land degradation and ocean acidification) with multiple and interacting impacts on individuals, populations, communities, landscapes, ecosystems and food systems. The induced stresses are gradual and cumulative, affecting temperature trends and precipitation patterns, melting glaciers, raising sea levels and changing ocean salinity. They are also abrupt, contributing to climate extremes that can be catastrophic (IPCC, 2023d).

The impacts of major climate and weather shocks on food systems include: reduced agricultural yields (Hoegh-Guldberg *et al.,* 2018); reduced nutritional quality, including decreased protein and mineral content (Sparling et al. 2024); the destruction of crops (as well as terrestrial and marine ecosystems) by hurricanes and subsequent stress to food security (Ortiz *et al.,* 2023); reduced land fertility as a result of storm surges, violent winds and saltwater intrusion; water scarcity and related stresses, including unsustainable rates of irrigation withdrawals (Meybeck *et al.,* 2024; Röckstrom *et al.,* 2023); high atmospheric CO2, contributing to ocean acidification (Dai *et al.,* 2025); and increased pressures resulting in land degradation and related changes to soil health and fertility. As climate and weather shocks and stresses exacerbate land and water scarcity, reduce agricultural land suitability, heighten competition for irrigation, and accelerate

groundwater depletion, the resilience of households and communities is undermined, worsening poverty and inequalities, food insecurity and biodiversity loss (FAO, 2018; IPCC, 2022). Beyond the limits of planetary boundaries, food system resilience begins to break down, making it imperative for all countries to work together to prevent this breakdown.

Due to their geography, food systems and communities in small island developing states are particularly vulnerable to the impacts of climate change and sea level rise, cyclones, acidification and marine heatwaves (Thomas *et al.,* 2020). For example, in 2016, Cyclone Winston in Fiji displaced more than 130 000 people (Thomas *et al.,* 2017).

The Intergovernmental Panel on Climate Change emphasizes that intersecting factors, such as gender, poverty and rurality, exacerbate climate risks and highlights that economically and socially marginalized populations in vulnerable regions bear the brunt of climate change impacts (IPCC, 2022). Women in particular bear disproportionate burdens during climate related hazards (such as increased workloads during heat waves). Their limited access to resources, water, land rights and decision-making processes heightens their vulnerability and diminishes their capacity to respond to climate change related challenges (FAO, 2023). Poor households disproportionately lose income to heat stress and floods, worsening income disparities by billions annually (FAO, 2024a). This entrenches existing vulnerabilities. Further, the income gap between male- and female headed households is widened by heat stress, which also increases children's labour in agriculture (FAO, 2024b; HLPE, 2023). Climate change impacts are projected to push an additional 32 to 132 million people into extreme poverty by 2030 (Jafino *et al.,* 2020), and the poorest 40 percent in developing countries are likely to experience income losses 70 percent higher than the average in the overall population (Hallegatte and Rozenberg, 2017). In an era of unequal and escalating climate impacts, building equitable resilience is critical as we address the social and economic factors that drive differential vulnerabilities (Matin *et al.,* 2018; Lipper and Cavatassi, 2024).



## 2.2.3 GLOBAL LIVESTOCK AND ZOONOTIC DISEASES

The emergence and re-emergence of global zoonotic diseases has had devastating food system impacts; and the speed, scale and complexity of animal trade has only accelerated these trends (WHO, 2024). Food systems and people are exposed to the direct impacts of zoonotic diseases on human and animal health, and by indirect impacts through disease eradication programmes (e.g. mass culling of livestock), market mediated crises (e.g. commodity price crashes resulting from suspending trade with affected countries), and regulatory change (Anderson and McLachlan, 2012). Livestock diseases (e.g. foot and mouth and blue tongue) and zoonotic diseases (e.g. bovine spongiform encephalopathy [commonly known as mad cow disease], avian flu and swine flu) undermine the stability of trade. Despite international efforts to control livestock diseases, they continue to spread and re-emerge as global livestock trade expands and intensifies (Delgado *et al.,* 2001). COVID-19 demonstrated the need for well-functioning food systems to prevent zoonotic spillovers, including the need for "stronger international and national oversight of biosafety, biosecurity, and bio-risk management" (Sachs et al. 2022, p. 1265; Webb *et al.,* 2021) to address differential vulnerabilities to shocks and stresses resulting from livestock and zoonotic diseases.

## 2.2.4 COVID-19 PANDEMIC

The COVID-19 pandemic, and especially the restrictive measures adopted to contain it, has had severe implications for FSN, affecting food systems and people's access to food in multiple ways, including through the triggering of a global economic recession (HLPE, 2020b). The pandemic did not reduce food availability so much as make differential vulnerabilities more apparent and impactful (Béné *et al.,* 2021). In many cases, households were affected because they could not access food physically or financially due to lockdowns that hindered their ability to move and work, particularly in the service sector and in informal urban labour

markets (Ismail *et al.,* 2023; Baliki et al. 2025). Additionally, in many countries, restrictions on labour mobility affected fruit harvesting, disrupting food supply chains. In some cases, migrant farm workers experienced significantly higher incidence of COVID-19 rates and deaths (Lusk and Chandra, 2021). A further example of the compounding vulnerabilities caused by the pandemic and resulting countermeasures was worsening mental health, which in turn impacted food security (Beck *et al.,* 2024). In many cases, however, availability of food at the local level was affected due to disruptions in supply chains, for example due to restrictions in labour mobility, and to altered food environments, for example due to the closure of informal wet markets as an early measure to contain the virus (HLPE, 2020b).

## 2.3 ECONOMIC STRESSES AND SHOCKS

Trade and market relations are essential to exchange goods and services and generate income. Moreover, in many countries where national food production is insufficient to meet demand, food imports are crucial to ensure food availability. Trade is essential in the short term to mitigate the impact of shocks and stressors on food systems such as climate change, conflicts or other factors disrupting supply chains and local production. However, trade can impact negatively the resilience of food systems. The legacy of colonialism and the first global food regime created power imbalances in which developing countries mostly supply raw materials and export crops, while importing finished goods (McMichael, 2009). This history of inequitable costs and benefits has resulted in trade-related stresses that in some cases can threaten current resilience capacities (Hickel *et al.,* 2022). For example, in Africa, "increased export production contributed to a decline in per capita food production" resulting in chronic food and nutrition insecurity (Bjornlund *et al.,* 2022). One study found that, from 1990 to 2015, the drain on embodied labour time resulting from unequal exchange in international trade from the Global South to the Global North totalled USD 242 trillion (constant 2010 USD) (Hickel *et al.,* 2022). This results in lost job opportunities, curtailed social services, compromised FSN and diminished economic prosperity associated with value added economies (Hickel *et al.,* 2022). As such, trade must be carefully considered so as to minimise embedded power imbalances and ensure that international food trade does not undermine food systems resilience. This section reviews some of the dynamics through which international trade can impact resilience, pointing to reforms to ensure trade supports food systems resilience.

Inequitable economic systems are also associated with an increase in indebtedness and financial fragility within food systems, affecting food system actors and countries. As recently discussed in a report of the International Panel of Experts on Sustainable Food Systems (2023, p. 4):

> Import dependencies, extractive financial flows, boom–bust commodity cycles, and climate vulnerable food systems are combining to destabilize the finances of the world's poorest countries. In turn, unsustainable debt leaves countries critically exposed to shocks and undermines their ability to make urgently needed investments in climate-resilient food production and food security.

International trade tends to disadvantage smallholder farmers in Africa due to systemic inequalities, structural constraints and unfavourable global trade policies (Doss *et al.,* 2018; Nasir *et al.,* 2022). This points to a need to develop long-term strategies that integrate necessary international markets with supported local and regional supply chains. Most African smallholders have limited capacity to compete with highly mechanized and subsidized farmers in developed countries (Kareem, 2025). For instance, the influx of cheap, subsidized poultry from Europe into Ghana has severely undermined local poultry production, contributing to the collapse of thousands of small-scale farms (FAO, 2020). Further, stringent sanitary and phytosanitary standards are required to export produce, especially in developed countries' markets, which small-scale

farms often lack the technical and financial capacity to meet. As a result, smallholders receive low farmgate prices as they are undercut in domestic markets by international competition, while struggling to access international markets. Additionally, most trade benefits are captured by large, multinational agribusinesses, which dominate global value chains and dictate prices, quality standards and supply terms (McMichael, 2013). At the same time, global trade policies rarely integrate climate resilience or sustainability measures that benefit smallholder systems (Barrett *et al.,* 2021). International trade rules and agreements should be restructured so they are more inclusive and supportive of smallholders in low-income countries. This includes fairer subsidy rules, equitable climate adaptive trade incentives, simplified export procedures, and greater participation of smallholder representatives in trade negotiations. It should also include support to local and territorial markets to operate in complementarity with international markets providing additional opportunities to small holders (see Section 4.3.3.1 and Figure 9).

## 2.3.1 TRADE AND RELATED SHOCKS

There is a multidirectional relationship between trade and food system resilience. International trade can impact food system resilience positively through the wider availability of cheaper food – especially during local food crises – and by helping countries diversify and overcome challenges induced by low agricultural productivity, urbanization, low land availability (e.g. small island developing states) and the nutrition transition. In times of localized shocks, access to traded food can provide additional short-term relief. Moreover, trade at both the global and the regional level is a critical element of food security in the many developing countries whose agricultural potential does not allow them, currently and in the near future, to produce enough food to feed their population. On average, least-developed countries (LDCs) source 14 percent of total food supply from international trade, and this is 10 percent in other developing countries (International Trade Centre, 2023).

Particularly in Africa, food imports – and therefore trade – are essential to meet food demand in the current structure of food systems.

It is very important to stress that power imbalances in international trade can increase the vulnerability of food systems to shocks (Clapp, 2025). While sourcing food in international markets can alleviate disruptions in food supply caused by domestic shocks, trade facilitates the transmission of shocks occurring far away. The impact of sudden market disruptions, such as the Evergreen ship incident that blocked the Suez Canal or the sudden imposition of tariffs (Contractor, 2025), sends shock waves around the world. Government reactions to these shocks can amplify the impacts. For example, in response to COVID-19, some governments imposed lockdowns on ports and implemented export bans on food to protect their domestic consumers, affecting consumers abroad. This was particularly the case for basic food commodities such as rice for which there were few exporters (Laborde *et al.,* 2020; Glauber *et al.,* 2023). When those shocks occurred, global food systems and the people dependent on the export and import of those foods suffered due to limited availability, difficulty accessing markets and higher prices (Kakaei *et al.,* 2022).

Specialization in cash crops for export (accompanied by food imports) has been shown to reduce diversity in food produced and available at the local level, leaving smallholder farmers exposed to fluctuating global prices and exchange rates (Heirman, 2016), compounded by the financialization of food commodity markets (IATP, 2008; UNCTAD, 2009; UNCTAD, 2023). Additionally, the intensification of international trade in food has gone hand in hand with the financialization of food and speculation in food commodities, a condition that can amplify fragilities and the negative implications of shocks. This was the case, for example, in the 2009 food crisis and in the blockade of the port of Odessa.

In Africa, a focus on increasing export production of cash crops (e.g. cocoa, cotton and palm oil) and the resulting specialization has caused a decline in per capita food production and broken traditional social bonds around production and

exchange that helped mitigate food insecurity (Bjornlund *et al.,* 2022). Net imports rose from 60 to 90 calories per capita per day in the first two decades of the twenty-first century: As low- and middle-income countries are net importers of food with an intensifying reliance on imports, they are at once most reliant on international trade and most affected by the vulnerability to such dependency on international markets (FAO, 2024b).

Trade has also contributed to homogenization of diets worldwide, with increased reliance on a few cereals (maize, rice and wheat) and on ultraprocessed foods. These shifts erode local food systems by sidelining healthy, culturally appropriate, traditional and Indigenous foods that are often more resistant to climate shocks (Kubitza *et al.,* 2025). There is also a reduction in the number of crop varieties sold on markets, increasing vulnerability if one variant is hit by a disease. Some countries are also dependent on a very small number of import sources for key inputs or foods. Furthermore, the availability of imported food may also act as a disincentive for domestic production, undermining agricultural livelihoods and pushing farmers off their land. Given the contribution of international trade to foreign debt, food trade can also exacerbate the foreign debt crisis in developing countries, creating a vicious cycle that limits the resources available to invest in climate and food system resilience (IPES, 2022a).

### 2.3.2 MARKET VOLATILITY AND INCOME VULNERABILITY

Improving access to markets for rural households – such as through investments in roads and other critical infrastructure – is an important strategy to increase rural incomes and reduce vulnerability. At the same time, when markets are volatile, access is uneven, and incomes are low, vulnerability to food system shocks and stresses can increase, with negative impacts on resilience (Antwi-Agyei and Stringer, 2025; Chen and Chen, 2023; Piketty, 2013). Macroeconomic shocks such as global supply shocks and abrupt policy changes can lead to price volatility with negative effects on household food security (Amolegbe *et al.,* 2021). The market volatility inherent to agriculture, livestock and fisheries can exacerbate the effects of sudden disruptions, such as extreme weather conditions or changes in market access. Market unpredictability also increases the severity of external shocks, reducing the ability of farmers and consumers to adapt or recover quickly. This, in turn, deepens food insecurity, reduces stability and weakens the resilience of the food system in the face of future challenges (Acheampong *et al.,* 2022).

Low incomes and market volatility affect food system resilience by limiting the capacity of food system actors to absorb changes, particularly the case for smallholder producers (Addai *et al.,* 2022; Mayrhofer and Wiese, 2020; Salifu, 2024). This compounds the impact of other shocks and stresses, such as weather and climate events, market disruptions and other economic downturns, as farmers and others in food system businesses are constrained in their ability to invest in adaptive capacity (Tofu, Woldeamanuel and Haile, 2022). As a result, livelihood and market threats amplify the impact of shocks, creating a vicious cycle of hardship. Smallholder agricultural producers are most vulnerable to the impacts of low income and market volatility, which directly limit their adaptive capacity and, thus, their resilience. Farmers also experience unequal access to input markets, such as for insurance or credit (Panda, 2013; Nesbitt-Ahmed, 2023). Illustratively, the uptake of insurance products by farmers is known to be low, often because the premium payment is required upfront at the start of the growing season, which is difficult especially for low-income households (Casabury and Willis, 2018). As insurance can support farmer adaptive capacities, this lack of access to input markets can further increase vulnerability and reduce resilience. There are clear knock-on effects for food access and affordability for consumers, too. A lack of infrastructure in local markets constrains farmers' ability to take their products to markets, increasing their reliance on and vulnerability to intermediaries, thus affecting livelihoods, food prices and food affordability. Thriving, accessible markets are crucial to resilient food systems but conditions of access and participation of

marginalized groups, as well as protection against price volatility and income variability need to be integrated in policy.

### 2.3.3 MARKET POWER–ASYMMETRIES

The HLPE-FSN report, Reducing inequalities for food security and nutrition, highlighted the need for actions to address power inequities between corporate actors, governments and those most negatively affected by the current food system (HLPE, 2023). Building on this, the present report emphasizes how transformation towards a more just food system is a foundational building block for achieving resilience through both adaptive and responsive capacities. For example, corporate power asymmetries can directly impact the ability of markets and communities to respond to shocks and stresses. As Clapp (2024, 2025) has highlighted, to help address these inequities, there needs to be a stronger emphasis on competition policies.

Power imbalances can limit farmers' agency and capacity to effect change and often result in lower prices for their goods and higher costs for inputs, thus reducing their resilience (Merkle *et al.,* 2022; Glavee-Geo *et al.,* 2022; Wood *et al.,* 2021). Empirical evidence from the cocoa industry in Ghana (Glavee-Geo *et al.,* 2022) documents how power imbalances create ongoing financial stress on small-scale producers, which limits their ability to reinvest in their farms or adopt better practices. This weakens the overall sustainability of their operations (Quarshie *et al.,* 2023) and undermines their resilience, including their capacity to prepare for and adapt to sudden shocks, such as market price crashes, climate related impacts (such as droughts or floods), and economic downturns (Tofu *et al.,* 2022).

## 2.4 DIFFERENTIAL VULNERABILITIES AND RESILIENCE

There are myriad ways in which differential vulnerabilities impede the realization of human rights, including the right to food. This section briefly elaborates identity-based discrimination, the marginalization of Indigenous Peoples' and traditional community food systems, and the loss of local knowledge systems as starting points to understand the systemic foundations for differential vulnerabilities.

### 2.4.1 IDENTITY-BASED DISCRIMINATION

Discrimination in its many forms impacts the allocation of land, the availability of the resources needed to grow food (Agyeman and Simons, 2016), everyday food access, where people live (Shaker *et al.,* 2023), the types of employment opportunities available (Yearby *et al.,* 2023), where waste is disposed of (Pulido, 2017), whose knowledges matters (Grosfoquel, 2013), and who gets to make decisions about food governance (Haysom and Battersby, 2023). When these structural issues are coupled with shocks such as natural disasters, pandemics and conflicts, many marginalized people are disproportionately impacted, while receiving less assistance (Asi, 2020).

In addition, gender inequality impacts food system resilience (HLPE, 2023). As a demographic, women are the most food insecure, despite being key contributors to food security globally (Visser and Wangu, 2021; HLPE, 2023). Women are more vulnerable than men during climate shocks (Nkengla-Asi *et al.,* 2017) and this is compounded by their general lack of access to land and other resources. Currently, less than one in five landholders are women, despite representing half the farming labour (Goebel, 2005; Halonen, 2023). Without rights to land, women face a disproportionate burden of food insecurity, water scarcity and forced migration (Halonen, 2023). Gender roles influence women's mobility and decision-making capacity, which impacts their food provisioning strategies and FSN, diets and wellbeing of their children (Levay *et al.,* 2013; Moore *et al.,* 2022).

There are also multiple structural barriers that confront members of lesbian, gay, bisexual, transgender, intersex and queer (LGBTIQ+) and marginalized communities, including

discrimination by food and service providers, stigmatization resulting in fear and violence, and an inability to access resources (including land) to be food secure, due to a lack of family and community support. LGBITQ+ people can have specific difficulties to access food. For example, in some countries, during the pandemic, separate food shopping days and procedures for receiving food packages were established based on gender (Fakhri, 2023; FAO, 2024; Capire,2021).

### 2.4.2 MARGINALIZATION OF INDIGENOUS PEOPLES' FOOD SYSTEMS AND THE LOSS OF LOCAL KNOWLEDGE SYSTEMS

Globally, Indigenous Peoples continue to be deeply affected by colonial and other histories, including processes of land dispossession, marginalization of Indigenous Peoples' knowledge, historic and ongoing resettlement, and landscape fragmentation. This has curtailed and, in some instances, severed links to place, territory, culture and knowledge systems that are deeply tied to Indigenous Peoples' foodways – foodways which have been developed over generations by communities of local farmers and pastoralists who apply and develop culturally informed knowledge (Fisher *et al.,* 2017) (Chapter 4, Box 14).

Food literacy, understood as food skills and knowledge (Truman *et al.,* 2017), includes informal education through land-based learning (where the land is the source of knowledge) guided by elders and Indigenous knowledge keepers, as well as knowledge handed down by families, including mothers/matriarchs (Soma, 2016). This may include the knowledge and capacity to foster, grow, harvest, store, process, cook and identify edible plants and animals, and their nutritional value, within a particular area, whether it be on the land or in water. Levkoe (2014) argues that food literacy also includes reviving and protecting cultural food practices, which is key in the context of many Indigenous Peoples' communities, whose traditional food system knowledges have been disrupted (Bartlett *et al.,* 2012).

## 2.5 VIOLENCE AND CONFLICT

Acute food crises, including famine, are often linked to wars and other conflicts that impact entire regional food systems (see also Section 4.2). In 2024, 135 million people in 20 countries were affected by food crises due to war and protracted conflicts (FSIN and Global Network Against Food Crises, 2024). As the wars in Gaza (FAO, 2025) and Sudan exemplify (HLPE, 2024), deliberate attacks on food security and humanitarian assistance; large scale, forced displacement; and the dismantling of food systems are increasingly becoming weapons of war that can hardly be addressed with standard approaches to humanitarian relief.

Under the Rome Statute of the International Criminal Court Article 8 (2)(b) (xxv): "Intentionally using starvation of civilians as a method of warfare by depriving them of objects indispensable to their survival, including wilfully impeding relief supplies as provided for under the Geneva Conventions" is considered a war crime and is against international humanitarian law. Although there are currently 124 countries that are States Parties to the Rome Statute of the International Criminal Court, the International Criminal Court has limited jurisdiction and capacity to act. For example, collective punishment through forced starvation and rationing have been deployed globally in the context of settler colonialism both past (Burnett *et al.,* 2016) and present (HLPE, 2024), yet there is very little that has been done to end the weaponization of food. In times of war and conflict, the provision of humanitarian assistance requires that aid workers are safe and protected to ensure that food and other aid can be distributed effectively. The killing of aid workers and the denial of access to food aid trucks and food aid in general, exacerbates food insecurity (OCHA, 2024).

Violent conflicts may be protracted or abrupt and can impact communities differently, based on their level of vulnerabilities (HLPE, 2022; HLPE, 2024; Vesco *et al.,* 2025). There are several ways

in which violent conflict and war can impact food security and food system resilience: 1) destruction of crops, land and other natural resources, and of infrastructure; 2) the weaponization of food and hunger; 3) control of food production, processing and distribution; and 4) conflict induced displacement (Vesco et al. 2025; Kemmerling *et al.,* 2022). Furthermore, conflict has highly gendered impacts on agricultural labour markets across many different settings, pushing women into harder work and more subsistence oriented activities (Ronzani *et al.,* 2025). Conflict induced acute food insecurity and famine also result in long lasting health repercussions, especially for children, the elderly and pregnant women (IPC, 2024).

Gender-based violence is also prevalent globally and impacts women's FSN. Studies show associations between an increase in gender-based violence, climate change and food insecurity, as well as an increase in violence during shocks, such as the COVID 19 pandemic (Agrawal *et al.,* 2023). It is documented that female children and women are the first to be abandoned, abused or negatively impacted during times of climate induced food insecurity (Beaumier and Ford, 2010).

In 2023, an estimated 117.3 million people were displaced as a result of conflict, violence and persecution (UNHCR, 2023). Such displacement and migration can also create additional shocks and economic stresses for food and resources in the host country, especially where the host countries are under-resourced (Alchatib, 2021; Kapinus *et al.,* 2023). Additionally, there is differential vulnerability within migrant groups in conflict zones as those with access to resources can migrate more swiftly, while, for example, temporary or seasonal migrant workers may face more barriers (Diab, 2024; Fakhri, 2024). There is also differential treatment when it comes to welcoming refugees and those displaced by wars, often negatively impacting racialized migrants (Sales, 2023).

Changes in land use also intensify human and wildlife conflict through encroachment on animal habitats (Ogutu *et al.,* 2014). Land use changes are not limited to increasing cropland. For instance, land conversion under the guise of conservation or development has displaced some of the most vulnerable populations who rely on those lands to survive (Aiken and Leigh, 2015), often using force and acts of violence to displace them (Thomson, 2014). These crises mostly occur in places that already suffer from detrimental climate change, are highly dependent on agriculture for food production and have a high degree of state fragility and of pre-existing tensions and conflicts. Organized crime and corruption affect all food system levels (from production, to distribution, to direct marketing) and stakeholders (including consumers) (Bakić Hayden, 2023; Rizzuti, 2022). In areas dominated by criminal organizations that control or use productive land, producers, retailers and other people are subject to extortion, kidnapping and terrorization (Yoo, 2022). In many cases, people are forced to close their retail outlets, sell their production units to criminals, or migrate to cities or other countries to escape the violence. The effect is an increase in food prices due to quotas imposed by criminals to allow food production, distribution and retail, as well as food production and distribution shortages (Maldonado Aranda, 2014).

## 2.6 CONCLUSION

Diminishing or, ideally, eliminating the impacts of stresses and shocks on food systems requires a systemic approach that removes cultural and socioeconomic structural barriers; enables agency and capacity building, grounded in values; and restores the ecological integrity and so the productive capacity of the land and aquatic environments. Understanding how to overcome the structural barriers that exist for billions of people around the world and move towards equitable resilience in food systems is the subject of the next chapter.

# CHAPTER 3

# FROM BOUNCING BACK TO EQUITABLY TRANSFORMATIVE RESILIENCE IN FOOD SYSTEMS

Bamiyan province, the Islamic Republic of Afghanistan, August 2023.

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## KEY MESSAGES

- Equitably Transformative Resilience (ETR) is a novel approach to build food system resilience to any shock by addressing differential vulnerabilities.
- Most approaches to food system resilience emphasize the ability to withstand disturbances and bounce back to restore a predisturbance status, focusing on how individuals and system components resist, absorb, adapt to, recover from and prevent shocks and stresses.
- While these principles are crucial to understand the ability to restore predisturbance conditions, they fall short of acknowledging and acting upon the deep historical and structural factors that underline today's food systems' vulnerabilities.
- Resilience, understood as an ability to "bounce forward", recognizes the need to support individuals and food systems more broadly to transform to a better state. This perspective acknowledges that food systems may bounce back to what was a suboptimal situation.
- Rather than supporting unqualified bouncing forward, ETR gives clear guidance on the direction of change, in line with HLPE-FSN and CFS mandates, emphasizing that bouncing forward is about transforming food systems in ways that specifically nurture equity, justice and human rights, while remaining within safe and just planetary boundaries.
- ETR is achieved when institutions, policies, people, ideas and practices uphold the capacity of individuals, communities, nature and socioecological processes to prevent, absorb, adapt to and transform in the context of multiple uncertainties compounded by structural and contingent shocks, stresses and differential vulnerabilities.
- Equitably transformative resilience goes beyond short-term responses that allow systems to bounce back, requiring food systems to bounce forward in equitable ways that address the structural and systemic causes of differential vulnerabilities and redress unequal distribution of power as well as unequal capabilities, resources, rights and duties; while harnessing socioecological synergies so that food systems are less prone to shocks in the future.



# 3.1 RESILIENCE AS BOUNCING BACK

Key to most – if not all – definitions of resilience is the notion of risk as "the consequence of the interaction between a threat or hazard, the characteristics that make people and places exposed and vulnerable to that threat or hazard, and the capacities available to manage the risk," or the "ability to return 'to shape' and restart" the original position (UNSDG, 2021, p. 31). However, not all theories of resilience discuss risk in the same way, and not all of them take into account the same timeframe and long-term aspirations.

"First wave" descriptions of resilience have been defined as "engineering resilience" (Holling, 1996) because of the way the term was used in a narrow sense to refer to the return rate to equilibrium upon a perturbation. The focus was on the capacity to absorb the shock and the re-establishment of the status quo that preceded it.

In this framework, a difference is often made between static and dynamic resilience. The former is generally used to define a system's capacity to absorb or cushion a shock, similar to the concept of robustness. The latter focuses on the capacity of a system, individuals or communities to go through a shock, be changed or affected by it, and fully or partially restore its previous state (that is, operational performance and trajectory) following a disruption, and thus

to recover. A dynamic description of resilience put forward by the ecological community recognizes that shocks and disruptions may lead to a change in practices, activities and dynamics, and is usually measured by the length of time required to recover from disruption, the intensity of the disturbance, and the capacity of the system to absorb the disruption then fully recover (Folke *et al.,* 2015).

From a food systems perspective, bouncing back resilience may include the use of drought resistant crops to withstand disturbances in areas with frequent droughts, establishing diversified agroecosystems with fully functional or restored functional diversity and ecological networks, or promoting biofortified food imported from far away. From an international trade point of view, resilience is often used to talk about value chains and their "capacity … to continue and develop in the provision of food security and other services in the face of disturbances, through the preparation for, response to, and recovery from unexpected shocks; the avoidance of tipping points; and adaptation to ongoing change" (Vroegindewey and Hodbod, 2018, p. 916).

Significant contributions from these elaborations of resilience include emphases placed on: (1) capacity; (2) goals; (3) systemic attributes; and (4) trade-offs. We consider each in turn, while noting gaps that suggest the need for an enlarged lens on resilience that highlights transformative properties and equity considerations.

### Capacity

According to the United Nations Common Guidance (UNSDG, 2021, p. 34), "Systems, institutions and people are considered resilient when they have at their disposal a set of distinct capacities and resources that are crucial to cope with, withstand or bounce back from adverse events and shocks" (see also Béné *et al.,* 2023). Considerations of capacity apply at the individual and collective levels. Subjective elements such as cultural identity, religion, past traumas or self-confidence may shape the resilience capacity of individuals (Scheper Huges, 2008).

Collective resilience capacities, on the other hand, refer to resources that are available at a group level, which may include self organization, cooperation and collaboration between groups in the food system (such as collaboration between farmers and consumers through community supported agriculture or farmers' markets). Capacity also refers to dynamic learning processes that occur in response to disturbances (Tendall *et al.,* 2015). Reaction to disturbances generates learning that may feed preventive action as part of building resilience to future shocks. Such an emphasis on capacity to act, bounce back and prepare for future shocks begs the questions – whose capacity? how is capacity distributed in food systems? (Zurek *et al.,* 2022).

### Goals

Functional goals or outcomes are another significant element emphasized in food system resilience thinking. The frequently asked question – resilience for what? – suggests that resilience is an intermediary outcome towards food system outcomes. Resilience is not an end in itself, but rather an iterative building process. Food systems that generate harm for people and nature and lock people into unsustainable practices should not be made resilient (Oliver *et al.,* 2018). Zurek et al. suggest that there may be "different perceptions of the desirability of those outcomes between different actors" (2022, p. 527), indicating that food system goals, states and ways forward should not be presumed as universally agreed upon. In this sense, Tendall et al. (2015) suggest prioritizing food systems that ensure sufficient, appropriate and accessible food for all, while operating in a sustainable manner. Béné et al. (2023) add "decent livelihoods and viable income–profits for those who are economically engaged in food systems" and the "protection (or restoration/ rehabilitation) of the environmental integrity of agroecosystems" as further core food system functions (p. 1439).

Thus, resilience should be seen as "contingent on social values regarding what we deem important and how we ought to allocate resources to foster it" (Tanner *et al.,* 2015, p. 23).

Resilience building is thus an ongoing process infused with contestations and shaped by power dynamics and inequities. Building resilience is not simply a matter of implementing technical fixes, but a political process, the outcome of which depends on how power is distributed in food systems and, specifically, how production, processing, distribution and consumption structures are organized.

### Systemic attributes

Another significant development in food systems resilience thinking is the emphasis placed on systemic attributes. Food systems comprise individual experiences of farming and eating, and local, regional and global transaction processes and markets, among others. Different parts of the food system are interconnected so that what happens in the system at one level or in one location may be affected by what happens in the system elsewhere. The recent globalization of quinoa illustrates how a sudden modification of global demand, while initially positive for producers, can have negative consequences for resilience, including for local communities, FSN and ecosystems (see Box 2).

## BOX 2
## THE GLOBALIZATION OF QUINOA: THE DRAWBACKS OF FAILING TO USE A SYSTEMIC APPROACH

Quinoa, a crop native to the Andes and cultivated for 8 000 years, has long been a staple for Indigenous Peoples. In the early to mid-2000s it rose to global prominence as a superfood and meat substitute due to its high protein content, the presence of all essential amino acids and several vitamins, and as it is gluten-free. The UN declared 2013 the "International Year of Quinoa", further boosting its profile. The surge in global demand, particularly in the Global North, caused prices to triple between 2006 and 2013, leading to a trend of quinoa monocultivation, not only in South America but globally. As quinoa transformed into a global food commodity, the implications became significant. For poor consumers in the Andes, the rising prices meant they had to replace quinoa with less nutritious foods. And, while rural producers initially benefited from the higher prices, they soon faced intense market competition. The Plurinational State of Bolivia, once a leading producer, saw its dominance challenged by Peru, where farmers have improved their livelihoods. However, this success was tempered by price fluctuations and the pressures of maintaining monoculture crops, which reduced biodiversity and increased vulnerability to international market changes. Additionally, the environmental impact has been profound. Complex ecosystems have been disrupted as traditional farming practices, such as combining quinoa cultivation with llamas for natural soil fertilization, are being abandoned. Llamas are being sold off and replaced by sheep, which take up less space but modify ecological balance. The initial economic benefits of the quinoa boom have thus given way to a host of social, economic and environmental challenges, showing the complex interconnections and feedback loops within food systems. Additionally, demand for quinoa has declined significantly after the initial increase. This case reflects the need to adopt a systemic approach that considers capacities, context and socioecological independencies.

*Sources:* Kerssen, T. 2015. La soberanía alimentaria y el boom de la quinua: retos para la recampesinización sostenible en el Altiplano Sur de Bolivia. *Cuestión Agraria*, 2: 87–117. https://www.researchgate.net/publication/290997578_La_soberania_alimentaria_y_el_boom_de_la_quinua_retos_para_la_recampesinizacion_sostenible_en_el_Altiplano_Sur_de_Bolivia; McDonnell, E. 2025. *The Quinoa Bust: The Making and Unmaking of an Andean Miracle Crop*. California, University of California Press; Sauras, 2025; Philpott, T. 2013a. Are Quinoa, Chia Seeds, and Other "Superfoods" a Scam? Mother Jones. [Cited 3 July 2025]. https://www.motherjones.com/environment/2013/06/are-superfoods-quinoa-chia-goji-good-for-you/; Philpott, T. 2013b. Quinoa: good, evil, or just really complicated? *The Guardian*, 25 January 2013. [Cited 3 July 2025]. https://www.theguardian.com/environment/2013/jan/25/quinoa-good-evil-complicated

From a systems perspective, it is important to note that an intervention to build resilience in one part of the system may impact or condition resilience in another part of the system. Systemic resilience thinking has therefore emphasized the need to acknowledge interdependencies between different parts of food systems at different levels.

Tendall et al. (2015) describe food system resilience as the "capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances." (p. 19. Béné et al. (2023, p. 1438) adopt a similar definition of food system resilience, describing it as "the ability of the different individual and institutional actors of the food system to maintain, protect, or successfully recover the key functions of that system despite the impact of disturbances."

These definitions emphasize how disturbances impact food systems and the capacity of the food systems to ensure food security. They also highlight how the robustness or capacity of food systems to withstand and absorb those disturbances can be enhanced by having elements that are replaceable or redundant, that adapt to the effects of the disturbance and do so rapidly and in a flexible manner. This is particularly relevant as food security can be threatened by various types of shocks, often unforeseen, and at various points in food systems. It is therefore important to improve the robustness of all the components of food systems, while making them sufficiently adaptable to change and equitably transformative. This systemic approach might also give way to interventions that can be less costly for each individual part of the system, relying on synergies and addressing potential blockages.

Yet, adopting a systemic approach to resilience does not by itself guarantee that food systems will be transformed or bounce forward.

### Resilience as trade-offs or as synergistic opportunities?

Some literature on resilience highlights trade-offs in building interventions, for example when a focus on the short-term results leads to disregarding longer-term and transformative solutions that recognize interdependencies (Béné *et al.,* 2023). Such trade-offs can be framed as follows:

- Diversity and efficiency: Applying principles of diversity and redundancy "might raise the relative costs for products that are otherwise associated with economies of scale (or scope)" (Vroegindewey and Hodbod, 2018, p. 9) due to the duplication of resources and infrastructure, implying a trade-off between diversity for resilience and efficiency. Regarding agricultural production, for example, specialized production systems (e.g. monocropping) can bring about efficiency and high productivity through economies of scale as compared to diversified production systems (e.g. agroecological practices), but may also be more vulnerable to shocks such as economic disruption, extreme weather events and pests, and therefore less resilient (Zurek *et al.,* 2022). In distribution, similarly, redundancy principles "may drive up the fixed costs of transacting with suppliers and buyers" and therefore reduce efficiencies and potentially increase the risk of food loss and food waste (Vroegindewey and Hodbod, 2018, p. 9).
- Short-term efficiency and long-term resilience: Investments in long-term resilience (such as training, retooling and building new systems) can appear to undermine short-term economic efficiencies (Vroegindewey and Hodbod, 2018). For example, fertilizer subsidies incentivizing higher application rates can improve short-term productivity for farmers. However, through effects on crop diversity, soil health, water quality and emissions, they can compromise long-term "environmental integrity of the agroecosystem, thus jeopardizing the resilience of the whole food system in the long-term" (Béné *et al.,* 2023, p. 1451).

- Trade-offs between outcomes prioritized by different actors: Trade-offs exist between outcomes for different groups as "the resilience of some people's livelihoods may result in the increased vulnerability of others" (Tanner *et al.,* 2015, p. 23). This has been observed through, for example, the impact of flood protection measures on migration of downstream communities (Tanner *et al.,* 2015). Similarly, there are trade-offs in prioritizing positive outcomes for different groups, where affordability for the consumer may come at the cost of environmental impacts of food production, and agrifood job creation may conflict with nutritional outcomes (Zurek *et al.,* 2022).

Although concerns about trade-offs are common in discussions about food system resilience, some authors suggest that this reasoning frames the objectives of resilience interventions in unhelpful, binary terms that overlook interdependencies, synergies and other potential solutions (Hanspatch *et al.,* 2017) and raises questions such as: Should long-term sustainability be compromised for short-term efficiency? Is there a genuine conflict between ensuring fair income for producers and affordable food prices for consumers?

Systems thinking about resilience is crucial to understand connections, feedback loops and tensions within food systems (and between food systems and other systems) and to present a more sophisticated understanding of resilience as bouncing back. However, we consider that there is scope for extending this analysis to give more attention to structural imbalances and to build the type of resilience that allows people and systems to bounce forward and not simply restore positions and functions that may be inadequate and inequitable.

The desirability of the outcomes and the distributive implications of the recovery process of food systems and food system actors must be brought to the fore. The next section elaborates the notion of "bouncing forward resilience", discussing its significance in directing resilience efforts towards the transformation of food systems.



## 3.2 RESILIENCE AS "BOUNCING FORWARD"

The example of quinoa presented in Box 2 underscores the importance of considering human–environmental interactions and interdependencies in relation to food systems (Ericksen, 2008) and the need to promote a shift towards another state, rather than seeking to consolidate existing circumstances or return to the status quo. More than 50 years ago, Holling (1973) proposed to move beyond the ability to bounce back and offered the idea of ecological resilience as the capacity of ecosystems to retain essential functions, structures and feedback, while changing and transforming. Walker et al. (2004, p. 1) define ecological resilience as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedback". In agroecosystems, the application of this definition incorporates the biodiversity change of functionally equivalent species in the ecosystem or the evolutionary changes in species that allow them to adapt to disturbances while maintaining their ecological function and, thus, their contribution to ecosystem services.

In the context of food systems, the 2020 United Nations Guidance on Helping Build Resilient Societies (FAO, 2021, p. xiv) argues that food systems must transform to become resilient, with the ultimate goals of "ensuring food security and nutrition for all and decent livelihoods and incomes for agrifood systems' actors". A transformative approach to resilience looks at the capacity of the actors and of the overall system to "transform with change" (Reyers *et al.,* 2022, p. 657).

The recent literature suggests distinct but complementary approaches to transformation towards sustainability. The report proposes applying this framing to the transformation of food systems as part of resilience building. This approach includes structural, systemic and enabling approaches (Scoones *et al.,* 2020). Structural approaches focus on changes

to the ways systems are organized and governed. Systemic approaches acknowledge interdependencies in complex systems. Enabling approaches emphasise the human agency, values and capacities that are needed to manage uncertainty and move towards desirable goals.

In the context of food systems, **structural approaches** comprise efforts to change prevailing governance and power structures that make food systems non-resilient. They may refer to changes in the systems of food production, distribution and consumption; how they are organized or governed; and how resources and income are distributed. Changing food system structures to build transformative resilience may require fundamental shifts to property regimes (e.g. land, water, agricultural inputs, seeds and knowledge), labour relationships, migration policies, trade and investment arrangements, market concentration, forms and spaces of consumption, and wastage practices.

**Systemic approaches** to food system transformation entail harnessing socioecological interdependencies and, specifically, prioritizing policies and interventions that result in synergies or mutual benefits for social and ecological elements of food systems. Box 3 provides examples of synergies between food security and biodiversity conservation emerging from a study on farming landscapes in the Global South (Hanspach *et al.,* 2017). Supporting socioecological synergies and interdependencies requires a fundamental reassessment of policy options that acknowledge and work with the socioecological interrelationships within a given food system. This can then help strengthen existing synergies to create win-win options while addressing vulnerabilities that are invisible to linear or fragmented approaches.

## BOX 3
## INTERDEPENDENCIES AND SYNERGIES: FOOD SECURITY AND BIODIVERSITY CONSERVATION AS MUTUALLY REINFORCING GOALS

Food security and biodiversity conservation are often seen as competing goals, leading to solutions that focus on reducing trade-offs and overlook scope for synergies. For example, measures solely focused on food production may harm biodiversity, while biodiversity conservation is sometimes done at the cost of food security. A study by Hanspach et al. (2017) suggests that using a trade-off perspective reduces food systems to binaries and fails to capture the synergies that exist between socioecological goals. To explore this idea, the researchers carried out an online survey to gather data on farming landscapes in the Global South. The survey included 223 respondents, selected from self-identified experts on food security and biodiversity conservation, and used non linear principal component analysis to derive indices of food security and biodiversity conservation in responses, and then established relations between them. The study found that food security and biodiversity conservation trade-offs are common but not universal or inevitable. Trade-offs were linked to "a singular focus on built and financial capital in a given landscape" (Hanspach et al., 2017, p. 492). Easy market access and ample financial resources correlate with high food security but low biodiversity. Conversely, poverty and high food insecurity can lead to involuntary reliance on the natural environment. "Win-win" outcomes for food security and biodiversity conservation were "associated with high equity, ready access to land for local people, and high human and social capital" (Hanspach et al., 2017, p. 492). The study suggests that it is crucial to focus not only on infrastructure development, commercialization and physical capital but also on enhancing human capital, social capital and equity. This approach is essential for creating, identifying and benefiting from synergies between food security and environmental conservation.

*Source:* Hanspach, J., Abson, D.J., French Collier, N., Dorresteijn, I., Schultner, J. & Fischer, J. 2017. From trade-offs to synergies in food security and biodiversity conservation. *Frontiers in Ecology and the Environment*, 15(9): 489–494. https://doi.org/10.1002/fee.1632.

Finally, enabling approaches are about giving people in food systems the capacity to move to a better state. Strengthening agency for food system resilience connects to capabilities, human rights and freedoms (Sen, 2001; Clapp *et al.,* 2022). Tanner et al. (2015) emphasize improvements to livelihood opportunities and well being in their elaboration of livelihood resilience as:

> the capacity of all people across generations to sustain and improve their livelihood opportunities and well-being despite environmental, economic, social and political disturbances. Such resilience is underpinned by human agency and empowerment, by individual and collective action, and by human rights, set within dynamic processes of social transformation (p. 2).

Emerging efforts to enhance women's agency in food systems under climate change are an illustration of the type of agency enabling transformative resilience needed. Structural inequalities limit most women's access to resources, services and agency, making them more vulnerable to the impacts of climate change (CFS, 2023). However, many climate interventions overlook gender issues, thus failing to address or even risking worsening food system inequalities. For instance, climate-smart technologies such as conservation agriculture may increase women's labour burden and reduce their control over income, time and decision-making (Bryan *et al.,* 2017). On the other hand, social protection programmes that combine a focus on peoples' empowerment through skill building and creating employment opportunities, while tackling the interconnected challenges of food insecurity, precarious livelihoods and environmental degradation, open pathways to transformation (Box 4).

BOX 4

## INTEGRATED RESILIENCE IN THE SAHEL: BURKINA FASO, CHAD, MALI, MAURITANIA AND NIGER (G5 SAHEL COUNTRIES)

The Sahel Integrated Resilience Programme, implemented by the United Nations World Food Programme and its partners, is designed to tackle interconnected challenges, such as food insecurity, malnutrition and environmental degradation by promoting ecosystem restoration and sustainable livelihoods alongside a focus on health, nutrition and educational improvements. The linkages between food systems, education and social protection enhance the overall contribution of the programme to enhancing system resilience in the Sahel. The programme operates in collaboration with national governments, NGOs and community leaders. From 2018 to 2023, it reached over 4 million people.

The programme has three pillars:

1. Anticipate, absorb and protect: Address immediate FSN-needs amidst shocks and stresses through food assistance, integration with social protection programmes, early warning systems, preparedness initiatives and anticipatory actions.

2. Adapt: Promote sustainable livelihoods and improve outcomes in nutrition, health and education through interventions such as asset creation, ecosystem restoration, natural resource management, support for smallholder farmers, market access, climate adaptation and mitigation efforts, homegrown school feeding programmes, and comprehensive nutrition support packages.

(CONTINUED FROM BOX 4)

3. Transform: Build and strengthen institutional capacities at local, national and regional levels to enable long-term resilience. For example, it established the Sahel University Network for Resilience, which includes six universities in five countries.

This programme contributes to the six dimensions of food security (stability, sustainability, availability, access, utilization and agency) by including: sustainable agricultural practices and ecosystem restoration to improve food production; provision of food assistance and conditional cash transfers to vulnerable households; nutritional support, including school feeding and education on healthy diets; and linking shock responsive social protection and disaster risk financing. In particular, the programme has an environmental sustainability dimension as it focuses on ecological restoration and actions against desertification (Great Green Wall initiative). It also builds community resilience by empowering local populations and strengthening local, national and regional institutional capacities such as early warning–early action systems and anticipatory action, thus strengthening agency.

*Source:* World Food Programme. 2023. *The Sahel Integrated Resilience Programme and Scale-Up 2023-2028.* Dakar. https://docs.wfp.org/api/documents/WFP-0000147028/download/?_ga=2.166359862.903520016.1738939577-1730195341.1738939577.

The emphasis on agency also leads us to consider the values of individuals and groups, and how these are mediated through relations and processes, including with or as part of nature and ecological processes. For example, research on the resilience of pastoralists describes the dynamic and relational nature of resilience, which involves constant adaptation and transformation of their system to accommodate new conditions (Scoones, 2024).

While "bouncing forward resilience" sets us in the direction of a different (or better) food system, it is not sufficient to address pervasive food system inequalities and inequities (HLPE, 2023). As previously discussed, inequities exacerbate existing vulnerabilities to shocks and stresses. Thus, addressing food system inequities in a systemic manner is fundamental to enhancing the resilience of food systems (including food system actors), and their ability to be prepared for and respond to shocks and stresses.

This begs the questions: Who is engaged in any move forward? What principles should the transformation processes follow? What goals should they achieve? In the following section, equity is added as a qualifier of each dimension of transformative resilience (structural, systemic and agency), providing the conceptual basis for the guiding framework of this report.

## 3.3 TOWARDS EQUITABLY TRANSFORMATIVE RESILIENCE IN FOOD SYSTEMS

While bouncing back means to resist, absorb, adapt to, recover from and prevent shocks and stresses, bouncing forward is about the ability to transform food systems by operating at the level of individual and collective agency and values, changing structures of power, and recognizing socioecological interdependencies. But how does this account for multiple forms of vulnerability and power differentials? Achieving FSN for all requires more than food systems transformation. It requires a transformation that takes into account "issues of social vulnerability and differentiated access to power, knowledge, and resources; it requires starting from people's own perception of their position within their human–environment system, and accounts for their realities, and for their need for a change of circumstance to avoid imbalances of power into the future" (Matin *et*

*al.,* 2018, p. 202). Building on this, we propose ETR as an understanding of resilience that goes a step further as food systems that are made resilient through transformations that address the root causes of differential vulnerabilities and are guided by equity considerations and socioecological interdependence.

Equitably transformative food system resilience is a dynamic condition that can be achieved when institutions, policies, people, ideas and practices uphold the capacity of individuals, communities, nature and socioecological processes to prevent, absorb, adapt to and transform in the context of multiple uncertainties, compounded by structural and contingent shocks and stresses and differential vulnerabilities. Equitably transformative resilience goes beyond bouncing back from immediate disruptions and requires food systems to bounce forward in equitable ways that redress the unequal distribution of power, capabilities, resources, rights and duties, while harnessing socioecological synergies so that food systems are less prone to shocks in the future.

All food system actors have a stake and a role to play in building the conditions for ETR. Governments have a key role in driving structural change that addresses power imbalances in food systems. Interministerial bodies and policy spaces are well positioned to drive holistic food system policies that harness socioecological interdependencies across, for example, agriculture, health, environment, and local economic development. Civil society organizations are ideally placed to build agency and raise the voice of disempowered and marginalized actors, ensure that transformations are equitable and that resilience capacity enables those marginalized to move to a better state. Private sector actors must consider how their practices impact resilience and equity in the food system, ensuring that their investments and business models do not exacerbate vulnerabilities, but instead contribute to inclusive, sustainable and rights-based food systems that support the well-being and agency of all.

Equitably transformative resilience suggests that it is possible to build a food system that captures the synergies between complex socioecological systems for the benefit of all. Such food systems create the conditions for individuals, communities and ecosystems to be more robust vis-à-vis-uncertainties, reduce the role of food systems in producing shocks, and make them capable of reversing – through increased diversity and redundancy – current trends that weaken resilience.

At its core, ETR recognizes the importance of redundancy and diversity. By embedding these principles across governance structures and supply chains, and by incorporating fallback options into long-term trajectories of food system change and transformation, ETR develops food systems that are better at absorbing and adapting to shocks and less exposed to future disturbances. Given the focus on social equity and the recognition of deep interdependencies, ETR combines anticipatory governance with a commitment to socioecological equity that enables not only recovery, but transformation towards more equitably resilient food systems.

Equitably transformative resilience approaches to food systems can help address the accelerating effects of climate change and build governance structures that reduce the impacts and incidences of severe weather events, such as droughts and floods, leaving food systems better able to cope with future shocks (HLPE, 2024). Enabling the uptake of positive shifts captured in this report can be a flywheel to accelerate progressively equitable, transformative food system resilience and can move us from critical planetary and human crises towards a genuinely sustainable future.

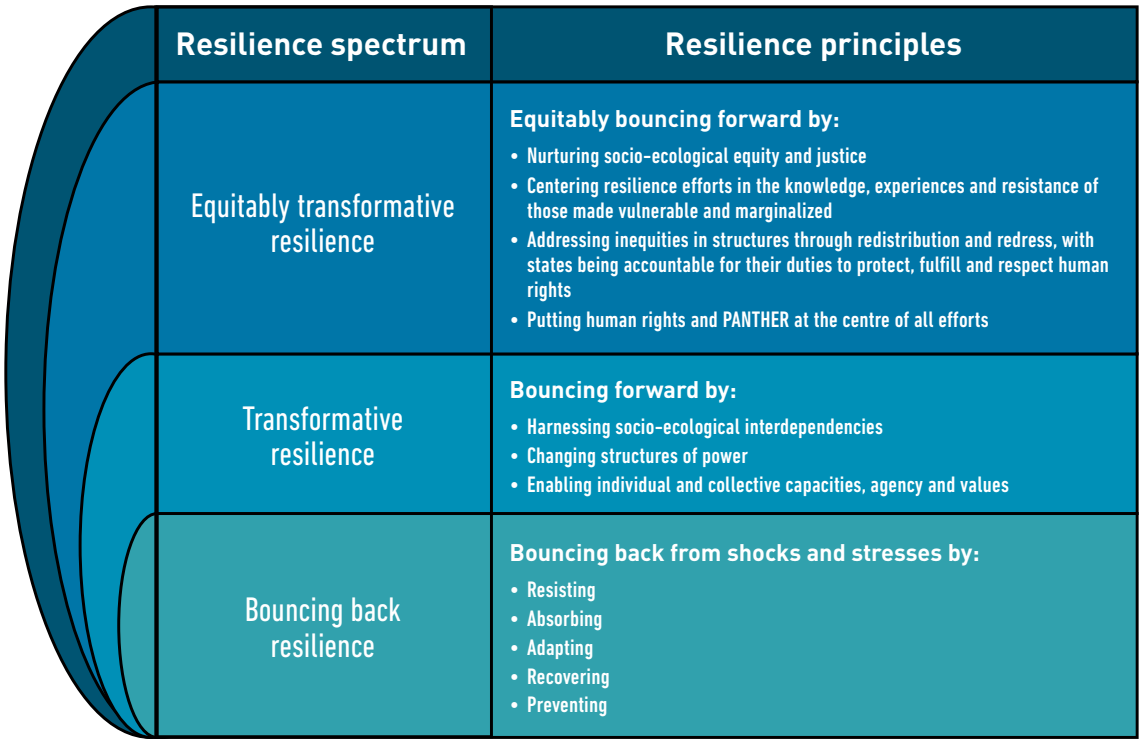
Synthesizing the elaboration above, four foundational principles to guide interventions towards building ETR emerge:

- nurturing socioecological equity and justice;
- centring resilience efforts in the diverse knowledge, experiences and capacities of those made vulnerable and marginalized;
- addressing inequities in structures through redistribution and redress, with states being accountable for their duties to protect, fulfil and respect human rights; and

- putting human rights and agency, through the principles of participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law (known collectively as the PANTHER principles) at the centre of all efforts.

This ETR centred conceptual framework is synthesized in Figure 7 and builds on the notions of bouncing back and bouncing forward resilience outlined above.

FIGURE 7
## EQUITABLY TRANSFORMATIVE RESILIENCE
Resilience spectrum moving from bouncing back, through transformative bouncing forward, to equitably transformative resilience (ETR).




*Note:* PANTHER: participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law.
*Source:* Authors' own elaboration.

### 3.3.1 NURTURING SOCIOECOLOGICAL EQUITY AND JUSTICE

A socioecological and holistic approach is needed to harness interdependencies and achieve an equitable distribution of benefits and responsibilities. This, in turn, will promote food systems that provide FSN for all, while fostering ecological processes and reducing the frequency and intensity of shocks and stresses. The implementation of policies and infrastructures that promote agroecological production and make its products accessible to the food insecure and the marginalized members of communities aptly illustrates the combined emphasis on equity and socioecological interdependencies. For example, FAO and HLPE-FSN's framings of agroecology provide a holistic view that weaves together the resilience of people and nature, within a framework of equity, defined in terms of fairness, values and rights (Box 5). More than a set of agricultural practices, agroecology involves a holistic approach that integrates ecological, social, cultural and political dimensions to transform food systems, and provides comprehensive solutions that emphasize ecological integrity alongside the rights of those most exposed to uncertainties, shocks and stresses.

FAO's Scaling Up Agroecology Initiative recognizes the transformative potential of agroecology and how it can lead to sustainability and equity for the entire food system. It proposes scaling up agroecology by focusing on contextualized knowledge and through participatory policy processes that include non state actors and collaboration and coordination in FSN, climate change, ecosystem restoration and biodiversity, among other areas (FAO, n.d.).

BOX 5

#### AGROECOLOGY AS AN ILLUSTRATION OF BUILDING EQUITABLY TRANSFORMATIVE RESILIENCE

Agroecology has a long history with varying emphasis on its scientific basis, practical applications, political motivations and as a social movement (Wezel et al., 2009; IPES Food, 2022). Agroecology is not a fixed package of techniques or practices, but a set of principles governed by social and ecological values. FAO's "10 elements of agroecology" highlight that agroecology encompasses technical–ecological elements and social justice (FAO, 2018). Within the 10 elements framework, agroecology is defined as:

*fundamentally different from other approaches to sustainable development. It is based on bottom up and territorial processes, helping to deliver contextualized solutions to local problems. Agroecological innovations are based on the co creation of knowledge, combining science with the traditional, practical and local knowledge of producers. By enhancing autonomy and adaptive capacity, agroecology empowers producers and communities as key agents of change* (FAO, 2018, p. 2).

The HLPE-FSN has translated these 10 elements into 13 operational principles to guide food system transformation, weaving together principles to improve resource efficiency (recycling and input reduction), strengthen resilience (thorough soil health, animal health, biodiversity, synergy and economic diversification), and secure social equity and responsibility (through knowledge co creation, social values, diets, fairness, connectivity, land and natural resource governance and participation) (HLPE, 2019).

Agency, the sixth pillar of FSN, is increasingly recognized as essential for fostering resilience in food systems and enabling context specific responses to socioecological stresses and shocks, while supporting collective efforts to challenge and transform the structural conditions that produce vulnerability (HLPE, 2020; Clapp et al., 2022; Brown and Westaway, 2011). Within this context, the frameworks of food sovereignty and agroecology have gained prominence for centring on the agency and capacities of communities, particularly small-scale producers and Indigenous Peoples (HLPE, 2019; Walsh-Dilley et al., 2016; Patel, 2009; Nyéléni, 2015). Grounded in local knowledge, participatory governance, human rights and autonomy, agroecology and food sovereignty bridge

(CONTINUED FROM BOX 5)

adaptive practices with broader systemic transformations, fostering resilience and equity across food systems (Anderson et al., 2019).

By integrating ecological principles, social inclusion and participatory governance, agroecology is, by design, about making food systems resilient in ways that are equitable and in line with systemic interdependencies (Barrios et al., 2020). Agroecology aims to strengthen local capacities to adapt to socioenvironmental changes, while promoting equity through fair access to resources, the empowerment of marginalized groups, and democratized decision-making.

*Sources:* Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D. & David, C. 2009. Agroecology as a science, a movement and a practice. A review. *Agronomy for Sustainable Development*, 29(4): 503–515. https://doi.org/10.1051/agro/2009004; Brown, K. & Westaway, E. 2011. Agency, Capacity, and Resilience to Environmental Change: Lessons from Human Development, Well-Being, and Disasters. *Annual Review of Environment and Resources*, 36(1): 321–342. https://doi.org/10.1146/annurev-environ-052610-092905; Walsh-Dilley, M., Wolford, W. & McCarthy, J. 2016. Rights for resilience: food sovereignty, power, and resilience in development practice. *Ecology and Society*, 21(1): art11. https://doi.org/10.5751/ES-07981-210111; Patel, R. 2009. Food sovereignty. *The Journal of Peasant Studies*, 36(3): 663–706. https://doi.org/10.1080/03066150903143079; International Forum for Agroecology. 2015. Declaration of the International Forum for Agroecology. Nyéléni, Mali. https://www.foodsovereignty.org/wp-content/uploads/2023/02/NYELENI-2015-ENGLISH-FINAL-WEB.pdf; FAO. 2018. *10 elements of agroecology guiding the transition to sustainable food and agricultural systems*. Rome. https://openknowledge.fao.org/server/api/core/bitstreams/3d7778b3-8fba-4a32-8d13-f21dd5ef31cf/content; Anderson, C.R., Bruil, J., Chappell, M.J., Kiss, C. & Pimbert, M.P. 2019. From Transition to Domains of Transformation: Getting to Sustainable and Just Food Systems through Agroecology. *Sustainability*, 11(19): 5272. https://doi.org/10.3390/su11195272; HLPE. 2019. *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition*. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome. https://www.fao.org/agroecology/database/detail/en/c/1242141/; Barrios, E., Gemmill-Herren, B., Bicksler, A., Siliprandi, E., Brathwaite, R., Moller, S., Batello, C. & Tittonell, P. 2020. The 10 Elements of Agroecology: enabling transitions towards sustainable agriculture and food systems through visual narratives. *Ecosystems and People*, 16(1): 230–247. https://doi.org/10.1080/26395916.2020.1808705; Clapp, J., Moseley, W.G., Burlingame, B. & Termine, P. 2022. Viewpoint: The case for a six-dimensional food security framework. *Food Policy*, 106: 102164. https://doi.org/10.1016/j.foodpol.2021.102164; IPES-Food. 2022. *Smoke and Mirrors: Examining Competing Framings of Food System Sustainability: Agroecology, Regenerative Agriculture, and Nature-Based Solutions*. Brussels, Belgium, International Panel of Experts on Sustainable Food Systems. https://ipes-food.org/_img/upload/files/SmokeAndMirrors.pdf

Such relational approaches to society and ecology have transformative and long-lasting implications on the way food systems are conceived and policies framed. They also consider nature to be an inherent and defining component of society and food systems. ETR in food systems requires that policies be informed by socioecological justice and by the need for social and ecological convergence and interdependence.

At the policy level, the idea of socioecological equity resonates also with recent calls to adopt a One Health approach as "an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent" (e.g. One Health in Nigeria, Lucero-Prisno *et al.*, 2023). One Health is based on the notion of interconnectedness that challenges the idea of trade-offs between healthy ecosystems, healthy animals and healthy humans (Stevenson, 2023; Talukder *et al.*, 2024).

### 3.3.2 ADDRESSING STRUCTURAL INEQUITIES AND POWER IMBALANCES

ETR in food systems requires "changing the world, its structure and conditions of possibility" (Evans and Reid, 2013). This shift requires the acknowledgement of path dependency and historical legacies that shape and lock people in positions of vulnerability and non-resilience. The need for structural change in food systems to address inequities has long been a call made by the CFS and HLPE-FSN. Research shows that an equitable distribution of wealth, resources (such as land, water, breeds and seeds) and opportunities is essential to build resilience within communities (Nelson *et al.*, 2007; Twigg, 2006; Matin *et al.*, 2018).

Structural change also necessitates an acknowledgment and recognition of the voice and decision making rights of the many marginalized actors that constitute the food system from farm to fork. The transnational social movement La Via Campesina has been a strong advocate for the rights of people to define their own food systems; and women's and feminist movements have brought gender to the forefront of food policy debates and questioned traditional gender roles and patriarchy at the core of food system practices (Caro, 2013; Conway, 2018).

Consistent with the CFS mandate centring on those most affected, equitable approaches to resilience need to consider as central elements the histories, wisdom and experiences of the people and ecosystems that are most exposed to the non-resilience of a system. If the focus is to support those who are most exposed, then it is crucial to hear and amplify their voices and to ensure that their requests for accountability, responsibility and transformation are answered.

Resilience building efforts should not place undue burdens on those facing the harsh end of disruptions that they did not cause. In this context, the report shows that an approach that assumes resilience on the part of marginalized people, including peasants, fisherfolk, workers, Indigenous Peoples or individuals and communities who are struggling because of uncertainty and shocks, does not increase their capacity nor agency, but may very well work to cement their marginalized position and compromise their capacity, hiding structural causes (Shwaikh, 2023; Lindroth and Sinevaara Niskanen's, 2022).

Mohammad et al. (2019) point to the inadequacy of Western concepts of resilience in contexts marked by political conflict, oppression, prolonged conflict or occupation, where resistance (or sumud – steadfastness) is, in fact, a more appropriate description of the situation of the people living in such contexts. Likewise, Indigenous Peoples around the world are living within national borders that have been established over their preexisting nations and territories. In many cases, these imposed borders have not been conceded by them nor been reconciled, yet Indigenous Peoples engage in the active revitalization of their cultures, languages, knowledge systems and governance structures in the name of the right to self-determination (Corntassel, 2012; Simpson, 2016).

Centring resilience in the knowledge, experience and resistance of the marginalized requires far more than merely "bringing people to the table" (Chambers 1983; Chambers, Pacey and Thrupp, 1989). It requires creating the conditions for those who are made vulnerable and marginalized to be at the forefront of resilience building efforts, valuing their knowledge and their experiences as the starting point for transformative interventions. Although bringing these voices into the policy arena may not be an easy task, there are examples of effective inclusive and participatory spaces at local and national levels – the CFS and food policy councils (described in Chapter 4), are examples to build on. Participatory budgeting is a long-standing example of participatory engagement. Described as "citizens meeting to agree on priorities for part of the local government budget for their neighbourhood or the city as a whole, and helping to oversee project implementation" (Cabannes, 2015, p. 257), its principles of equitable inclusion can be applied to various initiatives. Participatory budgeting has been adopted by 11 500 municipalities and is included in national law in nine countries. It has been used in schools, universities, public housing, non profit organizations, workplaces, cooperatives, community-based organizations, and philanthropic initiatives (Schugurensky and Mook, 2024). Another example of inclusive participation can be found in the community movements building towards in situ conservation of genetic material. In Brazil, Indigenous groups have claimed their rights to access and control ancestral maize genetic resources (Dias, Simoni Eidt and Udry, 2016; Bustamante, Barbieri and Santilli, 2017). The resulting collaboration between scientists and Indigenous groups has laid the groundwork for ethnoscience to emerge as a field of applied research connecting Indigenous Peoples' knowledge with scientific research, fostering mutual learning and innovation (Chapter 4, Box 26).

The need for structural shifts is not new to resilience conversations nor to the United Nations (UN) system and UN agencies. On the contrary, such deep engagement with resilience aligns

with recent call from the HLPE-FSN and the CFS to address inequalities in FSN by means of transformative and bold policies. Likewise, the 2020 UN Common Guidance on Helping Build Resilient Societies includes poverty, inequality, marginalization and exclusion among risk drivers affecting resilience (UN, 2020, p. 31).

Whereas mainstream approaches to resilience may overlook the fact that the intensity and extension of individual and collective experiences of food insecurity and exposure to risks and uncertainty are intrinsically linked with the past (Lindroth and Sinevaara Niskanen, 2019), ETR is premised on the recognition of decolonization as an unfinished project with ongoing consequences (Bhambra, 2022). This is the same for the ecological damage that has been imposed over several generations and that should be central when thinking about the present and future capacity of people and food systems to be resilient. Therefore, ETR requires a collective and inclusive engagement process to imagine what it would mean to have meaningful reparations (Táíwò, 2022).

Redistributive policies that are informed by past inequity and that guarantee access to resources, power and knowledge, are thus central to the construction of an equitably transformative approach to food system resilience, as already identified by the HLPE-FSN (2023). Access to land, water, seeds and local markets, included in the United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP) (UNCHR, 2018), is crucial to these structurally transformative and equitable shifts, especially when integrating a gender or intersectional component.

Food sovereignty as "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" (La Vía Campesina, 2007) illustrates how marginalized groups (including peasants, women, LGBTIQ+ and Indigenous Peoples from around the world) identify structural changes in the food system. In addition, the concept of food sovereignty has also extended beyond the focus on people's control over farming and food-related livelihoods to encompass a range of concerns about other aspects of food systems, including ecologies, food environments, social relations, consumers, and cultures (Wittman *et al.,* 2010).

For example, in Latin America, the food sovereignty movement is combining a call for food security and the right to food with the questioning of traditional gender roles and patriarchy at the core of food system practices (Conway, 2018; Caro, 2013). Likewise, the increasing emphasis on solidarities and the enlargement of the agroecology movement to encompass not only issues of production but also trade, consumption and care, also illustrates this alliance between diversely marginalized groups across the food system. These are efforts to drive justice and equity from people's own positions of disadvantage and marginalization, including LGBTIQ+; women; youth; no and low income; and Black, Indigenous, and People of Colour communities; among others, to create resilient food systems for their food security (Fakhri, 2022).

### 3.3.3 PUTTING HUMAN RIGHTS, AND THE RIGHTS OF NATURE AT THE CENTRE OF ALL EFFORTS

Human rights are key to the construction of ETR in food systems. The right to food has been widely recognized and promoted globally and nationally, first in the 1948 UN Universal Declaration of Human Rights, then in Article 11 of the International Covenant on Economic, Social and Cultural Rights (ICESCR) and in other international frameworks and national constitutions. The Voluntary Guidelines on the Right to Food (FAO, 2004) consolidated the right to food and its role in achieving food security and a food system that is rooted in dignity, agency and socioenvironmental sustainability (HLPE, 2023). The obligations associated with the right to food empower citizens and civil society to hold governments accountable for protecting, respecting and fulfilling the right to food, including vis à vis protection from actions and inactions of private actors. The right to food is interdependent and interrelated with other economic social and cultural rights in the ICESCR, such as right to health (Art. 12), right to work (Art.6), right to fair wages and conditions (Art.9), Protection of Families and Children (Art. 10), Right to Education (Art.13), Non-discrimination (Art. 2/2), and Gender Equality (Art.3). Understanding these intersections is critical for designing rights-based

food security policies, especially in contexts of poverty, conflict, climate shocks, and structural inequalities. Yet, these rights are often treated "as mere rhetoric, nothing more than an empty promise because of lack of institutional structure and ineffective monitoring systems" (Elver, 2023, p. 20) and because this right is upheld only to a limited degree in national and international courts.

In practice, the right to food and other economic, social, and cultural rights are undermined by the pursuit of maximized financial return and by governments that fall short in their obligation to protect, respect and fulfil this right. Especially, because of structural inequalities in the food systems, peasants, Indigenous Peoples, small-scale producers and workers, as well as numerous other marginalized groups, are subject to disempowerment.

The right to food is also related to other key rights specific to farmers, such as the right to land and right to seeds, which have an impact on FSN and are increasingly recognized as crucial components of the broader human rights framework, particularly in relation to the right to food, Indigenous Peoples' rights and peasants' rights. The right to land is increasingly viewed as integral to the realization of other human rights, particularly the right to food and cultural rights. While land rights are not yet universally codified as standalone rights under binding international law, they are emerging rights supported by soft law instruments, such as UN Declaration on the Rights of Indigenous Peoples (UNDRIP) (UN General Assembly, 2007), UN Declaration on the Rights of Peasants (UNDROP) (UNHCR, 2018), and the CFS Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (FAO, 2022b). The right to seeds refers to the right of farmers and communities to save, use, exchange, and sell farm-saved seeds or propagating material, as affirmed by UNDROP (Art. 19.1.d), which is often in conflict with intellectual property rights over seeds (UNHCR, 2018).

Importantly, ETR emphasizes the need to put the right to a healthy environment and the rights of nature at the centre of transformative actions. All these rights, specifically the rights to a healthy environment and access to clean water highlight the close interdependencies between people and ecosystems (Elver, 2023). The aforementioned international resolutions reflect the growing international commitment to environmental protection and the recognition of both human and environmental rights.

These new rights, unlike the right to food and other economic, social and cultural rights, are often supported by soft law principles. United Nations General Assembly Resolution A/ReS/76/300 (28 July 2022) recognizes the human right to a clean, healthy and sustainable environment and its role in contributing to an equitably resilient society and acknowledges the interdependency of human beings and societies within complex ecosystems and ecological processes. Likewise, UN General Assembly Resolution A/res/77/169, of 14 Dec. 2022, focuses on the concept of "harmony with nature" and recognizes that some countries recognize the rights of nature in the context of the promotion of sustainable development. By redefining the role of nature in international law (Natarajan and Dehm, 2022), this approach challenges the traditional view of nature as mere property and opens new opportunities for transformative and equitable resilience by requiring the consideration of and interaction with nature as a community entitled with rights that must be respected, protected and fulfilled (Gilbert *et al.,* 2023).

Recognizing the rights of nature establishes ecosystems and natural entities as legal subjects with intrinsic rights, shifting from a human-centred approach to one that grants nature legal standing and fosters ecological integrity.

In sum, the right to food does not stand alone. It is supported by a web of rights under the ICESCR that, if realized together, provide a robust foundation for sustainable food security. Policy makers must adopt holistic, right based approaches to address hunger and malnutrition at their roots.

A human rights-based approach to transformation towards an equitably resilient and just food system underlines the need to combine substantive and procedural components and thus bring together many of the elements that have been discussed in this chapter. This approach highlights the importance of the PANTHER principles (FAO, 2011). The PANTHER principles can facilitate transformations that are conscious of differential

vulnerabilities and of historically informed structural issues that have an impact on various capacities, values and agencies.

For example, participation requires that Indigenous Peoples' communities be involved in all the phases of infrastructure projects on their lands – including the discussion about the desirability of the project, and that their local protocols of engagement be respected and their voices be heard and respected in alignment with free, prior and informed consent (FPIC). Accountability, on the other hand, requires that affected communities have accessible legal avenues to seek justice and adequate restitution against those who, for example, pollute water ways, the air or soil; as well as vis à vis public authorities who do not protect them from third parties. Notably, ETR requires engagement with human rights and with the mandates of public actors in a strategic manner – going beyond the immediate harm to address the root causes of uncertainties, differential vulnerabilities and the socioecological breakdown (Marks, 2011; Brinks *et al.,* 2019; Moyn, 2019).

Finally, rights are void without access and enforcement. Recent international legal instruments such as the Escazú Agreement (Etemire, 2023) and the Aarhus Convention (Ryall, 2019) certainly represent steps forward in the direction of transparency, empowerment and the rule of law, and it is thus essential that countries ratify them, enforce them and take up best practices and achievements from other jurisdictions. The transformative potential of the right to food (De Schutter, 2014) and an approach to human rights rooted in the desires and aspirations of thriving people and nature (rather than sufficiency) provide a common framework that: enables international cooperation and cohesion (Fakhri, 2024), identifies shared values, and enhances people's dignity. This framework must be central to ETR efforts.

## 3.4 THEORY OF CHANGE

Figure 8 shows the changes and processes needed to achieve ETR in food systems. Realizing ETR is an iterative process that requires changing existing non-resilient food systems in line with ETR principles. These principles are grounded in human rights, the integrity of nature, equity, care and the application of the PANTHER principles. These ETR principles can support the realization of the six dimensions of food security (Chapter 1, Figure 5).

Equitably transformative resilience in food systems can be fostered through structural, systemic and enabling transformations that can happen simultaneously or independently, depending on individual contexts. Equitably transformative resilience focuses on social innovation in processes that harness accessible, scale appropriate technology and the power of place-based change. Political and economic structures and processes that support non-resilience must change in favour of structures and processes that realize the rights of people and nature and address differential vulnerabilities. Supporting this shift towards ETR means realizing a road to achieving FSN for all within safe and just planetary boundaries (Rockström *et al.,* 2023) while improving livelihoods and agency across scales and strengthening more equitable governance.

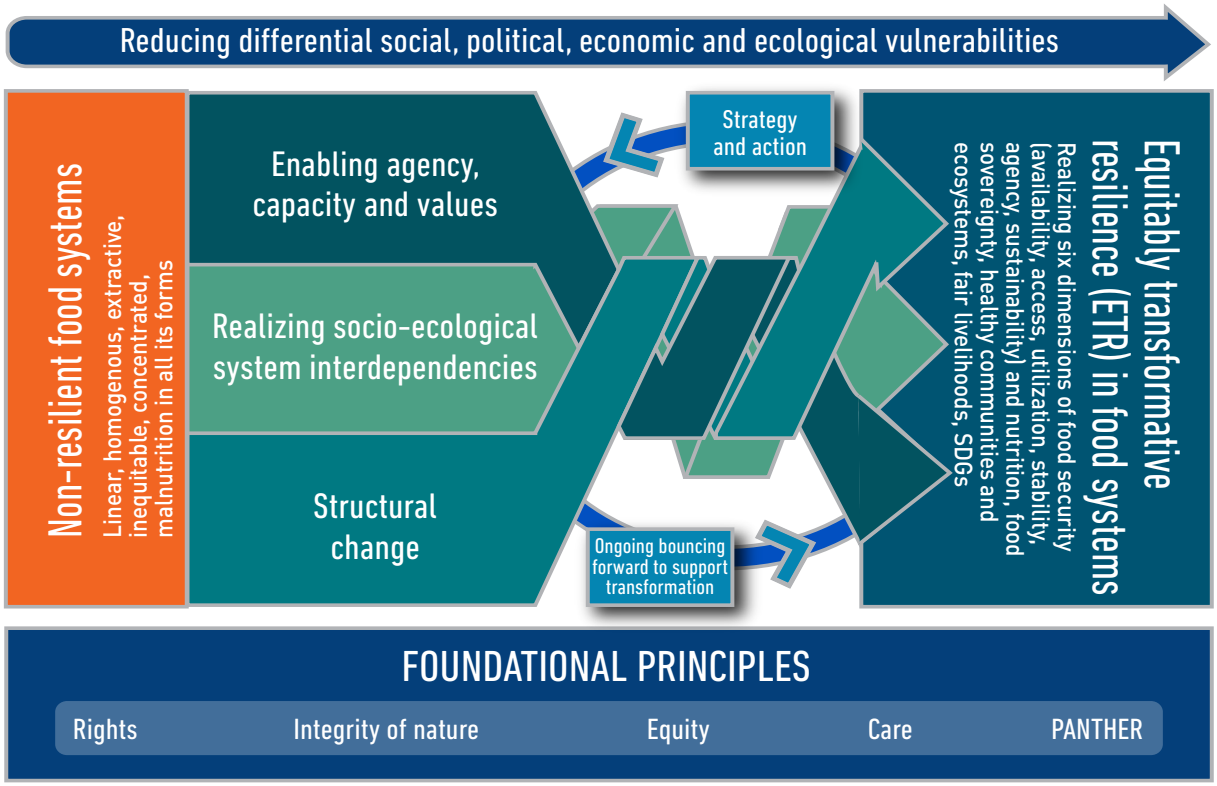
Moving towards ETR requires supporting complex, multiscale synergies between socioecological interdependencies and connections across geographies and time, through explicit institutional changes. By enabling human agency, building capacities and upholding values consistent with ETR principles, we can activate collective action and address power imbalances and social injustice as part of achieving ETR within food systems. Supportive strategy and action, underpinned by appropriate policy and adequate funding, are required to make this a reality.

To achieve ETR in food systems it will be necessary to develop structural, systemic and enabling approaches to create the conditions for individuals, communities and ecosystems to be more robust in the face of uncertainties and differential vulnerabilities. This approach can reduce the role of food systems in producing shocks and help reverse current detrimental trends through increased diversity and redundancy.

FIGURE 8

**EQUITABLY TRANSFORMATIVE RESILIENCE IN FOOD SYSTEMS (THEORY OF CHANGE)**

Transforming non resilient food systems into systems with equitably transformative resilience (ETR), founded on principles of human rights, the integrity of nature, equity, care and the PANTHER principles requires enabling the agency and capacity development of the most vulnerable, grounded in their values.




*Note:* PANTHER: participation, accountability, non-discrimination, transparency, human dignity, empowerment and rule of law.
*Source:* Authors' own elaboration.

## 3.5 CONCLUSION

While the pathway towards ETR presents many challenges, the long-term costs of maintaining the status quo in the ecological, economic and societal spheres, are substantially higher. The costs of inaction include higher economic burdens, weakened climate action and related costs, widening inequalities, and greater human suffering and social unrest. Specifically, failing to create more ETR in food systems may lead to:

- increased humanitarian and recovery costs;
- slower, less effective and more costly climate action that ignores the needs of the many that are more vulnerable to shocks;
- missed opportunities for bottom-up leadership and innovation, missing out on effective localized solutions;
- deepening social inequality that erodes social cohesion and exacerbates vulnerabilities; and
- entrenched systemic injustices, leading to unrest and conflict.

Enabling ETR in food systems is not only a strategic investment in long-term socially and ecologically sustainable development, but also a shift away from reactive, high cost interventions that frequently produce unintended negative consequences. Addressing the root causes of the problems, recognizing the interconnectedness between social and ecological elements of the food system and empowering diverse communities to control their food systems can improve resilience against supply shocks and economic disruptions, promote culturally appropriate diets, strengthen local social networks and reduce the contribution and exposure of food systems to future shocks and stresses. Addressing food system inequities contributes to healthier people, fairer economies and planetary health, and is a crucial step towards meeting global goals on climate, biodiversity and social inclusion and justice.

# CHAPTER 4

# STRATEGIES AND ACTION: PATHWAYS TO EQUITABLY TRANSFORMATIVE RESILIENCE IN FOOD SYSTEMS

Family cooking on the rubble of their home, Deir Al-Balah, Palestine, November 2023.

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## KEY MESSAGES

- Strategies and actions from around the world have shown how individuals, communities, organizations, territories and governments can work towards ETR in different contexts.
- Planning and action towards ETR address the causes of differential vulnerabilities and risk for individuals, communities and ecosystems, respecting planetary and social boundaries and helping improve resilience to shocks and stresses.
- Reducing underlying stresses also helps communities respond in an effective way when shocks occur, minimizing the need for damaging coping strategies such as selling off assets or compromising nutrition.
- Humanitarian food aid – including food assistance (in-kind aid), cash assistance (cash transfers, vouchers) and livelihood support (emergency agriculture and inputs) – is an essential strategy to meet urgent needs when the impact of shocks outstrips preparedness. However, humanitarian aid must be carefully designed to ensure equity, efficiency and safe distribution, and to avoid exacerbating vulnerabilities.
- Successful interventions are holistic, operate simultaneously in many parts of food systems, create diversification and redundancy across multiple actors, and are equitably transformative.

*"The challenge with transforming food systems is not a scarcity of food, but a resistance to reconfiguring power relations in food systems in the spirit of solidarity, care and respect for all life." (Fakhri, 2025, p. 2)*

# 4.1 FOOD SYSTEM GOVERNANCE AND POLICY COHERENCE

Governance includes decision-making processes that can support structural reforms, systems approaches and socioecological interdependencies. From the local to the global, governance structures are more effective when they ensure synergies and complementarities and are linked across scales. The following examples provide insights into different governance, policy and programme initiatives that contribute to resilient food systems.



## 4.1.1 MULTISCALE GOVERNANCE

This section addresses building integrated and coherent governance from local to global scales.

### 4.1.1.1 Integrated governance at the subnational scale

Decision-making and policy at the municipal level are critical to building resilient food systems. Regarding operationalizing context specific policy to strengthen governance, the HLPE-FSN 19 report states:

> "Actions should focus on national governments' acknowledgement of and respect for the mandates of local/city and subnational government in shaping food systems; providing support to local governments to enable them to act on these mandates; providing investment to address the challenge of weak and fragmented local government; and investing in multilevel, multilateral and multi-actor governance processes." (HLPE, 2024, p. xix)

A city region approach can capture **synergies between urban, peri-urban and rural** spaces (Blay Palmer *et al.*, 2022). For example, in Quito, Ecuador the city-led Participatory Urban

Agriculture Project (AGRUPAR) enables women and other vulnerable groups to improve their nutrition, build their livelihoods and enhance their agency. In practice, AGRUPAR supports residents so they can grow food in their neighbourhoods using agroecological and traditional Andean practices. It provides inputs, training and technical assistance for growing, raising, processing, marketing and selling their food; and has created spaces in Quito to sell this food at the Bioferia organic markets (Rodríguez *et al.,* 2022). Over 80 percent of AGRUPAR participants are women, and a project goal is to increase their agency and empowerment (Young and Rodríguez, 2020). In addition to individual and household benefits, AGRUPAR incentivizes urban agriculture and highlights its role in social, environmental and economic sustainability. The project has led to the development of public food policies to strengthen citywide food security, promoting food security and sovereignty, healthy food environments, and a circular economy to manage loss and waste (Rodríguez *et al.,* 2022). Together, AGRUPAR's actions improve overall food system resilience.

**Food policy groups**, such as food policy councils (which are "collaborative, membership driven organizations", focusing on "improving local and regional food systems" [Schiff, Levkoe and Wilkinson, 2022, p. 1]), provide examples of how to integrate context specific governance at the local scale. Food policy groups have become more prevalent across the local, provincial/state, national and even territorial scales. They help manage stresses and shocks and work towards FSN. Food policy groups offer integrated ways to explore food policy and support the inclusion of ETR principles into decision-making. As Santo et al. (2014) note, the origins (e.g. where and how a food policy group is started) can have a lasting impact on the work of the group and should be carefully considered as new initiatives are developed.

For example, the Baltimore Food Policy Initiative in Maryland grew from a task force to one of the largest food policy programmes in the United States of America by taking an integrated, resourced approach across government, combining institutionalizing efforts within government and including the work of key stakeholders (ibid). It devised a comprehensive, intentional approach to food systems policy, with an emphasis on food access and the everyday experiences of communities across the city. Through the work of their Food Policy and Planning Division, Healthy Food Priority Areas (HFPAs) are recognized as areas with elevated levels of poverty, a limited number of food retailers, and where at least 30 percent of residents do not have access to a vehicle. Identifying these HFPAs allows city staff to better target programming on a needs basis (City of Baltimore, 2024a). As of 2024, the Baltimore City Food Policy and Planning Division had offered produce box programmes that delivered over 23 million servings of produce; was an active partner in delivering food as medicine through the FoodRx programme; offered 42 specific recommendations through the Food Access chapter of the Comprehensive Plan; and supported both school feeding programmes and a food access pilot project for older adults (City of Baltimore, 2024b).

In Australia, the Victorian Food Security and Food Systems Working Group was established during the COVID-19 pandemic. It is an example of grassroots social innovation and co-governance supported by state led resourcing (Carey and Murphy, 202 5). The working group was established by VicHealth, a statutory Victorian Government agency focused on health promotion. It coordinated actions across a wide range of civil society organizations and local and state governments with an immediate focus on addressing food insecurity during the pandemic. Over time, the working group collaborated on the development of a consensus statement to transform Victoria's food system towards becoming more healthy, regenerative and equitable (Victorian Food Security and Food Systems Working Group, 2022). Another example in Andhra Pradesh demonstrates effective partnership between the state and local communities supporting ecological transition and improved livelihoods and yields (Box 6).

## BOX 6
## STATE PARTNERED COMMUNITY NATURAL FARMING IN ANDHRA PRADESH, INDIA

Andhra Pradesh Community Managed Natural Farming (APCNF) is an example of a state partnership that supports ecological transitions. APCNF is now considered the largest agroecological transition in the world, with nearly a million farmers engaged in the transition (CIRAD 2023; GIST Impact 2023). APCNF production practices rely on a set of principles and practices that include pre-monsoon seeding, a large selection of indigenous seeds (30 varieties), natural inputs derived and processed at the farm level, integrated crop planting, and crop cover 365 days a year. The integration of fruit bearing trees, creeper vegetables (e.g. cucumbers), flowers, root vegetables, and herbs between rice plots, contributes to diversification, nutrition, income, run-off reduction, and risk management (e.g. managing pests). A complementary market garden approach produces crops year-round for household consumption and market sales. It is combined on farm with market-based field crops (e.g. rice, cotton), enabling farmers to access food and income throughout the year.

The APCNF model contributes to resilience by improving livelihoods and yields, enhancing soil quality, creating more resilient environments, and shifting dietary regimes towards more nutritious foods for families (Bharucha et al., 2020; Durga, 2023; Duddigan et al., 2023; Durga, 2023). In addition, researchers have estimated that transitioning to APCNF could reduce emissions from food production by an average of 46 percent (Rosenstock et al., 2025). The practices included in the APCNF model can improve the soil root systems and physiology of the plants, thus increasing agroecosystem resilience (Kumar et al., 2024). For example, in recent years, while cyclones have devastated conventional farm fields across Andhra Pradesh, APCNF farmers and crop systems have demonstrated an increased ability to withstand shocks such as flooding and drought, making the APCNF farms more resilient to climate pressures (see https://www.youtube.com/watch?v=bdXCp1scSAw).

Integrated governance is key to community natural farming projects. Initiated and funded by the Andhra Pradesh state government in 2016, Rythu Sadhikara Samstha is a not-for-profit company that works to pair increased capacity and agency of individuals and communities with structural change at the government level. Further, the governance and expansion of APCNF relies on the engagement of women's groups across Andhra Pradesh and farmer to farmer learning, with most adopters focusing first on a small part of their fields and eventually transitioning the entire farm.

To bridge a gap in consistent, available, high quality data for decision makers and to empower the farmers behind the transition, the Global Agroecology Academy (see https://courses.apcnf.in/aboutus) and the farmer scientist programme has created pathways for community leaders to earn a degree through a combination of classroom and field activities, the latter including pest identification, crop planning, mentorship and data collection (RySS, n.d.). The farmer scientists are also harnessing the collective power of APCNF farmers to demonstrate aggregated results of agroecological transitions through consistent and high-quality data on yields, livelihoods, nutrition, pests and soil quality.

The adoption of natural farming is voluntary, and while some farmers have adopted the APCNF practices, others have yet to transition. As such, chemical inputs are still available. Rather than a federal ban on chemicals, farmers are learning how to transition away from costly inputs towards integrated, ecological farming practices that enhance yields and livelihoods. This transition is happening through networks based on trust, farmer scientists and demonstration farms. Simply put, the outcomes of natural farming transitions are driving national uptake. In 2024, the Government of India announced a national effort to support agroecology. The Mission on Natural Farming was announced to support a shift that "follows local agro ecological principles rooted in local knowledge, location specific technologies and has evolved as per the local agro-ecology" (Government of India 2024).

(CONTINUED FROM BOX 6)

*Sources:* GIST Impact. 2023. *Natural Farming Through a Wide-Angle Lens: True Cost Accounting Study of Community Managed Natural Farming in Andhra Pradesh, India*. India and Switzerland, GIST Impact, Global Alliance for the Future of Food. https://www.gistimpact.com/groundbreaking-comparative-study-reveals-natural-farming-leads-for-yields-livelihoods-and-health/; Bharucha, Z.P., Mitjans, S.B. and Pretty, J. 2020. Towards redesign at scale through zero budget natural farming in Andhra Pradesh, India. International. *Journal of Agricultural Sustainability*, 18(1): 1–20. https://doi.org/10.1080/14735903.2019.1694465; Government of India, 2024; Durga, L., Bharath, Y., Bliznashka, L., Kumar, V., Jonnala, V., Chekka, V., Yebushi, S. et al., 2023. *Impact of a nutrition-sensitive agroecology program in Andhra Pradesh, India, on dietary diversity, nutritional status, and child development*. medRxiv,. [Cited 4 July 2025]. http://medrxiv.org/lookup/doi/10.1101/2023.05.16.23290036; Duddigan, S., Shaw, L.J., Sizmur, T., Gogu, D., Hussain, Z., Jirra, K., Kaliki, H. et al., 2023. Natural farming improves crop yield in SE India when compared to conventional or organic systems by enhancing soil quality. *Agronomy for Sustainable Development*, 43(2): 31. https://doi.org/10.1007/s13593-023-00884-x; Kumar, A., Brar, G.S., Kaushal, S. and Shubham. 2024. Sustainable Development Attributes of Zero Budget Natural Farming (ZBNF) to Agricultural Practices. *Asian Journal of Soil Science and Plant Nutrition*, 10(2): 205–214. https://doi.org/10.9734/ajsspn/2024/v10i2277

#### 4.1.1.2 Global governance, policy coherence and the most affected

The UN develops frameworks and guidelines regarding global issues that can operate and provide norms across scales. These norms, such as those promoted by the UNDRIP and the UNDROP, seek to lessen marginalization and acknowledge the inherent human rights of all people (e.g. the right to a safe working environment and the right to access traditional foodways) (UN General Assembly, 2007; UNCHR, 2018). Accessing and fulfilling these rights lowers the vulnerability of individuals to shocks and stresses, but it takes time to integrate these policies and build policy coherence.

Ensuring these declarations and rights-based frameworks are fully realized and reflected in policies is an important step towards resilience for all countries where implementation and protection happens at the national and jurisdictional scales. This can be realized through national legislation that formally recognizes, for example, the **rights of nature** in support of community FSN and the protection of livelihoods. India's Forest Rights Act helps Indigenous and forest dependent communities gain legal access to traditional lands. Forest rights support communities in sustaining ecologically sensitive food production, while preserving biodiversity and enabling FSN (Kurup and Bhaya, 2020). According to the Ministry of Tribal Affairs, the act encompasses both individual and community rights related to cultivation and habitation.

The rights outlined in the act include the right to access lands and waterways, and to apply traditional knowledges. In addition, the governance of the act incorporates processes that enable tribal communities to engage in the development of policies and programmes that impact them locally. Actions carried out under the act also help realize national commitments to the SDGs and India's nationally determined contributions (Kurup and Bhaya, 2020).

### 4.1.2 BUILDING EQUITABLY TRANSFORMATIVE RESILIENCE THROUGH POLICY COHERENCE

A number of policy initiatives and programmes, in areas such as finance, land reform, labour, social protection and school feeding programmes, help clarify how policy coherence can contribute to ETR.

#### Finance

Transforming how food systems are financed is a vital area for ETR, including reducing the historical and future indebtedness of vulnerable people and countries, and investing in the long-term process of building ETR, including by reinvesting profits into food systems and into the livelihoods of the most vulnerable actors.

Inclusive, democratic and equitable provision of financial investment, credit and resources is an important component of the capacity of public and private actors to respond to

shocks and build resilient food systems. An Organisation for Economic Co-operation and Development analysis of the performance of small and medium-sized enterprises (SMEs) during and after the COVID-19 pandemic stressed the importance of "avoiding MSME over indebtedness, fostering a diverse range of financial instruments, stimulating business creation and strengthening MSME resilience through structural measures" (OECD, 2020, p. 1).

To contribute to ETR, financial mechanisms must be designed to be democratic, inclusive and respectful of the needs and rights of the most vulnerable and must extend along the entire food system. In some cases, smaller and women-led agrifood enterprises can be less resilient to shocks, as observed in Nigeria and Türkiye during the COVID-19 pandemic (McCarthy 2025; Minten, Belton and Reardon, 2023; Ekin, 2024), partly due to less access to credit and other pre-shock financial constraints. As such, digital finance and inclusive financial technologies and mechanisms can help in building resilience. These are shown to contribute positively to food security (Lin *et al.,* 2022; Liu and Ren, 2023), especially when designed as to redress common barriers to accessing credit, savings and insurance (Mapanje *et al.,* 2023; Idika *et al.,* 2024). Local funding may also be a key component of financial resilience, as reliance on foreign capital also undermines the resilience of enterprises (Ekin, 2024). In particular, "overcoming barriers to agricultural credit financing requires a systematic and multi-faceted approach involving various stakeholders, including governments, financial institutions, agricultural development organizations and farmers themselves" (Mapanje *et al.,* 2023, p. 1).

Emerging innovative financial mechanisms, such as blended finance, outcome-based finance, and resilience bonds, can contribute to making financial resources available and accessible for resilient food systems (Lipper *et al.,* 2021; Diaz-Bonilla, Swinnen and Vos, 2021). However, such financing instruments often lack the inclusivity and accessibility required to contribute to food systems resilience. Wattel et al. (2024) showed that many innovative financial mechanisms designed for food systems transformation remained inaccessible to smallholders, especially women and youth. This was because they relied on inaccessible formal institutions, involved high upfront costs, and in many cases did not suitably incorporate agricultural growing cycles.

Public and social financing (including impact investing and government support) can help attract financial resources to regenerative food system initiatives (Stephens, 2021; Bosma *et al.,* 2022), contributing to the social and ecological resilience and equity of food systems (Ekin, 2024). However, there are several barriers to implementing social finance practices for regenerative food systems, including that they "do not fit well within existing investment modalities that prioritize quick, tangible returns" and that there is a "perception of finance itself as undermining resilience" (ibid, p. 5). Still, when designed with respect to locality and the specificity of different shocks, concessional or impact finance tools with low interest can contribute to the resilience of agricultural and food systems and support their ability to adapt and respond to economic shocks, pandemics, conflict and natural disasters (Minten, Belton and Reardon, 2023).

### Land reform

Secure access to land is a foundational requirement for smallholder farmers and the communities they nourish. The CFS Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security can inform approaches to governance across scales. The Voluntary Guidelines were largely considered an early success after the CFS reform process in 2009, as the guidelines were a product of intentional collaboration and consensus building that centred on the most affected (Bekh *et al.,* 2015). It is a model that can inspire other processes.

As traditional, communal land management has come under pressure from the

formalization of individual property rights and land acquisitions, those lacking secure land tenure have had to look for new ways of (re)claiming land (e.g. Ghana, in Ghebru and Lambrecht, 2017). In Kenya, pastoralists have been working collectively with organizations to support climate resilient grazing practices while respecting and strengthening Indigenous Peoples' rights. Kenya's Rights-based and Agroecological Initiatives for Sustainability and Equity in Peasant Communities project puts an emphasis on empowering peasants to know their rights and engage in policy processes such as legislative reviews. This is consistent with other initiatives across Africa that link land rights with FSN (Onyeaka *et al.*, 2024). Similar efforts in Brazil have highlighted the land rights of the most vulnerable, while promoting agroecology and improving farmer resilience (Box 7).

BOX 7

## LAND REFORM AND THE LANDLESS RURAL WORKERS' MOVEMENT

Working towards a more equitable world since 1984, the Movimento dos Trabalhadores Rurais Sem Terra (Landless Rural Workers' Movement, or MST) has become the largest social movement in Latin America. Since the 1990s, MST settlements have been engaging with other global movements such as La Via Campesina to explore, engage and broaden concepts of agroecology (Borsatto and Souza-Esquerdo, 2019). For example, De Melo (2024) highlights the institutionalization of a lesbian, gay, bisexual and transgender collective that has helped raise the profile and voices of those within the movement who have been marginalized. In Brazil's Cerrado, where MST leadership encouraged the adoption of agroecology, farmers in regional agroecological marketing cooperatives (such as the Associação Regional dos Produtores Agroecológicas [Regional Association of Agroecological Farmers]) were found to achieve higher overall resilience across eight community identified indicators (Blesch and Wittman, 2015). In 2001, MST transcended the local scale to demand justice and a more equitable world on the global stage through the World Social Forum Alliance, demonstrating the importance of connecting local and global scales.

*Sources:* Borsatto, R.S. and Souza-Esquerdo, V.F. 2019. MST's experience in leveraging agroecology in rural settlements: lessons, achievements, and challenges. *Agroecology and Sustainable Food Systems*, 43(7–8): 915–935. https://doi.org/10.1080/21683565.2019.1615024; Blesch and Wittman, 2015



### Labour

Food systems with equitably transformative resilience are founded on social and economic resilience, which is inextricably linked to the protection of employment availability and protection against labour market vulnerabilities. Ensuring the application of labour legislation, including international labour standards and national legislation (covering occupational safety and health, social security and workers' rights) for all food system workers is essential to ensure their capacity to be resilient to shocks and stresses.

Other human rights instruments, such as UNDROP, include important considerations related to workers' rights. In particular, UNDROP includes the right to refuse the handling of or exposure to hazardous chemicals, the right to fair pay (e.g. a living wage), access to collective bargaining, and the dismantling of discriminatory labour practices in agriculture (such as the exemption to minimum wage and the denial of the right to unionize) (UNHCR, 2018). Protecting workers and food producers from exploitation and uncertainties in labour markets and food systems enhances their capacity to respond to

shocks and stresses and enables their agency, making food systems more economically and socially resilient. India's experiences with public hearings for accountability show how workers can assert their agency to influence employment schemes, using rights-based processes to support rural workers (Box 8) (Pande, 2021).

*Leveraging public programmes for equitably transformative resilience: social protection*

Social protection is widely recognized as a critical policy instrument for building resilience by contributing to the absorptive, anticipatory, adaptive and transformative capacities of those facing shocks and stresses.

BOX 8

## EMPOWERING THE MARGINALIZED: JAN SUNWAIS AS A TOOL FOR ACCOUNTABILITY AND THE REALIZATION OF RIGHTS

Jan Sunwais, or public hearings, emerged from grassroots struggles in India during the 1990s to address discrepancies in wages and public works under employment schemes. Jan Sunwais are platforms where community members critically evaluate the execution of government programmes and policies and the activities of private entities. The Mazdoor Kisan Shakti Sangathan, a collective of workers and farmers in Rajasthan, organized the first Jan Sunwai in 1994. Community members openly voice grievances, demand accountability and engage with officials regarding programme entitlement, execution and targeting, referring to publicly available muster rolls or payment records to expose irregularities. These day long public hearings are attended by journalists, retired civil servants or judges, public officials and elected representatives. The Jan Sunwais creates a temporary space where the terms of exchange between villagers and local government representatives are altered, creating an environment without fear of reprisal.

The well-known Mahatma Gandhi National Rural Employment Guarantee Scheme, which is based on the Right to Work Act, provides a legal guarantee to up to 100 days of employment during a financial year to any rural household willing to do unskilled manual work at established state minimum wages. This is guaranteed regardless of funding availability. The act mandates social audits to ensure accountability and transparency in delivering guaranteed wage employment, with Jan Sunwais serving as a key mechanism for these audits. Progress has been uneven across states, with Jan Sunwais now being a state led process in some states; a bottom up, civil society led process in other states (as in Rajasthan); and a collaboration between civil society and the state in still other states.

Today, the government also mandates social audits in several other schemes, covering food security, persons with disabilities, and the Building and Other Construction Workers Act. By making governance processes transparent and inclusive, Jan Sunwais can help realize critical rights such as the right to work and the right to food, thus strengthening social justice.

*Source:* Pande, S. 2021. *Social Audits in India: Institutionalizing Citizen Oversight.* In: Accountability Research Center. [Cited 7 July 2025]. https://accountabilityresearch.org/social-audits-in-india-institutionalizing-citizen-oversight/



Its role is acknowledged across key international frameworks, agreements and scientific reports shaping sustainable development and resilience agendas, including the Agenda 2030; the Sendai Framework for Disaster Risk Reduction 2015–2030; the Intergovernmental Panel on Climate Change's Sixth Assessment Report; the Just Transition Work Programme; the Emirates Declaration on Sustainable Agriculture, Resilient Food Systems, and Climate Action; and the Global Alliance against Poverty and Hunger. Although various agencies define social protection differently, there is a general consensus that "Social protection is a set of policies and programmes aimed at

preventing and protecting all people against poverty, vulnerability and social exclusion, throughout their life cycle placing a particular emphasis on vulnerable groups" (SPIAC-B, 2019, p. 1). Broadly, it encompasses three types of programmes: i) social assistance: non-contributory programmes that ensure households and individuals maintain a minimum level of income and consumption; ii) social insurance: contributory programmes (sometimes subsidized) that protect against various life cycle risks, and iii) labour market programmes: aimed at working age populations that enhance employability and boost earning potential.

Social protection enhances the capacity of the most vulnerable social groups to withstand shocks and stresses (Devereux *et al.,* 2024; Burchi and Loewe, 2022). It helps individuals and communities not only bounce back (by absorbing the impacts of shocks, smoothing consumption, preventing negative coping mechanisms, and reducing immediate vulnerability), but also helps them bounce forward by building long-term capacity and agency, promoting equity and supporting the realization of rights. **Cash transfer programmes**, for example, not only provide protection against immediate deprivation (Bastagli *et al.,* 2016) but also prevent further economic decline and promote long-term investments in human development in areas such as health, education, skill building and asset creation (Baird *et al.,* 2014). Such programmes have helped households overcome financial constraints, manage risks and invest in assets, livelihoods and income diversification (Tirivayi, Knowles and Davis, 2013; Asfaw and Davis, 2018; Handa *et al.,* 2018). This multifaceted capacity underscores the critical role of social protection programmes in strengthening resilience across multiple dimensions.

**Environmental cash transfers**, where payments are linked to adopting sustainable practices or compensating for restricted ecosystem access, and **public employment programmes**, demonstrate potential in supporting natural resource management and ecosystem restoration. However, challenges such as financial sustainability and community participation highlight the need for participatory approaches and long-term funding mechanisms (Bhalla *et al.,* 2024). Public employment programmes, such as India's Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA) and Ethiopia's Productive Safety Net Programme, have also provided critical relief during crises. MGNREGA includes provisions to prevent discrimination based on gender and caste (Tenzing, 2020), while participatory and accountability mechanisms, such as social audits, empower marginalized groups to claim rights, hold service providers accountable, and influence programme decisions (Box 8).

Social protection systems are critical in contexts of fragility, conflict, and protracted crises, where they can serve as both a lifeline for meeting urgent needs and a platform for long-term development, stability, and peacebuilding, even amid contested governance. This requires addressing needs across the humanitarian–development–peace nexus, investing in local social protection delivery capacity and fit for purpose digital tools (Smith, 2025). In this context, concepts such as adaptive social protection, (originally introduced in relation to climate resilience) and shock-responsive social protection (which focuses on scaling programmes during crises) have gained traction as frameworks for building more flexible, timely and risk-informed systems (Tenzing, 2020). These approaches emphasise the integration of social protection with disaster risk management and humanitarian assistance, and highlight its role in anticipating, responding, and adapting to a range of shocks and stresses.

Social protection systems also play a critical role in absorbing the impacts of crises and can systematically incorporate anticipatory action approaches in advance of forecasted shocks (FAO, 2023; Bharadwaj, Mitchell and Karthikeyan, 2023; Costella et al.et al., 2017). Additionally, social protection can help manage risks arising

from climate change (Costella *et al.,* 2023). A review by Bhalla *et al.* (2024) describes how social protection can facilitate climate adaptation by: i) increasing the adoption of climate adaptive agricultural practices and technologies, ii) enabling diversification to include income sources and livelihoods that are less sensitive to climate variability, and iii) contributing to natural resource management and ecosystem restoration. However, social protection programmes should explicitly incorporate specific elements that address climate change in order to build adaptive capacity and coverage should be extended to those most vulnerable who most need these interventions. Moreover, social protection plays an important role in easing the impact of climate mitigation policies by ensuring fairness and equity in the shift to a green economy.

Social protection programmes also serve as vital macroeconomic stabilizers during times of crisis. During covariate shocks, such as COVID-19, social protection provided liquidity and increased local spending, which supports businesses, preserves jobs and boosts aggregate demand. As a fiscal stimulus, it has strong multiplier effects due to higher consumption among low-income households (Behrendt, 2013; Bhalla *et al.,* 2021).

As previously mentioned, transformative change requires a systems approach. In this regard, social protection programmes should be aligned with complementary nutrition initiatives, climate action, livelihood programmes and employment policies. The focus on livelihoods usually takes the form of economic inclusion programmes that address multiple barriers to accessing sustainable livelihoods (Arévalo-Sánchez et al. 2024), which can support bouncing forward. Such integration strengthens linkages across sectors, addressing root causes of vulnerability, reducing social inequalities and enhancing resilience over the long term. In doing so, it is important that social protection programmes use a rights based approach to extend coverage, ensure participation and accountability mechanisms, and incorporate gender sensitivity and a gender transformative lens to advance women's empowerment (Kundo *et al.,* 2024) to ensure the programmes contribute to building transformative capacity and reducing social inequalities.

Achieving multiple objectives within social protection programmes is complex. Ulrichs et al. (2019) stress the importance of **not losing sight of the basics** – the first step towards transformative social protection is expanding coverage and improving its delivery to ensure it is timely, reliable, consistent and adequate. At present, only 9.7 percent of the population in low-income countries is covered by at least one social protection benefit (ILO, 2024). Increasing coverage and strengthening the foundations of social protection at national and subnational levels is therefore crucial to effectively support resilience capacities.

### Leveraging public programmes for equitably transformative resilience: stockholding

Extreme weather events continually jeopardize agricultural production and leave an increasing number of people food insecure. Public food stocks are thus a relevant policy tool for improving a populations' resilience, stabilizing prices, maintaining access to foodstuffs in times of crisis and controlling market volatility. Since 2007/08, and even more so since the war in Ukraine, there has been renewed interest in public stocks. Public stockholding allows grain to be purchased on local or international markets, stored, then distributed or resold when needed. Public stocks aim to stabilize the availability of grain, protecting populations from the inherently fluctuating nature of agricultural production and reducing the economic pressure experienced by producers (especially smallholders) due to the fluctuations and volatility of highly financialized commodity markets (van Huellen and Abubakar, 2021). The HLPE-FSN's 2011 report recognized that "the relationship between stock levels and price volatility is well established: low stocks are strongly associated with price spikes and volatility" (HLPE, 2011, p. 12). As amplified by FAO in 2021, "ample stocks can provide a cushion against supply and demand shocks, preventing eventual shortages and instilling

confidence in markets." (FAO, 2021b, p. 2). So, while the implementation modalities of public stockholding programmes in countries have been contested at the World Trade Organization, they are an important policy mechanism to achieve FSN. Better and transparent information systems, such as with the Agricultural Market Information System (AMIS), an inter-agency platform for food market transparency, are essential for policy decisions and management of stocks (Nakuja, 2018). (See also Section 4.2.2.)

Although the objectives and scope vary widely, public stockholding initiatives have nevertheless made interesting progress combating food insecurity and supporting domestic production. For example, the Economic Community of West African States' three level storage strategy (local, national and regional) consists of physical grain stocks and financial reserves to respond to different levels of crisis. The regional reserve has been used 19 times since 2017 to support 6 countries in the region with a total of 55 000 metric tons of cereals (Maduna, 2022). The stocks contribute regional resilience to economic, climate, health and security shocks by reducing the cost of crises to humans and capital. As shocks increase, the physical and financial reserves will need to be expanded, and the strategy will need to be integrated with other social protection programmes to best contribute to regional food security and resilience (ECOWAS Commission, 2021).

### Leveraging public programmes for equitably transformative resilience in food systems: school feeding programmes

Public procurement represents a significant opportunity for governments and institutions to use public laws, regulations and funds to support various dimensions of FSN and socioecological interdependencies (Morgan 2025). School feeding programmes, as one variation of public procurement, reach 418 million children worldwide, making them one of the most widely used ways to provide social protection. Still, only 18 percent of children in low-income countries receive a daily, nutritious meal in school, revealing gaps in coverage (Alderman *et al.,* 2024). The primary goals of school feeding programmes are to increase school enrolment and retention, and address hunger and malnutrition by supplementing children's food intake. This is especially beneficial for girls who experience structural discrimination and disadvantages and often have less access to education and health services. Additionally, school feeding programmes typically purchase foods from local smallholder farmers. When designed as "homegrown" programmes they can enhance local agricultural value chain development and contribute to food system transformation, encouraging local food production, creating jobs along the food supply chain (including in food canteens), and offering producers greater certainty regarding market access and terms of trade (Bhalla *et al.,* 2024). Improving FSN for children and providing more stable markets and livelihoods for local farmers reduces stresses and enhances overall resilience if shocks occur.

Laws to solidify equitable access to institutional markets for family farmers, traditional communities, and women help to bring about structural changes, enabling transformation to equitable resilience in food systems. For example, in Brazil, Law No. 11.947/2009 establishes that at least 30 percent of the federal resources allocated to the PNAE (National School Feeding Programme) must be used to directly purchase products from family farms and rural family entrepreneurs or their organizations. While these targets are not always achieved (Oliveira *et al.,* 2024), this helps to ensure consistent funding, operational support and inclusivity. The PNAE supports the integration of public procurement with education, agriculture and nutrition sectors to promote sustainable food systems, while the PNAE monitoring platform ensures transparency and accountability. Further, the emphasis on family farming strengthens rural livelihoods and facilitates access to the programme by women and Indigenous Peoples. For example, when food is purchased from a rural family, at least 50 percent of the value must be acquired in the woman's name (Law no. 14.660/2023).

Daily, PNAE provides meals to 40 million students and helps ensure year round access to nutritious

foods, emphasizing local, minimally processed foods (Vilela, 2025). Subsidized meal programmes prioritize vulnerable populations, including Indigenous Peoples and Quilombola communities, with access addressed through differentiated funding per capita. Nutritional guidelines promote diverse, culturally appropriate diets, and healthy eating habits. The PNAE legislation mandates the participation of Indigenous representatives in school feeding councils in states and municipalities with students from Indigenous areas or Quilombola communities. Importantly, legislative frameworks protect the programme against political changes, ensuring consistent support and stability. Socially and economically, the programme empowers small scale family farmers, promotes short value chains, and respects traditional food practices as part of overall sustainability. The active involvement of school feeding councils and Indigenous representatives ensures participatory governance. Despite its success, some municipalities fail to meet the mandated 30 percent procurement from family farmers, and inflation adjustments for meal costs have been inconsistent, impacting food diversity and equity. In addition, complicated documentation requirements for farmers can undermine participation (Oliveira *et al.,* 2024).

There are also significant school feeding programmes in Ghana, India, Japan and Kenya, among other countries. These programmes focus on locally sourced foods, culturally appropriate nutrition and food-based learning, in addition to ensuring the right to food for all. Kenya provides an example of a food procurement policy in action, where the government has established school feeding programmes that aim to source food from local farmers directly or through aggregate purchasing in areas where population density is low and road networks are inadequate. While the engagement process for smallholder farmers needs to be simplified to increase access, the programme increases literacy around nutrition and food growing, builds skills and local economies, and improves FSN, especially for children. A project in Busia County sourced nutritionally rich indigenous plants to promote biodiversity and provide market access to smallholder farmers (Bhalla, 2023). The Kenyan National School Meals and Nutrition Strategy explicitly links smallholder farmers to school meals by procuring directly from these suppliers, where possible. The emphasis on school gardens as a platform for nutritional and vocational education also fosters community engagement and can supplement school meals with locally grown fruits and vegetables, promoting dietary sustainability. One pilot within the programme demonstrated the feasibility of linking public procurement with the cultivation of local, nutritious and biodiverse crops such as African leafy vegetables, improving nutrition, conserving biodiversity and developing value chains at the local level (Bhalla, 2023).

The Ghana School Feeding Programme (GSFP), launched in 2005, is a government led social intervention aimed at improving school enrolment, attendance and the nutritional status of pupils in public primary schools, particularly in low-income communities. The programme provides one hot, nutritious lunch daily to children in kindergarten and primary schools (Ministry of Gender, Children and Social Protection, 2017). Meals served under the GSFP are based on typical Ghanaian diets (World Food Programme, 2025) and are designed by nutritionists to ensure a balance of carbohydrates, proteins and vegetables to support healthy growth and learning (MoGCSP, 2021). The GSFP follows a homegrown school feeding model, sourcing food from local farmers to boost the rural economy and support national agricultural development. It also creates employment opportunities, particularly for women, many of whom serve as caterers and cooks within the programme (Mohammed, 2021). The programme is funded primarily by the Government of Ghana, with technical and financial support from development partners such as the World Food Programme (WFP), SEND Ghana and SNV (WFP, 2019; MoGCSP, 2021). Funding is allocated through the national budget, but challenges such as delayed disbursements and rising food prices can affect meal quality and consistency (SEND Ghana, 2014). Currently, the GSFP benefits over 3 million children across all 16 regions of Ghana

(MoGCSP, 2021). Importantly, the programme is coordinated by the Ministry of Gender, Children and Social Protection, in collaboration with the ministries of education and food and agriculture. Targeting is based on poverty and vulnerability indicators to ensure support reaches the most disadvantaged areas (SEND Ghana, 2020). Despite its achievements, the programme faces challenges, including infrastructure gaps, inconsistent meal delivery, weak monitoring systems, and limited community oversight. Strengthening accountability, integrating school gardens, decentralizing food procurement, and ensuring timely and adequate funding are essential for long-term sustainability (SEND Ghana, 2020).

These examples illustrate interventions that are working to bounce food systems forward towards ETR by building territorial market connections and socioecological interdependencies.

## 4.2 EMERGENCY PREPAREDNESS, CONTINGENCY PLANNING AND FORESIGHT

FSN is threatened by environmental, economic, health, social and political shocks and stresses. Global hunger rose sharply during the COVID-19 pandemic (2019–2021) and prevalence now remains around 9 percent (FAO *et al.*, 2024). Nearly 282 million people experienced high levels of acute food insecurity (IPC/CH Phase 3 and above) in 59 food crisis countries or territories in 2023 (GRFC, 2024). Acute food insecurity occurs when individuals face severe food deprivation that threatens their lives or livelihoods. Acute food insecurity may have long-term (both lifetime and even intergenerational) consequences for children as well as women who are pregnant or lactating. Children are most vulnerable in their first 1 000 days (Box 9), and food insecurity in that window can diminish lifetime

### BOX 9
### THE FIRST 1000 DAYS

The period from pregnancy to the first 2 years of life for a child, known as the "first 1 000 days", is a critical window of opportunity to intervene to improve child nutrition and health (Victora et al., 2008; Cusick and Georgieff, 2016). It is a time of rapid physical growth for the foetus and infant, including brain, metabolism and immune system development (Likhar and Patil, 2022). Nutritional deficiencies during this period are difficult to address through catch up growth later in life. During pregnancy, maternal diet and nutrition are important for maternal health and to ensure the future development of children. This period lays the foundation for a child's future nutrition and health, influencing birth outcomes (such as birthweight), early and subsequent growth, and future earning potential (Martorell, 2017). For infants, introducing complementary foods at 6 months is important, and the inclusion of diverse, nutrient dense, appropriate foods depends on maternal knowledge and household food security. Additionally, childhood up to age 5 is a vulnerable period when children are particularly at risk of malnutrition. Diversified and nutrient rich foods are required during this time to meet micronutrient, protein, energy and other requirements for early child growth and development. Without these, children experience stunting, wasting, underweight, micronutrient deficiencies, or in some regions, overweight and obesity. Globally, poor nutrition contributes to 45 percent of all deaths in children under 5 (Katoch, 2022). Shocks and stresses, such as conflict and climate change, exacerbate these challenges. Resilient and equitable food systems should provide adequate nutrition and diets throughout the life cycle, especially for pregnant and lactating women and for children in the first 1 000 days, as well as throughout childhood. They should ensure that children from poor and vulnerable households, both rural and urban, receive complementary foods of appropriate nutritional quality to support optimal growth and to prevent all forms of malnutrition.

*Sources:* Martorella, R., Improved nutrition in the first 1000 days and adult human capital and health *American Journal of Human Biology*, 29(2): e22952. https://doi.org/10.1002/ajhb.22952; Likhar, A. and Patil, M.S. 2022. Importance of Maternal Nutrition in the First 1,000 Days of Life and Its Effects on Child Development: A Narrative Review. *Cureus*, Oct 8;14(10): e30083. https://doi.org/10.7759/cureus.30083; Katoch, O.R. 2022. Determinants of malnutrition among children: A systematic review. *Nutrition*, 96: 111565. https://doi.org/10.1016/j.nut.2021.111565

health and productivity (Rosen *et al.,* 2024). Chronic food insecurity refers to the persistent inability to access sufficient diets for a healthy and active life, due to underlying structural issues such as poverty and marginalization.

A UN study on peacekeeping suggests that over 40 percent of intrastate conflicts over the past six decades were linked to natural resource issues, such as natural resource exploitation, or climate and ecological stresses (UN Peacekeeping, n.d.). Crises in turn precipitate interconnected, overlapping and multiplicative food system impacts, resulting in so-called polycrises (Lawrence *et al.,* 2024). Recognizing and addressing the overlaps and connections between acute and chronic food insecurity is essential for developing more proactive and effective responses. Conflict, economic shocks and weather extremes interact with each other and with underlying vulnerabilities, such as poverty, to drive and amplify food crises (ibid, 2024).

Moreover, crises are becoming complex and lasting longer. In 2023, 36 countries were experiencing protracted food crises, with 19 experiencing both protracted and severe food crises (GRFC, 2024). On average, humanitarian response plans now span 10 years, with appeals in some countries running continuously for over 20 years (UNOCHA, 2025). In protracted crises a significant portion of the population faces acute vulnerability to hunger, disease and livelihood disruptions over prolonged periods (FAO, 2010). These crises often result from a combination of factors – conflict, environmental degradation, natural and humanmade disasters, climate change, inequality and poor governance – all of which exacerbate the fragility of food systems and drive widespread displacement (CFS, 2015; Fakhri, 2022; GRFC, 2024). They disrupt all six dimensions of food security, leading to severe manifestations such as undernutrition, stunting, wasting, micronutrient deficiencies and even death (HLPE, 2020a; HLPE, 2024)..



## 4.2.1 HUMANITARIAN CRISES

In situations where shocks exceed preparedness capacities, humanitarian relief is essential for addressing urgent needs and protecting lives. This requires the equitable, efficient and safe distribution of aid to all affected communities, with particular attention to those who may be marginalized due to gender, age, disability, ethnicity or displacement. It also requires simultaneously safeguarding agricultural livelihoods and production systems from the impacts of shocks. Sometimes, food aid comes with strings attached (such as food donations tied to donor country commodities). This can exacerbate the vulnerabilities of aid recipients and of local markets (Clapp, 2017). Recognizing this, the WFP quadrupled local and regional purchases from 1999 to 2005, reflected in a growing share of global food aid (more than half of all non US food aid) being purchased in the developing world. The WFP seeks to promote local and regional procurement to stimulate competition, strengthen farmer organizations, and support the development of food marketing infrastructure in the region (Barrett, 2008). While there is limited empirical evidence of this, Barrett (2008) emphasizes that the focus of food aid programmes should be on well targeted food aid to address seasonal liquidity and nutritional constraints, which can increase smallholder productivity and market participation. Equally important are investments in resilient institutional and physical infrastructure that enhance smallholder access to productive assets and improved technologies. Public investments in disaster resilient transportation networks, storage facilities and cold chains are essential for safeguarding food quality and enabling timely, efficient distribution.

The humanitarian community has increasingly recognized the need for more sustainable and coordinated approaches. This shift was reflected in the 2016 Grand Bargain, launched at the World Humanitarian Summit in Istanbul, which emphasized greater efficiency; localization of humanitarian efforts through increased local capacity and leadership; and the integration of humanitarian, development and peacebuilding efforts to address the root causes of crises and build long-term resilience. This is a long-term effort which requires enhancing the capacity and agency of individuals and building equitable governance structures to effectively manage future risks. This also implies better coordination

between humanitarian aid, development aid and climate finance, directed towards food systems.

Addressing food crises requires policies that not only alleviate immediate symptoms but also tackle root causes, so that ETR can be achieved and long-term vulnerability reduced. The Framework for Action for Food Security and Nutrition in Protracted Crises (CFS, 2015), endorsed by the CFS in 2015, provides 11 principles for guiding action in protracted crises. These include meeting critical FSN needs and building resilient livelihoods adapted to the specific challenges of these situations (for instance, by protecting those affected by or at risk from protracted crises, empowering women and girls, supporting evidence based action and stakeholder buy-in and accountability), and contributing to resolving the underlying causes of food insecurity and undernutrition (by peacebuilding through FSN, managing natural resource sustainably and reducing disaster risks, among other actions).

## 4.2.2 CONTINGENCY PLANNING AND EMERGENCY PREPAREDNESS

Food and nutrition crises are often predictable, meaning effective foresight, contingency planning and emergency preparedness can minimize the harm these crises cause and protect FSN. Both short- and long-term approaches are required to identify how to bounce back and bounce forward. Foresight work can be mobilized to plan and strategize ways to equitably transform our food systems for resilience. Systems – including early warning systems, supply chain and logistics networks, social protection mechanisms and coordination platforms – need to be strengthened to enable swift mobilization and efficient distribution of emergency food supplies and associated logistics. These actions must be anchored in broader intersectoral policies covering areas such as agriculture, health and infrastructure.

Preparedness and contingency planning are important elements of disaster risk reduction strategies and polices, which are "aimed at preventing the creation of disaster risk, the reduction of existing risk and the strengthening of economic, social, health and environmental resilience" (UNDRR, 2017). The Sendai Framework Terminology on Disaster Risk Reduction aims to promote a shared understanding of disaster risk reduction concepts.

Preparedness refers to the knowledge, capacities and actions developed in advance by governments, organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely or imminent disasters. It is grounded in risk analysis and is closely linked with early warning systems and includes activities such as contingency planning (UNDRR, 2017).

Contingency planning, in turn, is a management process that analyses disaster risk based on possible emergency scenarios and establishes arrangements in advance for organized and coordinated action. It defines clear institutional roles, allocates resources, outlines information flows, and sets operational procedures for specific actors, enabling timely, effective and appropriate responses (UNDRR, 2017).

Shocks and disruptions range from climate and environmental disasters to geopolitical conflicts, economic disturbances and health and biosafety situations. While different shocks require tailored responses, policy actions such as multihazard early warning systems (MHEWS) help anticipate and mitigate the impacts of various hazards (Box 10).

Progress is being made in setting up these systems. As of March 2024, there were 108 countries which reported having MHEWS, more than double the number in 2015 (52 countries). However, fewer than half of the least developed countries and only a third of the small island developing states have these systems in place, and limited disaster risk knowledge, operational systems and infrastructure limits their effectiveness.

Countries with "limited" to "moderate" MHEWS comprehensiveness have a six times higher disaster related mortality ratio and four times more disaster-affected people compared to countries with "substantial" to "comprehensive" MHEWS (UNDRR and WMO, 2024). Anticipatory action, based on early warning information, involves taking proactive measures to reduce the impact of disasters on food systems before they occur.

## BOX 10
## EARLY WARNING SYSTEMS

Developed by the United States Agency for International Development in 1985, the Famine Early Warning Systems Network (FEWS NET) tracks food insecurity in humanitarian and other food insecure regions in at least 30 countries. It collects data on acute food insecurity and other shocks in global food supply systems that could lead to famine or food insecurity.

Central to the operations of FEWS NET is its support for and coordination with local governments and stakeholders to understand local livelihoods and vulnerabilities as a basis for assessing the impact of shocks (including conflict, economic instability and climate hazards), on household food security, livelihoods and incomes. FEWS NET supports, coordinates and collaborates on activities in countries, such as annual vulnerability assessments and tracking and reporting on the seasonality of food prices for staples and other items in national food baskets. Additional activities supported by FEWS NET include collecting data through the United States Geological Survey climate services to predict weather hazards and providing a data portal with geospatial data, satellite images and other products for climate and global drought monitoring. Further activities supported by FEWS NET include agrometeorological analysis, food security monitoring, climate hazard and seasonal climate forecasting.

Funding for FEWS NET was temporarily halted and then resumed in May 2025. It is unclear if all previous functions will be restored.

*Source:* AIR, 2025; Semba, R.D., Askari, S., Gibson, S., Bloem, M.W. and Kraemer, K. 2022. The Potential Impact of Climate Change on the Micronutrient-Rich Food Supply. *Advances in Nutrition*, 13(1): 80–100. https://doi.org/10.1093/advances/nmab104; https://fews.net/

Some examples of food security and agricultural early warning systems (Box 10) include FAO's Global Information and Early Warning System, the Famine Early Warning Systems Network of the United States Agency for International Development, the Monitoring Agricultural Resources Crop Yield Forecasting System, the U.S. Department of Agriculture's Foreign Agricultural Service, and the WFP's World Food Programme Seasonal Monitor. These systems provide alerts regarding ongoing or anticipated food security crises at national and regional levels, using information on food prices, production and supply levels, and harvest and weather forecasts.

One example of early warning systems at the national level is Ethiopia's Livelihoods, Early Assessment and Protection tool and the Livelihood Impact Analysis Sheet, which feed into the country's flagship social protection programme – the Productive Safety Net Programme. The programme integrates a drought response mechanism enabling rapid scale up to include additional beneficiaries facing food insecurity. During the 2011 Horn of Africa drought, the programme quickly extended support to 3.1 million more people over 3 months. Its direct connection to early warning systems allowed for a response within two months, faster than the eight month response time that humanitarian appeals took (Gustafson, 2019). In Mozambique, in October 2023, an anticipatory action project to address the risk of an El Niño induced drought, undertook the following key actions: community mobilization and awareness meetings to disseminate early warning; training on water efficient agricultural practices; and access to drought tolerant seeds, organic enhanced fertilizers, and farming tools (through vouchers) to sustain food production during the drought. These actions reduced livestock mortality rates and increased crop yields (UNDRR and WMO, 2024).

An important element of food systems preparedness is establishing a baseline. Baseline food assessments, or food asset maps

(Soma *et al.,* 2022) can help to understand the infrastructural, social and community gaps to be addressed by investments, as well as understanding community and infrastructural strengths that can be mobilized during emergencies.

The Centre for a Liveable Future at Johns Hopkins University developed a guide entitled Food System Resilience: A Planning Guide for Local Governments (Moore, Biehl, Burke *et al.,* 2022) centred on equity and justice in resilience. The guide provides a step by step process that local governments in the United States of America can use to assess local food systems and define the strategy and scope of food systems resiliency interventions and implement and evaluate them. The initial steps are to: identify partners, stakeholders and their roles in an emergency; conduct a jurisdictional inventory and a scan of relevant policies/plans; assess baseline food systems functioning; identify potential hazards via hazard assessments; conduct vulnerability and risk assessments; and develop appropriate strategies based on identified vulnerabilities and hazards. For example, a city might identify vulnerabilities around mobility and food access linked to weak public transportation systems to food markets.

Along the same lines, the Disaster Resilience Scorecard for Cities: Food System Resilience Module, developed by United Nations Office for Disaster Risk Reduction and partners, is a tool for local governments to evaluate and improve the resilience of their food systems against various shocks and stresses (UNDRR, 2017). Community level emergency preparedness can utilize centralized resources such as school feeding services, kitchen space and warehouse space for emergency feeding (Preston, 2023). Effective preparedness also benefits from educational resources and strong social networks to build community capacity (Levac, Toal-Sullivan and O'Sullivan, 2012). Local governments can integrate these elements into broader preparedness plans to strengthen food security during emergencies.

Food crises can arise from a range of disruptions across and beyond the food system: supply chain disruptions, production disruptions and economic shocks and downturns that reduce purchasing power and food access and increase prices. Addressing each of these different types of disturbances requires tailored policy tools.

For supply chain disruptions, such as trade barriers or transport blockages, governments can maintain public food stocks, establish strategic transport corridors, and engage in trade facilitation to ensure food continues to move efficiently and guarantee the final availability and quality of food.

For production shocks caused by climate change related events, investing in the take up of appropriate agricultural practices and facilitating access to productive resources is required.

Economic shocks, such as food inflation, warrant scaling up social protection programmes such as cash transfers and school feeding to ensure access to food for the most vulnerable. Public food stockholding can be a particularly versatile tool for reinforcing food security across multiple risks by maintaining supply levels, stabilizing prices, and providing emergency food assistance when domestic production or imports are affected.

Following the COVID-19 pandemic, there has been renewed focus on building public food stocks to address price and supply volatility and safeguard food security. Depending on production and trading structures, there is considerable variation in how countries procure and manage food stocks.

Maintaining public food stocks is challenging for low income countries with limited national budgets. For such contexts, experiences in Southeast Asia, with the ASEAN Plus Three Emergency Rice Reserve (APTERR), and in West Africa, with the ECOWAS Regional Food Security Reserve (see Section 4.1.2), demonstrate the potential of cost sharing and mutual support in times of crisis. While these regional arrangements demonstrate potential, increased financial and infrastructure investments are required, with careful attention to governance frameworks that effectively address unequal

power dynamics between large and small producers and traders (IATP, 2024).

### 4.2.3 FORESIGHT PLANNING

Since the 1990s, foresight methods have been used in major environmental assessments, such as the Millennium Ecosystem Assessment and the assessments of the Intergovernmental Panel on Climate Change and the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (Ash *et al.*, 2010). Particularly, scenario planning methods have been used to explore future uncertainties, to determine how current interactions between driving forces might play out in the future, and to identify the emerging drivers that might become more important over time. A better understanding of what the future might hold can help adjust decisions effectively today, but also better prepare for potential impacts of anticipated hazards, such as environmental stresses or political strife, that might grow in importance (Ash *et al.*, 2010). Thus, foresight can be an important tool for contingency planning and emergency preparedness.

There are a wide variety of foresight methods used to investigate different aspects of the future. Scenario planning methods have been used to explore a wide array of future risks and uncertainties and are becoming a more common feature for many discussions around food system transformation and resilience building. Often, these processes begin with food system assessment, that can rely on quantitative and/or qualitative participatory methods, to describe the current state and vulnerabilities of a particular food system. To this assessment is added an analysis of past and current driving forces shaping the elements and structure of the food system and its FSN and other outcomes. A deep analysis of important trends and drivers that will continue in the future, as well as new factors that might shape the future, helps to discern a set of "what if" narratives that describe how different futures might develop. Finally, an analysis of the scenarios allows decision makers to better understand how different risks might influence their food systems in the future and how vulnerable groups might be impacted and to stress test options for change and resilience building against the scenarios in order to develop robust plans that "survive in different future settings" (Ash *et al.*, 2010; Wiebe *et al.*, 2018). Today, these methods are becoming part of anticipatory governance settings that aim to build the capacity of food system decision makers to better incorporate these techniques into governance practices (Muiderman *et al.*, 2023).

A study of how participatory scenarios can help support the exploration of new potential risks and shocks to the global food system concluded that the role of automation and the rise of social media in the food space have not been sufficiently investigated, in addition to known food system stresses (such as climate change) (Hamilton *et al.*, 2020). Key questions to consider include: Who participates in the foresight discussion? What happens with trigger points that change regimes? At what scale? How should the recommendations (such as changing crop location, or helping farmers in some places who are exiting agriculture, which could entail huge social costs) be acted upon? Better understanding the interactions between old vulnerabilities and new risks can enable decision makers to take a long-term view of potential stresses to develop better contingency planning today.

## 4.3 DIVERSIFIED FOOD SYSTEMS FOR EQUITABLY TRANSFORMATIVE RESILIENCE

Diversity in socioecological systems directly contributes to resilience. Having overlapping pathways, functions and components that are diverse and complex enhances a system's capacity to continue to function in the face of shocks and stresses (Kharrazi, 2020; 2016). The strength and diversity of ecosystems and geographies are sources of opportunities that can be harnessed through more interconnected,

diversified systems to achieve ETR. For example, dietary diversity can improve FSN by providing a range of nutritious foods from local sources, while supporting on-farm agrobiodiversity and ecosystem diversity (Odour *et al.,* 2023). Indigenous foodways; diversified food production systems with diverse food sources, markets and consumer environments; and integrated food loss and waste approaches can reduce the vulnerabilities and dependencies that result in non resilience.

### 4.3.1 INDIGENOUS PEOPLES' AND TRADITIONAL FOODWAYS

Indigenous Peoples' foodways are grounded in complex, interconnected, resilient biocultural systems. As Zavaleta Cortijo et al. (2023) explain:

> The knowledge of Indigenous peoples is central to community resilience, and their holistic vision of population health aligns with public health approaches. As efforts develop to build health emergency preparedness, support climate adaptation, and promote sustainable development, we conclude it is imperative that Indigenous knowledge, practices, and worldviews underpin policy development and decision-making processes (2023, p. 642).

Examples of the importance of Indigenous Peoples' knowledge include agroecological farming based on traditional knowledge in the Peruvian Andes, which includes participatory plant breeding of quinoa (Andreotti *et al.,* 2023) and the cultivation of native potatoes that are resilient to climate change to help ensure more equitable food security through improved access, availability and stability (Calizaya *et al.,* 2023). Another example is in Wellington, New Zealand, where Our City's Food Future applies a framework grounded in Māori ways of knowing about food systems and the environment (Wellington City Council, 2023). In Tamil Nadu, in India, the Indigenous Irula and Kurumba communities revived the cultivation of traditional millet, enabling them to remain self sufficient despite disrupted food supply chains. They did this using existing networks, food sharing and their Indigenous People's knowledge, based on socioecological interdependencies – all of which contributed to increased resilience in their food system (Zavaleta-Cortijo *et. al.,* 2023). The COVID-19 pandemic also provides lessons in resilience as Indigenous Peoples' communities were able to respond in ways that buffered the impacts of the pandemic (see Box 11).

BOX 11

#### A COMMUNITY FOOD SYSTEM: HAIDA GWAII, BRITISH COLUMBIA, CANADA

Haida Gwaii is home to the Haida Nation, a remote community on an archipelago in the province of British Columbia, on the west coast of Canada, with a population of 4 500 people. Haida Gwaii's Local Food to School programme (established in 2010) uses learning circles as a form of responsible governance for community members and elders to discuss ideas and pathways to address food security (Farm to Cafeteria, n.d.). To avoid dependence on outside food shipments, the schools integrate local, culturally significant game, seafood and plants into school meals. Schools involved in the programme teach children a range of food literacy skills, including how to catch and process fish and seafood, how to harvest and process deer, and how to grow food in school gardens, while also teaching them about Indigenous Peoples' plant medicines. The food harvested from school gardens is included in the school meals, and food scraps and other organic waste are processed in the composting systems and used in the school garden. The "Pantry" of the Local Food to School programme functions as a food hub where food processing equipment is made available to serve the community; food is produced for school meals; and canned salmon, deer and vegetables are stored for distribution.

During the COVID-19 pandemic, the community came together under the leadership of the Haida Gwaii Local Food to Schools programme to coordinate an emergency food plan. Moving beyond school meals, the programme distributed food to the community, especially to elders. This pivot was particularly important as the archipelago relies on ferry service to supply food to the few grocery stores, a service which was disrupted during the pandemic.

### (CONTINUED FROM BOX 11)

Despite these structural barriers, the Haida Nation has taken important steps to build resilient systems that can nourish and sustain life (considering both people and the ecosystem) within their community. To ensure that community actions, such as those taken by the Haida Nation, can flourish, governance, at various scales, must facilitate the creation of complementary processes, along with appropriate resourcing and support. For example, the Government of British Columbia announced funding in 2023 to work with the Haida Nation to support the installation of two smokehouses that will allow for increased processing of traditional foods, while supporting employment and training within the community. Long-term success can be ensured by partnerships between the Haida Nation and the Government of British Columbia and overarching enabling structures.

*Source:* Farm to Cafeteria. n.d.. *The Local Foods to School (LF2S) Learning Circle, Haida Gwaii, British Columbia. British Columbia*, Canada. https://www. farmtocafeteriacanada.ca/wp-content/uploads/Ch10-Haida_Gwaii_Case_Study.pdf; McEachern, L.W., Yessis, J., Yovanovich, J., Crack, S., Zupko, B., Valaitis, R. and Hanning, R.M. 2022. Implementation of the Learning Circle: Local Food to School Initiative in the Island Communities of Haida Gwaii, British Columbia, Canada—a Descriptive Case Study. *Current Developments in Nutrition*, 6(6): nzac090. https://doi.org/10.1093/cdn/nzac090

## 4.3.2 DIVERSIFIED PRODUCTION SYSTEMS: FOOD PRODUCTION, FORESTS, FISHERIES AND PASTORALISM

Fostering beneficial interdependencies between socioecological systems is foundational to achieving ETR. This requires a holistic, systems approach that includes crop and livestock production, forests, fisheries and pastoralism.

### Diverse food production

Production systems that foster plant and soil diversity help enhance the capacity of ecosystems to respond to shocks and stresses and build community resilience. For example, the adoption of natural farming practices (a form of agroecology) by farmers in Andhra Pradesh has shown that place based production improved livelihoods, enhanced diet diversity, and reduced the dependency on off farm inputs (such as fertilizer and pesticides), which are often subject to volatile international markets (Box 6) (Bharucha, Mitjans and Pretty, 2020; Durga *et al.*, 2023; Duddigan *et al.*, 2023). Farmers who apply innovations such as natural farming are more resilient than their neighbours who depend on chemical inputs (including being more resilient to extreme weather events, such as cyclones [Hussain *et al.*, 2023]), and their farms are perceived as being more drought tolerant (Veni *et al.*, 2022). Representatives from fourteen sub Saharan African countries have visited Andhra Pradesh to create co-learning networks for the uptake of natural farming practices. In Zimbabwe, the Towards Sustainable Use of Resources Organization (which goes by the name TSURO Trust) works with community leaders, local and national governments to help address ecological and livelihood challenges by diversifying livelihoods (Kuria *et al.*, 2025) (Box 12).

BOX 12

## TSURO TRUST: AGROECOLOGY AND RESILIENCE IN A CLIMATE CRISIS

For nearly 25 years, the Towards Sustainable Use of Resources Organization (TSURO) Trust has worked with farming leaders in Chimanimani District, Zimbabwe, to transform agricultural landscapes and livelihoods by promoting agroecological practices (TSURO, 2025). For example, the organization's Nature Plus project, which aims to reach nearly 5 000 individuals (875 families), focuses on improving livelihoods through income diversification (including apiculture) and gender-responsive solution building, and by supporting agroecological practices such as 365-days-a-year crop cover, minimal soil disturbance, and sowing diverse crops. The Nature Plus project also focuses on developing inclusive land-governance structures in consultation with the community and local policymakers. These governance practices ensure a focus on climate resilience and biodiversity, while supporting a vibrant, prosperous community. Efforts such as the Nature Plus project help build community resilience in the face of increasing climate uncertainty. By bringing the community together and actively engaging women in decision-making processes, the TSURO Trust is attempting to lower the vulnerability of women and their families. The TSURO Trust also supports initiatives focused on farmer-led seed systems and efforts to bolster seed sovereignty, strengthen ecosystems and protect groundwater.

Much work remains to be done in support of a broader landscape change towards the practices promoted by the TSURO Trust. At present, the TSURO Trust is building relationships with government departments at local and national levels and expanding its work with individual farmers in order to scale up this transition. This is done by leveraging the organization's strong organizational capacity for extension; through partnerships and networks of trust; through empowerment at the individual, household, community and regional levels; and with the support of funders.

*Source:* Tsuro Trust. 2025. About Us. In: Tsuro Trust. [Cited 4 July 2025]. https://tsurotrust.org/

Transformative applications of agroecology, as in Andhra Pradesh and Zimbabwe, embody and deploy diversified place based science, practices and social movements, all of which contribute to the overall success of the food systems where they are applied. These initiatives integrate Indigenous Peoples' and traditional knowledges (e.g. locally adapted crop varieties) and sciences (e.g. soil testing, plant biology), as well as employing scale appropriate and time relevant technology (e.g. the development of natural inoculants) to support existing production and farmer-to-farmer transition. All of this relies on, and is founded on, place based implementation and change, as well as the agency and rights of farmers to produce, sell and consume in ways that support their health and well being.

Innovations in natural farming can be further diversified and **combined with other mechanisms to build positive food system synergies**, such as supporting food access points where farmers can sell their products (e.g. territorial markets) and leverage public procurement (e.g. school feeding programmes) to make healthy food more accessible and to enable ETR through better access to nutrition and by bolstering livelihoods, building community foodways and markets, and increasing the agency of communities over their food systems. All these outcomes enable families to build their resilience in the face of shocks and stresses.

### Forest synergies

Trees and forests can be essential to ETR in food systems. They provide energy, fruits and nuts, habitat for animals and support for pollinators, as well as regulating the climate, supporting pollinators, and mitigating seasonal food gaps (Ickowitz *et al.,* 2022). They are critical carbon sinks, absorbing nearly 16 billion metric tonnes of CO2 annually and sequestering about 860 gigatons of carbon in branches, leaves, roots and soil (Ruiz, 2024). Forests can help manage risk by sequestering carbon; providing shade for people, animals and crops; mitigating landslides, flooding

and drought; improving the level of biodiversity and reducing vulnerabilities. Forest monocultures, on the other hand, are more vulnerable to diseases and wildfires (Schuler *et al.,* 2017) and are more susceptible to pest invasion (Jones, McNamara and Mason, 2005).

Forest gardens, as managed perennial fruit and nut trees, along with herbaceous root food crops and medicines, demonstrate the value of diversity and multifunctionality as they provide food and firewood and support climate adaptation (Armstrong *et al.,* 2021). Forest gardens tended by Indigenous Peoples have significantly greater plant and functional trait diversity than periphery forests, after more than 150 years of management by humans, demonstrating their resilience (Armstrong *et al.,* 2021). They can also help restore biodiversity, making the land resources more resilient to the impacts of climate change (Thompson *et al.,* 2009).

Examples of forest regeneration initiatives in Kenya and Sri Lanka demonstrate the beneficial impacts of forests for food systems and livelihoods. In Kenya, the Farmer-Managed Natural Regeneration approach is used to regrow trees and bushes from roots of vegetation that has been removed. Once indigenous trees and bushes have been identified, they are pruned and grown where they originated. This helps restore soil, reduce chemical-input reliance, and build long-term food-system stability. In Sri Lanka, rubber cultivation has been proposed as an alternative to traditional short-term rainfed crops in response to climate change (Rodrigo and Munasinghe, 2021). Potential benefits include the reduction of midday air temperatures by up to 6 °C within the rubber plantation, with an average decrease of 3.7 °C during the day, and the retention of up to twice the surface soil moisture, making production less vulnerable to warming and drought. This provides safer working conditions, shielding farmers from excessive heat, and acts as a source of income diversification, increasing the resilience of livelihoods and bolstering equity (Rodrigo and Munasinghe, 2021).

### Fisheries and coastal management

Small-scale fisheries play an important role in community diets, providing approximately 40 percent of global fisheries catches and contributing 20 percent of dietary intake for 2.3 billion people (Basurto *et al.,* 2025; Lowitt *et al.,* 2020). With 1 in 12 people globally involved in small-scale fisheries for their livelihoods, their sustainability is crucial (Basurto *et al.,* 2025). One threat to small-scale fisheries are harmful subsidies that can result in overfishing (Schuhbauer *et al.,* 2019). A key to food system resilience is ensuring stewardship and sustainable catching practices, as well as fair livelihoods in the blue economy (Eddy *et al.,* 2021). Oceans also play a critical role in carbon sequestration, absorbing an estimated 30 percent of carbon dioxide emissions and capturing a majority of the heat generated by excess emissions (UN, n.d.). For this reason, as well, they must be protected.

Mangrove forests and other coastal habitats are critical to food security for fisherfolk communities in coastal regions around the world (Box 13). However, these critical ecosystems are under threat from rapid coastal development, climate change and ocean acidification (Veitayaki *et al.,* 2017; Bell *et al.,* 2018) and need to be protected as part of ETR.



## BOX 13
## MANGROVE HABITATS AND SMALL ISLAND DEVELOPING STATES

In Oceania and Southeast Asia mangroves are deeply connected to food security and livelihoods. For example, the largest area of mangrove forests in the world (approximately 21 percent of global mangrove area) is found in Indonesia (Middleton et al., 2024). These forests support food security for millions of people and host hundreds of species. Beyond providing food, mangroves store carbon, prevent coastal erosion and flooding, are a vital source of non-timber forest products, and protect coastal communities from storm surges (Middleton et al., 2024; Menéndez et al., 2018; Menéndez et al., 2020).

In small island Pacific states, mangrove habitats provide shelter (at some point during their life cycle) to between 50 and 80 percent of fish species deemed critical to local and commercial fisheries (Veitayaki et al., 2017). Bell et al. (2018) emphasize the importance of community-led approaches to manage and protect critical habitats, such as mangrove

forests, in the face of environmental stresses. Research from Mozambique shows that for community initiatives to succeed, they must have multiscale coordination and resourcing. For example, if mangrove forest restoration is implemented with few restrictions or little enforcement of harvest restrictions, the restoration initiatives are at risk due to continued economic precarity. In contexts such as these, Macamo et al. (2024) suggest supplementing mangrove management plans with alternative income opportunities to improve livelihood resilience. Regarding coastal habitat restoration (including mangroves) Hernández Delgado (2024) states that:

> Solutions must include enhanced green infrastructure restoration (coral reefs, seagrass meadows, mangroves/wetlands, urban shorelines), sustainable development practices, circular economy principles, and the adoption of ecological restoration policies. This requires securing creative and sustainable funding, promoting green job creation, and fostering local stakeholder engagement. Tailored to each island's reality, solutions must overcome numerous socio-economic, logistical, and political obstacles. Despite challenges, timely opportunities exist for coastal habitat restoration and climate change adaptation policies (p. 235).

### (CONTINUED FROM BOX 13)

Mangrove forests and other marine habitats (e.g. seagrass beds) are essential to food security and environmental resilience in coastal communities. However, for these ecosystems to flourish, conservation measures must take into account livelihoods and must be grounded in community values and ETR principles.

*Source:* Middleton, L., Astuti, P., Brown, B.M., Brimblecombe, J. and Stacey, N. 2024. "We Don't Need to Worry Because We Will Find Food Tomorrow": Local Knowledge and Drivers of Mangroves as a Food System through a Gendered Lens in West Kalimantan, Indonesia. *Sustainability*, 16(8): 3229. https://doi.org/10.3390/su16083229; Menéndez, P., Losada, I.J., Beck, M.W., Torres-Ortega, S., Antonio, E., Siddharth, N., Díaz-Simal, P. and Lange, G.M. 2028. Valuing the protection services of mangroves at national scale: The Philippines. *Ecosystem Services*, 34: 24–36. http://www.sciencedirect.com/science/article/pii/S2212041618301232; Menéndez, P., Losada, I.J., Torres-Ortega, S., Narayan, S. and Beck, M.W. 2020. The Global Flood Protection Benefits of Mangroves. *Scientific Reports*, 10(1): 4404. https://doi.org/10.1038/s41598-020-61136-6; Veitayaki, J., Waqalevu, V., Varea, R. and Rollings, N. 2017. Mangroves in Small Island Development States in the Pacific: An Overview of a Highly Important and Seriously Threatened Resource. In: R. DasGupta and R. Shaw, eds. *Participatory Mangrove Management in a Changing Climate*. pp. 303–327. Tokyo, Springer Japan. https://doi.org/10.1007/978-4-431-56481-2_19; Bell, J.D., Cisneros-Montemayor, A., Hanich, Q., Johnson, J.E., Lehodey, P., Moore, B.R., Pratchett, M.S. et al., 2018. Adaptations to maintain the contributions of small-scale fisheries to food security in the Pacific Islands. *Marine Policy*, 88: 303–314. https://doi.org/10.1016/j.marpol.2017.05.019; Macamo, C.D.C.F., Inácio Da Costa, F., Bandeira, S., Adams, J.B. and Balidy, H.J. 2024. Mangrove community-based management in Eastern Africa: experiences from rural Mozambique. *Frontiers in Marine Science*, 11: 1337678. https://doi.org/10.3389/fmars.2024.1337678; Hernández-Delgado, E.A. 2024. Coastal Restoration Challenges and Strategies for Small Island Developing States in the Face of Sea Level Rise and Climate Change. *Coasts*, 4(2): 235–286. https://doi.org/10.3390/coasts4020014.



### Pastoralism

It is estimated that pastoralism is a source of livelihood for millions of people in more than 100 countries, on rangelands that cover 54 percent of the world's surface (Rangeland Atlas, 2021).

A study of pastoralists in six locations (Ethiopia, India, Italy, Kenya, Tibet and Tunisia) found that pastoralists contribute to food-system resilience through their worldview; extensive, grounded knowledge; and land-management practices (Semplici and Campbell, 2023). Pastoralists provide nutrient-dense foods such as milk and meat to local food systems. They support essential ecosystem services such as carbon and nitrogen sequestration in soil; they enhance biodiversity; and, through proficient management of grazing and fire, they can contribute to the preservation of open ecosystems (Scoones, 2023). Their cosmologies emphasize the interrelatedness of all beings and inform their stewardship (Himes *et al.,* 2024). Pastoralists become resilient "through everyday practices, social organization and governance, sociocultural dimensions, as well as ongoing overarching processes of reconfiguration" (Semplici *et al.,* 2024, p. 11), the latter of which often require "building on networks and relationships and the social fabric on which pastoralism is built" (Scoones, 2024). This demonstrates the relational nature of resilience and the importance of diversification.

Pastoralists tend to live in marginal lands, often in mountains and drylands, and face uncertainty and variability in their daily lives. This uncertainty may relate to changes in markets, in access

to resources and in social relations. Land enclosures for farming, nature conservation and infrastructure development projects often threaten their ways of life. Population pressure, disease outbreaks, conflict, pests and epidemics are further threats to their ways of life (Semplici and Campbell, 2023). In particular, pastoral ways of life are extremely vulnerable to the changing climate, with the increasing frequency and severity of drought (Martin *et al.,* 2016).

Numerous interventions have been implemented to strengthen the resilience of pastoralist communities, including early warning systems, better water management, animal vaccination, fodder banks and more (Wright *et al.,* 2014) (Box 14). Two strategies in particular – community-led sustainable grazing practices and participatory governance – can support pastoralist communities, many of which have been displaced from their land as a result of land grabs (Scoones *et al.,* 2020; Bergius *et al.,* 2020).

### 4.3.3 DIVERSIFYING MARKET SYSTEMS FOR RESILIENCE

Policy responses to the COVID-19 pandemic and the war in Ukraine provide insights into the benefits of territorial markets when global markets are disrupted. Research from five African countries, for example, found that relying on distant markets at the onset of COVID-19 was associated with lower dietary quality as higher prices of imported foods, resulting in lower-quality diets, were observed throughout the COVID-19 pandemic period (Ismail *et al.,* 2023). More broadly, Clapp and Moseley (2020) found that food prices in import-dependent countries – where food is disconnected and distant from the fields where it is grown – were disproportionately impacted by price inflation during the pandemic (IPES, 2024). The war in Ukraine has demonstrated the challenges that arise when countries are dependent on products such as wheat and fertilizer that are exported by only a few countries. These lessons point to the importance of diversified market linkages that

#### BOX 14

#### NASHIPAY MAASAI INITIATIVES (ECO BOMA AND PERMACULTURE, TOURISM AND PASTORALISM), MAKUYUNI, THE UNITED REPUBLIC OF TANZANIA

Nashipay Maasai Initiatives (NMI) is a community-focused, non profit, civil-society organization located in Makuyuni, the United Republic of Tanzania. The organization empowers Maasai pastoralists in Makuyuni and beyond through culturally sensitive education and nature conservation that respects community rights, sustainable livelihoods and ecological integrity. Their forest management practices sequester carbon and help manage water flow and supply. Forests and agroecological production also contribute significantly to healthy diets and nutrition, especially for the most vulnerable, building on socioecological interdependencies. Agroecological, participatory, gender-sensitive food sovereignty and food literacy are critical elements of the work of NMI in building equitably transformative resilience in food systems. NMI developed an Eco Boma (Eco Village) in support of community-led, culturally empowering economic development and ecotourism, based on uplifting Maasai culture. NMI initiatives also include honey production, forest gardens, grazing spaces for livestock, and an expansive permaculture garden. While a portion of the land is legally owned by the community, with grazing areas granted by the Tanzanian Government, there is always a risk the grazing areas used by the community may be repossessed and the community displaced.

NMI also developed the Nashipay Maasai School, an internationally certified eco-school with 428 students that integrates Western and Maasai curriculum, including permaculture education. The school serves three daily meals to its students, with most of the food sourced directly from the school farm. About 60 percent of the students are girls, and Maasai oral traditions and literature are part of the students' extracurricular activities. Children are taught permaculture since kindergarten and receive training to grow organic food and manage the school gardens. While the communities are pastoralist and rely predominantly on livestock, integrating permaculture helps them increase the availability and consumption of vegetables and adapt to climate-change-induced extreme droughts and shocks that impact livestock production.

*Source:* Nashipay Maasai Initiatives. 2025. Our Projects In: Nashipay Maasai Initiatives. Arusha, Tanzania. [Cited 12 June 2025]. https://nashipay.org/projects/

can reduce vulnerability to economic shocks and stresses (FAO, 2021a).

In considering diversification, key characteristics of territorial markets include:

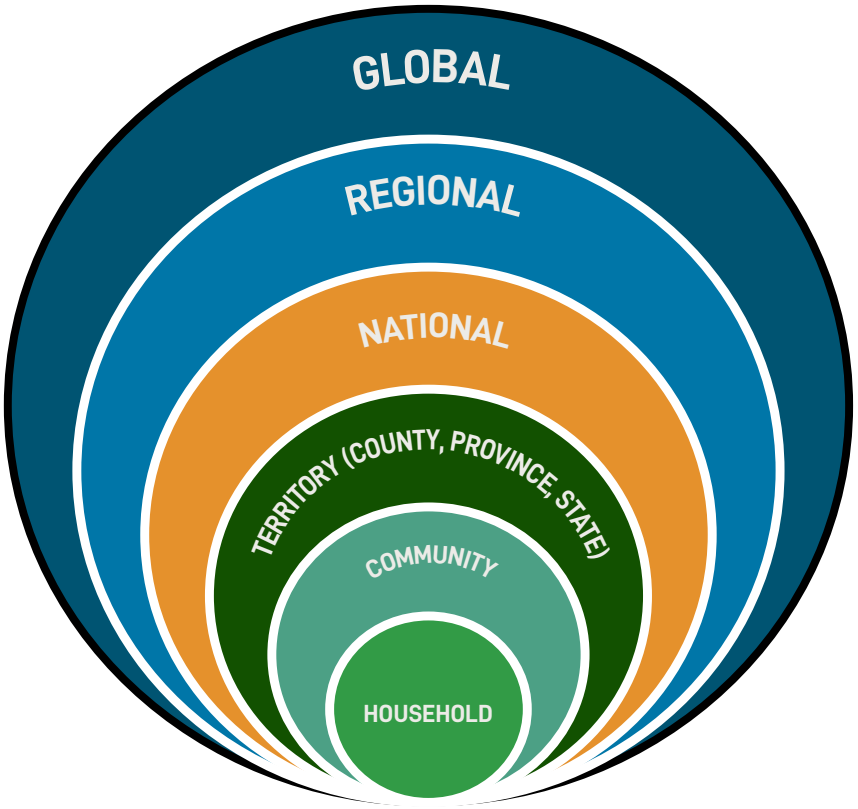
- enhanced participation of family farming and inclusivity for small-scale entrepreneurs and producers, bolstering sustainable livelihoods;
- direct relationships between consumers and producers, enhancing availability, affordability and accessibility of healthy and diversified diets;
- embodiment of local conditions and knowledge, fostering community and regional relationships;
- flat, non-hierarchical organizations with strong participation of small-scale food producers;
- short supply chains with minimal intermediaries, fostering geographical and cultural proximity, trust and high social capital (Muiagi, Kariuki and Mubashankwaya, 2025).

Lessons from COVID-19 and other shocks, as well as stresses, emphasize the relevance of and potential for a nested-market approach to FSN as part of an equitably transformative food-systems resilience approach (Figure 9 and Box 15). A nested-market approach centres households, communities and territorial food production as the primary source of food, especially for fruits, vegetables, dairy, eggs, grains and meats; while

FIGURE 9

## NESTED MARKETS

Nested markets include household to territorial scales (green shaded areas) as the most cost effective and bioculturally relevant for affordable access to fresh and staple foods such as fruits, vegetables, eggs and dairy in support of food security and nutrition. National to International markets should be relied on as needed for dried staples such as rice, pulses and grains that cannot be produced within the territory.




*Source:* Author's own elaboration adapted from Swyngedouw, E. 2004. Scaled Geographies: Nature, Place, and the Politics of Scale. In: E. Sheppard & R.B. McMaster, eds. *Scale and Geographic Inquiry*. First edition, pp. 129–153. Wiley. https://doi.org/10.1002/9780470999141.ch7.

BOX 15

## INCREASED RESILIENCE AND FOOD-SYSTEM CAPACITY BUILDING THROUGH CITY-REGION FOOD SYSTEM NETWORKS IN ANTANANARIVO, MADAGASCAR

In the early 2000s several initiatives were implemented that later enabled the City of Antananarivo, Madagascar and its surrounding regional food system to be more agile in adapting to the COVID-19 pandemic. Vegetable gardens in schools and other areas that had been established by the Urban Agriculture Department, an existing central distribution point that eliminated intermediaries, and the creation of strategically located direct access points throughout the city translated into more stable market access for farmers and the availability of better food for consumers. These initiatives were layered on top of work done the previous decade to protect land in Antananarivo as a strategy to mitigate flooding and landslides and to address food security and nutrition (Dubbeling et al., 2019).

Despite shorter market hours as COVID-19 unfolded, the decision of the national government to process perishable food – in particular milk, poultry and eggs – meant that food loss was minimized and people could still access healthy food. A prior multistakeholder engagement process had resulted in a network of food-system actors that were brought together as COVID 19 emerged, which facilitated this agile reaction. Existing food-flow maps informed planning and action in response to COVID-19 and provided an example of more diversified, locally integrated food systems developed around city regions as a complement to existing food chains. Forward planning provided both resources and capacity to understand and address food-security and livelihood challenges, helping to avoid more catastrophic results.

COVID-19 made it clear that human networks, physical infrastructure and supportive policies and programmes are key to resilience. In Antananarivo, multiple stakeholders who were engaged across the food system found relevant solutions that enabled, "a multisector food strategy, contributing to a more sustainable, economic and social approach for the benefit of the food system of Antananarivo city region and the whole national territory." (FAO, 2022a).

*Sources:* Dubbeling, M., van Veenhuizen, R. and Halliday, J. 2019. Urban agriculture as a climate change and disaster risk reduction strategy. Field Actions Science Reports. *The journal of field actions* (Special Issue 20): 32–39. https://journals.openedition.org/factsreports/5650; FAO. 2022. Antananarivo définit les priorités pour développer un plan d'action concret et améliorer la résilience du système alimentaire. In: Food for the cities programme. [Cited 7 February 2025]. https://www.fao.org/in-action/food-for-cities-programme/news/detail/en/c/1565373



national, intranational, intraregional and global markets fill in any gaps. The more distant sources are most relevant for easily shipped and stored basic, nutritious foodstuffs such as grains and pulses, if they cannot be produced within a territory, while connections between local production and consumption are promoted.

Diversity in the size and type of food enterprises (particularly small and medium sized enterprises, and social enterprises, such as cooperatives) can support a shift in power within supply chains, as well as offering greater flexibility in response to shocks (Murphy *et al.,* 2023). Smaller-scale enterprises can be nimble in responding to food-supply-chain disruption and may have better local knowledge of alternative suppliers and supply routes (Smith *et al.,* 2016). Circulating value within territorial economies can enhance ETR by increasing the viability of livelihoods and by strengthening solidarity networks (Levidow *et al.,* 2023). Including cultural values and knowledge along territorial supply chains also contributes to ETR (Lugo-Morin, 2023).

Small-scale farms and businesses are often disadvantaged, having limited participation in supply chains, which tend to favour larger farms. As a result, small-scale farmers usually participate in food value chains by selling their crops, livestock and other raw materials through intermediaries, directly to local stores, or in markets. The participation of small-scale farmers and fishers in formal or informal food value chains can enhance

their opportunities for improved income, helping to address equity challenges and making food value chains more sustainable (Liverpool Tasie *et al.*, 2020). For example, Wayuu Communities in Alta Guajira, Colombia have been working to transform their food systems and become more resilient to challenging environmental and socioeconomic pressures. This participatory initiative has had significant results despite the challenges of living in a remote desert ecosystem with difficult access to water due to high temperatures, extreme droughts and distant markets (up to 200 km away). The intervention provided: (i) access to water for irrigation and human consumption with at least 8 hours of daily water access in all communities (enabling household gardens); and (ii) increased food diversity based on traditional products, including between 5 and 20 nutritious foods such as vegetables, fruits, eggs and tubers. This has improved FSN, with better ties to cultural identity. Traditional beans are cultivated that are adapted to both drought and flooding and are resilient to climate change impacts; economic diversification is achieved through the sale of handicrafts and livestock; composting and vermiculture close the waste loop; soil and water conservation and reforestation are improving the local environment; community managed savings and credit groups are enabling financial autonomy and building governance and self-management capacity; and the creation of a social enterprise – Kottirawa'a Wapushuaya (All United in Wayuunaiki) – for collective marketing and purchasing provides improved economic stability and independence (De Flex, 2023; Granit, 2022; FAO, 2025). These shifts towards diversity, integration and community management helped build both absorptive and transformative resilience, as well as FSN and economic sustainability in the face of extreme weather conditions. This comprehensive initiative also builds ETR in food systems by changing structures and enabling agency and capacity building, grounded in local values.

Mechanisms that build positive food-system synergies include supporting food access points where farmers can sell their produce (such as territorial markets) and leveraging public procurement (including school feeding programmes) to make healthy food more accessible (Box 16).

## BOX 16
## CURITIBA TO SÃO PAOLO, BRAZIL, REGIONAL SUPPLY CHAIN

O Circuito is a distribution network that sells agroecological products for the same price as conventional products sold in supermarkets, and sometimes for lower prices. Given the extent of their market network, they are able to offer 95 fresh and minimally processed products, providing stable demand for farmers and access to local, diverse, affordable food for consumers. The markets are linked by a network of small, medium and long routes with small hubs, enabling flexible distribution using trucks and vans owned by members of the circuit. Food produced is distributed across 73 municipalities and the network includes 5 400 small-scale producers and 165 markets. In 2016, O Circuito sold 3 000 metric tonnes of food. In 2019, they were selling 150 metric tonnes of food weekly. By 2019, "the flow of food delivered to distant local food markets had developed into an astonishing 7 500 metric tons per year – a growth of 1 800 percent over 11 years." (Van der Ploeg, Ye and Schneider, 2024, p. 1868).

*Source:* Van Der Ploeg, J.D., Ye, J. & Schneider, S. 2023. Reading markets politically: on the transformativity and relevance of peasant markets. *The Journal of Peasant Studies*, 50(5): 1852–1877. https://doi.org/10.1080/03066150.2021.2020258

In Brazil, small-scale farmers are supported by public procurement efforts (see Leveraging public programmes for ETR: school feeding programmes in Section 4.1.2), enabling job creation through local supply-chain activities (such as production, transportation, distribution and food service) and increasing access to healthy food for 40 million students and for vulnerable populations, including Indigenous Peoples and Quilombola communities (Box 17).

While there are myriad examples that demonstrate the value of increasing market diversity in food systems, they are all context specific. This means that developing generalizations as the basis for policy and programmes can be challenging. For example, community supported agriculture can help stabilize farmer income to establish more equitable livelihoods. While these can be seen as cost prohibitive unless built for high-income markets, they could complement other larger-scale solutions in certain countries (Box 18).

Despite being largely dependent on imports, Singapore's population is one of the most food secure in the world (Kumar, 2019). Thanks to a diversification strategy undertaken by the state

BOX 17

## THE CARIOCA NETWORK OF URBAN AGRICULTURE AND PROMOTING TERRITORIAL AGROECOLOGICAL MARKETS, RIO DE JANEIRO, BRAZIL

This case study focuses on the development of territorial agroecological markets and solidarity networks in Rio de Janeiro's metropolitan area, emphasizing the efforts of the Carioca Network of Urban Agriculture (RECAU). RECAU works to strengthen food security in the city in all its dimensions, paying particular attention to the circumstances of marginalized producers and consumers living in peripheral areas of the city. Rio de Janeiro, historically a net food producer, has experienced significant urbanization and agricultural decline since the mid-20th century. Despite this, around 1 500 urban producers continue to grow various crops in small plots, mainly in the West Zone of the city. Established in 2009, RECAU aims to support urban food growing and address inequities in access to land and food, as well as addressing distribution, to improve food security. In 2022, 23.6 percent of the population of the state of Rio de Janeiro faced severe or moderate food insecurity. Since its inception, RECAU has promoted the right to land, shorter food supply chains, participatory certification for agroecological products, and access to fresh and nutritious food for peri-urban populations. Although municipal support has been inconsistent, the network's advocacy efforts led to the approval of the State Policy on Agroecology and Organic Production in 2019, with funding secured in 2022. The organization has worked to connect agroecological production with the supply of healthy food to vulnerable populations, particularly during the COVID-19 pandemic. It has supported territorial markets (including agroecology fairs), local producer participation in government procurement, and campaigns to celebrate and build solidarity. It has also sought to address broader issues such as: inequities in urban areas related to housing and basic services, the recognition of Quilombola territories, and institutionalized violence in marginalized areas, including in favelas. Despite many challenges, RECAU has increased the visibility of these issues and empowered local actors and initiatives by forming alliances with other agroecology groups nationwide. The network's work is consistent with ETR principles, focusing on transforming urban food systems by utilizing agroecology's integrated socioecological principles and promoting empowerment and solidarity among marginalized communities to create alternatives to prevailing food systems.

*Source:* May, J., Bellwood-Howard, I., Cabral, L., Glover, D., Schmitt, C.J., Mendonça, M.M.D. and Sauer, S. 2022. Connecting Food Inequities Through Relational Territories. *IDS Working Paper* 583. Brighton, Institute of Development Studies. https://doi.org/10.19088/IDS.2022.087

## BOX 18
## COMMUNITY-SUPPORTED AGRICULTURE, GERMANY

Often included in the range of alternative food networks (Goodman and DuPuis, 2011), community supported agriculture (CSA) is a partnership between farmers and CSA members (consumers) in which responsibilities, risks and rewards are shared. Members subscribe to the CSA by paying for part of their share of the harvest before the growing season to support production costs. In return, they receive regular shares of fresh, seasonal farm produce. Various CSA arrangements exist in different countries, with variations on who drives the interventions (farmers or consumers) and levels of engagement (some offer the option to work in exchange for food). While there are diverse types of arrangements in place (Blättel Mink et al., 2017), as an alternative to prevailing markets, the model generally promotes a direct relationship between farmers and CSA members, with the potential to enhance trust and transparency in transactions, foster a sense of community, and encourage environmentally conscious food choices.

A study on the CSA structure in Germany indicates that, while not a complete solution as it might not increase farmer income and could lead to farmer subsidizing through their own unpaid labour, CSAs can contribute to resilience by providing a reliable income source, market independence and increased satisfaction for farmers. The study also finds that a CSA can have positive impacts beyond the farmgate, including in community building and promoting crop diversification, which contribute towards making local food systems more resilient (Rosman et al. 2024).

Another study on CSA experiences in Brazil and Spain concludes that, while reliant on urban consumers, CSA is a model with resilient socioeconomic structures (González-Azcárate et al., 2023). Despite the transformative potential of CSAs with regard to food transactions, there are limits to its emancipatory action (Parot et al., 2024). Most CSAs involve upper middle-class consumers with higher education and income levels, while low income membership remains relatively limited. "The challenge in CSA is that social support actions assisting low-income households do not necessarily resonate with supporting smallholder farmers (Parot et al., 2024, p. 695). Committing to the CSA may be challenging for those without a stable income.

*Sources:* Goodman and DuPuis, 2011; Blättel Mink, B., Boddenberg, M., Gunkel, L., Schmitz, S. & Vaessen, F. 2017. Beyond the market–New practices of supply in times of crisis : The example of community-supported agriculture. *International Journal of Consumer Studies*, 41(4): 415 421. https://doi.org/10.1111/ijcs.12351; Rosman, A., MacPherson, J., Arndt, M. and Helming, K. 2024. Perceived resilience of community supported agriculture in Germany. *Agricultural Systems*, 220: 104068. https://doi.org/10.1016/j.agsy.2024.104068; González-Azcárate, M., Silva, V.L., Cruz-Maceín, J.L., López-García, D. and Bardají, I. 2023. Community Supported Agriculture (CSA) as resilient socio economic structures: the role of collaboration and public policies in Brazil and Spain. *Agroecology and Sustainable Food Systems*, 47(8): 1237–1268. https://doi.org/10.1080/21683565.2023.2230171; Parot, J., Wahlen, S., Schryro, J. and Weckenbrock, P. 2024. Food justice in community supported agriculture – differentiating charitable and emancipatory social support actions. *Agriculture and Human Values*, 41(2): 685–699. https://doi.org/10.1007/s10460-023-10511-w.



after the food crisis of 2008/09 and urban planning strategies that include food access points as part of development on the island state, Singapore's commitment to improving food access is an example of food policy that supports models of affordable food (Box 19). As a result, Singaporean markets have become a widely used source for food across society and class. Communities from around the island state visit markets as regular access points for fresh foods (wet markets) and prepared foods (hawker markets). As part of a move to improve food access, Singapore aims to meet 30 percent of its nutritional needs locally by 2030 (Teng and Montesciaros, 2019).

Aggregation and integration of regional food-systems infrastructure can help address localized gaps in the production or distribution of food and can strengthen local, regional and other markets. For example, it is well established that distance to markets, both for the sale and the purchase of agricultural products, can negatively impact access to healthy, diversified diets (Clark, Conley and Raja, 2021). Poor road infrastructure affects food value chains, leaves farmers vulnerable to middlemen and may increase food loss and decrease the quality of produce when distances to urban and other markets are long, especially when cold chains

BOX 19

## FRESH AND ACCESSIBLE FOODS THROUGH MARKETS, SINGAPORE

Across the decades and generations, Singapore has developed a culture of markets that supports affordable access to fresh (wet) and prepared (hawker) foods (Chua et al., 2024). As part of a state-sponsored initiative, markets have gone through several iterations over the past decades. Once part of a bustling informal economy, from the 1960s to the 1980s, market culture in Singapore blossomed with the registration and integration of food sellers – of both of fresh and prepared foods – into dedicated centres (Kumar, 2019). These centres were strategically located near areas of employment and dense residential areas. As the Singaporean government moved to establish new "towns" outside of the city centre, each was planned to include a wet and a hawker market. Recently, food markets have undergone renovations to ensure better accessibility for consumers and increased access to cold-chain infrastructure under the Hawker Centre Upgrading Programme (Kumar, 2019). Today, Singaporeans spend an estimated 37 percent of their food budget on hawker foods, and the centres have come to be important food access points (Kumar 2019; Loh, n.d.). The government enforces rules that support vendor occupation rather than the presence of corporate chains, and prevents practices that would make rents unaffordable (e.g. banning reverse-rent schemes). Recent policy has pursued a revival of entrepreneurship amongst hawkers, contributing to multiple Michelin nominations and awards for Singaporean hawkers (Tarulevicz, 2018). To ensure the culture of hawkers continues for future generations and for emerging vendors, programmes like the Hawkers' Development Programme support the skills development needed to ensure succession planning among vendors and to attract youth back into the sector.

Despite significant support for markets in Singapore, food related noncommunicable diseases continue to rise (although lower than regional averages) and there are challenges with malnutrition among elderly citizens (Chiam, 2008). However, this forward-looking programme builds ETR through enhanced, more affordable, local livelihoods for small-business owners, and increased access to healthy food, bolstering FSN.

*Sources:* Kumar, T. 2019. Town Planning and Food Accessibility in Singapore: It's No Mirage, It's A Food Oasis! *Urban Solutions*(14). https://isomer-user-content.by.gov.sg/50/722bcfe0-f6bb-4c25-b329-5fc3b96bf0bc/7_essay-town-planning-and-food-accessibility-in-singapore.pdf; National Geographic. 2025. All Singapore under one roof. In: *Singapore's hawker culture*. [Cited 6 July 2025]. https://www.nationalgeographic.com/travel/article/partner-content-all-Singapore-under-one-roof; Chiam, M. 2008. Malnutrition in the elderly. The Singapore Family Physician - *Nutrition Updates*, 34(4): 50–54. https://www.cfps.org.sg/publications/the-singapore-family-physician/article/450_pdf; Government of Singapore National Environment Agency. 2020. New Programme Targets To Train 100 Aspiring Hawkers Over The Next Three Year. In: *National Environment Agency*. Singapore. [Cited 6 July 2025]. https://www.nea.gov.sg/media/news/news/index/new-programme-targets-to-train-100-aspiring-hawkers-over-the-next-three-year, Government of Singapore National Environment Agency. 2025. Hawkers' Development Programme. In: *National Environment Agency*. Singapore. [Cited 6 July 2025]. https://www.nea.gov.sg/our-services/hawker-management/programmes-and-grants/hawkers-development-programme;
Tarulevicz, N. 2018. Hawkerpreneurs: Hawkers, Entrepreneurship, and Reinventing Street Food in Singapore. In *Revista de administracao de empresas* 58 (3); May-Jun 2018 https://www.scielo.br/j/rae/a/G35M7QB7p3wLmdRFNSr6hqQ/



or electricity are not widely available (Wudad *et al.*, 2021; Barrett *et al.*, 2022). It is also important to consider energy use and sustainability across cold food chains and to identify ways in which energy use can be minimized (UNEP/FAO, 2022). These supply-chain examples demonstrate the potential of ETR to realize FSN and build socioecological interdependencies towards human and ecosystem well-being.

### 4.3.4 DIVERSIFYING CONSUMER ENVIRONMENTS FOR EQUITABLY TRANSFORMATIVE RESILIENCE

Facilitating access of consumers to diverse foods is part of building resilient food systems. This requires investments in hard and soft infrastructure in both rural and urban areas. For example, community food-system infrastructure can address local food-system challenges by using local resources, knowledge and advocacy

to build capacity and address food insecurity in marginalized communities (Marsden, Hebinck and Mathijs, 2018). Localized activities can include community gardens and urban farms that sell healthy produce to low-income urban communities. Actions by local governments and other actors can strengthen community food-system interconnections. Enabling local communities to make decisions regarding their own food systems can be part of the equation (WWF, 2021), for instance, through food-policy councils and participatory budgeting, and can increase resilience as the most affected build capacity and agency (Box 20).

There are many factors that shape consumer environments and influence behaviour. Access to healthcare and infrastructure, such as water, sanitation and hygiene, have a significant

## BOX 20
## SOLIDARITY KITCHENS, BRAZIL

At the start of the COVID-19 pandemic, the Brazilian Homeless Workers Movement (MTST) created solidarity kitchens to distribute baskets of food to people in homelessness and other vulnerable circumstances in the city of São Paulo. Initially, MTST aimed only to distribute food baskets, but they soon realized that many people lacked cooking facilities or money for gas, leading some to sell the food they received. Consequently, MTST shifted towards distributing lunch boxes with hot prepared food.

MTST is a sister organization of the Landless Workers Movement (MST). Similar to MST's land occupation strategy as part of the struggle for land justice, MTST occupied empty public buildings to draw attention to the lack of decent housing as a violation of a basic human right. MTST established solidarity kitchens in occupied buildings across the city, using cash donations to buy ingredients, packaging supplies and cleaning materials. MTST also paid allowances to those who worked in the kitchens and those who delivered the lunchboxes. This work was also supported by volunteers, including students with knowledge of food hygiene and nutrition. Fruits and vegetables were included in the baskets and lunchboxes from the beginning to increase the nutrition content of the meals.

By 2022, MTST's solidarity kitchens had grown to 33 locations in São Paulo. This included the downtown area of São Paulo, where there are high concentrations of homelessness (at Praça da Sé, 500 lunchboxes were given out daily), as well as other neighbourhoods where people could not afford adequate food due to rising prices of food and fuel. The lack of regular funding constituted a major challenge, but solidarity kitchens demonstrated how grassroots initiatives contribute to build resilience from the bottom up. While addressing pressing food insecurity, they crucially advocated for healthy diets and food sovereignty for marginalized individuals and drew attention to the interrelated human right to food and decent housing.

This grassroots innovation attracted the attention of local and national governments, in part due to the championing role played by politician, activist and MTST member, Guilherme Boulos. In 2023, solidarity kitchens were legally recognized and were transformed into a federal social protection programme with funding to support their expansion. By 2024, there were approximately 800 kitchens across the country, approximately 49 of which are run by MTST. Integration with public programmes such as the Food Acquisition Programme and the National School Feeding Programme (PNAE) for a holistic approach to food security is under discussion. This shows how grassroots innovation can inspire governments to implement resilience interventions.

*Source:* Domingues, I., Colombo, C. and Bruno, J. 2024. From the plate to politics: the case of solidarity kitchens. In: *Institute of Development Studies*. [Cited 12 June 2025]. https://www.ids.ac.uk/opinions/from-the-plate-to-politics-the-case-of-solidarity-kitchens/

impact on household and community well-being, including FSN (HLPE, 2015). Food-environment factors include food literacy, nutrition knowledge, information availability, and guidelines and advertising. Building ETR into food environments is complex (Box 21). It is impacted by policy from multiple scales that combine to impact communities, households and individuals differently. For example, policies and programmes can promote diets and eating habits that are nutritionally balanced and that strengthen physical, social and mental health. However well intentioned, though, general guidelines are not enough to ensure FSN. This is important as healthy people make for more resilient communities, and enabling healthy choices adds to ETR in food systems. Policies to regulate the manufacturing and processing of unhealthy foods and incentivize the production and distribution of healthy foods are critical for human health and for resilient populations. Increasing equitable access to quality markets and decreasing food deserts is an important aspect of this effort (Laar *et al.,* 2020). Building healthy food environments requires a range of policy responses, including promoting healthy foods, regulating the sale of foods connected to chronic diseases (such as ultraprocessed foods) and related policy, tax and regulation (Popkin *et al.,* 2021). Several examples of such policy responses have emerged in recent history. In Chile, research on the country's integrative approach under the Law of Food Labelling and Advertising showed a more significant decline in consumption of sugar-sweetened beverages than from just one policy alone (such as a sugar tax) (Taillie *et al.,* 2020). To achieve ETR, action needs to address poor nutrition and health outcomes. This includes addressing the lack of infrastructural investments, services and policies required to ensure the consistent availability of healthy diets (including sufficient access to fruits, vegetables and protein rich foods, as well as mono and polyunsaturated fats). It is also important to limit excessive consumption of some foods (including ultraprocessed foods) (Monteiro *et al.,* 2019) and to use policy, such as public procurement, to make diverse, healthy and nutrient-dense foods more affordable, especially for individuals with limited resources, in order to ensure equitable access (Box 21).



## BOX 21
## PLATO DEL BIEN COMER, MEXICO

The icon of the 2023 Food Guide of Mexico's Ministry of Health, entitled, Plato del bien comer (The Good Eating Plate), portrays the usual food groups recommended for a healthy diet, but also includes two components especially compatible with building ETR though product labelling: De temporada y producción local (Seasonal and locally produced) and Evita productos con sellos (Avoid products with stamps). The latter refers to products marked with octagonal stamps informing consumers about excess calories, saturated fats, trans fats, sugar or sodium. This labelling is the result of a long struggle (2010 through 2024) against ultraprocessed foods and beverages that promote non communicable diseases (NCDs) such as obesity, diabetes and hypertension (Barquera and Rivera, 2020; Rivera et al., 2024). These products are aggressively and successfully marketed by multinational corporations with remarkable distribution networks that reach even the most remote places in Mexico. Diet related NCDs are a serious public health problem in Mexico and in other low- and middle income countries, affecting people of all income levels in those countries (Barquera and Rivera, 2020). This problem is fuelled mostly by high calorie beverages, ultraprocessed foods and fast foods (Rivera et al., 2016). The corporations which produce these products have been and continue to be powerful opponents of all public health policies that discourage their consumption (Barquera and Rivera, 2020; Rivera et al., 2024).

In a recent review paper, Mexico's Experience in Building a Toolkit for Obesity and Noncommunicable Diseases Prevention, Rivera et al. (2024) show that a series of nutrition policies (health taxes, front of pack warning labels, marketing regulations, school feeding policies, and dietary guidelines) were implemented by the Mexican federal authorities, with varying degrees of success, after intense lobbying and opposition from multinational corporations. The impact of these public policies was assessed through modelling and surveys, and indicated a modest increase in tax revenues, a reduction in the consumption of these foods and beverages, and a modest increase in public food literacy. The food industry's response has been to aggressively diversify its advertising, including on the internet, recommending reducing the portion sizes of beverages and snacks, and adhering to good nutritional advice, including recommending eating fruits and vegetables in its advertising campaigns. By the time this review paper was published (19 January 2024), nutrition policies were in place, including a ban on advertising high calorie foods and beverages in television programmes aimed at children, a ban on the sale of these foods and beverages on primary and secondary school premises, nutrition and content labels on foods and beverages, and front of pack warning stamps.

Warning stamp policies have been successfully implemented in many Latin American and African countries. However, the food industry lobby in Mexico succeeded in having the mandatory warning labels on cereal packages removed in October 2024 by reducing the sugar content and other problematic ingredients in their products. This was accompanied by the reintroduction of previously banned cartoons in advertising (Martínez, 2024). As the incidence of NCDs continues to rise in children and adults, the question arises as to whether the 2023 Ministry of Health icon represents a practical or merely an aspirational step on the path to better FSN in Mexico.

*Sources:* Barquera, S. and Rivera, J.A. 2020. Obesity in Mexico: rapid epidemiological transition and food industry interference in health policies. *The Lancet Diabetes & Endocrinology*, 8(9): 746–747. https://doi.org/10.1016/S2213-8587(20)30269-2; Rivera, J.A., Colchero, M.A., Pérez-Ferrer, C. and Barquera, S. 2024. Perspective: Mexico's Experience in Building a Toolkit for Obesity and Noncommunicable Diseases Prevention. *Advances in Nutrition*, 15(3): 100180. https://doi.org/10.1016/j.advnut.2024.100180.

Further, there is a pressing need to recognize the significant role of the informal economy in food systems. Street traders run informal businesses selling fresh, processed or cooked food in public areas. They are mainly owner operated, though some hire workers with different levels of responsibility. Despite the crucial role of street traders for local economic dynamism and food security, they are overlooked in policies. Recognizing the importance of street traders is vital for future food security and crisis management. Policy changes are needed to provide more public spaces for street traders, including in wealthier areas (HLPE, 2024). A shift towards a participatory approach to urban planning and food systems informed by street traders' needs, participation and specific contexts is essential. This approach should be flexible, incremental and responsive, valuing the contributions of those excluded from official processes (Box 22).

BOX 22

### RESILIENCE OF INFORMAL STREET TRADERS AND THEIR CONTRIBUTION TO FOOD SECURITY IN SOUTH AFRICA

Research conducted on fresh food traders in South Africa during the COVID-19 pandemic provides insights regarding their resilience and their significant contribution to food security (Wegerif, 2024). Initial COVID-19 lockdown measures severely impacted food-trader operations, leaving many struggling to recover due to a harsh economic environment, lack of government support and harassment by public officials. Despite reduced incomes for many, street traders continued operating, providing affordable and more accessible fresh produce, especially important for those in poverty.

It is recognized that street vendors provide critical access to foods that support a diverse, nutrient-rich diet (Skinner and Haysom, 2017; HLPE, 2024) – something billions of people around the world lack access to (FAO et al., 2024). Wegerif (2024) adds to these findings by emphasizing the importance food traders played in maintaining affordable access to such foods during the pandemic, despite grocery retailers prioritizing profits over food security.

However, there are challenges (such as food safety) that are associated with informal food system actors. The HLPE-FSN report, Strengthening urban and peri-urban food systems (HLPE, 2024), notes the need for greater policy attention to street vendors – in particular, support for increased food-safety training and basic infrastructure (HLPE, 2024).

Street trading showed resilience by creating stability in the food system, becoming a refuge for those who lost jobs in the formal sector. The sector's potential to alleviate unemployment and inequality was found to be significant. The study by Wegerif (2024) also finds that street traders play a crucial role in food security by offering prices below those offered by formal retailers, by selling on credit, and by allowing people to buy small quantities without regressive pricing (a standard practice among formal retailers). They are also conveniently located near where people live, work and travel, ensuring physical accessibility. This flexibility improves resilience by supporting FSN.

*Source:* Wegerif, M.C.A. 2024. Street traders' contribution to food security: lessons from fresh produce traders' experiences in South Africa during Covid-19. *Food Security: The Science, Sociology and Economics of Food Production and Access to Food*, 16(1): 115–131. https://doi.org/10.1007/s12571-023-01409-w; Skinner, C. and Haysom, G. 2017. The Informal Sector's Role in Food Security: A Missing Link in Policy Debates. *Hungry Cities Partnership Discussion Paper* No. 6. Waterloo, ON. https://scholars.wlu.ca/cgi/viewcontent.cgi?article=1006&context=hcp; HLPE. 2024. *Conflict-induced acute food crises: potential policy responses in light of current emergencies*. Issues paper. Rome, CFS HLPE-FSN. https://www.fao.org/fileadmin/templates/cfs/Docs2324/BurAg/240729/CFS_BurAG_2024_07_04_HLPE-FSN_Issues_Paper.pdf; FAO, IFAD, UNICEF, WFP & WHO. 2024. *The State of Food Security and Nutrition in the World 2024 – Financing to end hunger, food insecurity and malnutrition in all its forms*. Rome, FAO. https://doi.org/10.4060/cd1276en.



## 4.4 DIVERSIFYING FOOD LOSS AND WASTE REDUCTION SYSTEMS

To address food loss and waste and capture the benefits of circular food systems requires a worldview that values food beyond being a commodity (Spring *et al.,* 2020). Three important factors must be considered in this regard: opportunities, such as material and infrastructural investments; motivations, preferences and worldviews; and education, abilities and skills-building needed to prevent and reduce food loss and waste (National Academies of Sciences, Engineering, and Medicine, 2020).

From a prevention perspective, there are several infrastructural and material investments that can assist farmers, especially in lower-income countries, to preserve and better store their harvests. These include solar powered cold storage (Kansanga *et al.,* 2025), grain-drying machines (Bradford *et al.,* 2020), and better transportation infrastructure, as well as handling practices and packaging to protect crops post-harvest and reduce spoilage

(Priyadarshi, 2024). Digital platforms can better match supply with demand, support transparency in the supply chain, enable the quick sale of short-dated and time-sensitive food items, identify alternative markets and buyers and provide farmers with price information, therefore helping to prevent losses due to limited markets (Benyam *et al.,* 2021).

When it comes to bouncing back, scholars and anti-poverty activists have raised concerns regarding the potential for food-waste reduction efforts to become the panacea for food insecurity, with waste being foisted onto the charitable sector (Spring *et al.,* 2019). Dignified food recovery and food rescue operations, from farms (Soma *et al.,* 2021) or from the retail sector (Filimonau *et al.,* 2017) can help ensure that quality surplus food that is nourishing and safe is not taken to landfills but rather is used in ways that offer autonomy, dignity and choice (Barnard, 2016). Across the world, there are many organizations that offer surplus food redistribution and food-rescue services. For example, the Foody Hub and Ortomercato, established within the Milan general wholesale market, collect edible fruits and vegetables and recover food losses directly from producers and wholesalers, donating them to local organizations (Casson *et al.,* 2024). Other organizations and companies may include apps, gleaning services and platforms to match those with surplus food to those who may need it. (One example of a digital platform engaging in the food loss and waste space is foodiverse.net.) In Barcelona, Spain, Fundació Espigoladors empowers communities to participate in food recovery activities and sell "imperfect" food to challenge the stringent aesthetic standards. It also upcycles surplus produce into jams. At the retail level and consumer level, regulations and policies are needed to address wastage caused by confusion around best-before dates. It was found for example, in a study of 612 retail outlets, that 28 percent of food discarded due to best-before dates was in fact fit to eat (Lebersonger and Schneider, 2014).

While prevailing forms of agriculture may use waste by-products via industrial rendering and the processing of fats, oils, feathers and other materials for industrial livestock meal (Mekonnen *et al.,* 2014), this scale of production causes challenges around management and biosafety. Agroecology, on the other hand, integrates livestock with cropping systems that optimize the use of manure (Billen *et al.,* 2021). Anaerobic digestion is another approach where large-scale organic waste is converted into energy (Teigiserova, Hamelin and Thomsen, 2020) and, at a smaller scale, community composting is important as a place-based and decentralized approach that helps manage organic waste and create soil amendment that can contribute to urban agriculture and the recycling of nutrients from food production back into the soil (Shrestha Small and Kay, 2020). Community composting can also reduce waste-management costs. For example, in Canada (Box 23), on site community composting can save up to an estimated 34 percent (Adhikari *et al.,* 2010). Community composting can also reduce the transportation and energy costs of moving waste, as well as reducing the potential for increased contamination with larger-scale waste collection (Zhou *et al.,* 2013). It is important, however, to recognize, as part of ETR, that source reduction and prevention should be the first step and that interventions focusing on composting and waste-to-energy schemes should primarily focus on unavoidable food loss and waste (such as banana peels and eggshells).

BOX 23

### COMMUNITY COMPOSTING FOR FOOD-SYSTEM RESILIENCE

Making Agriculture Sustainable in the Hazeltons is a non-profit organization focused on food security in the Hazeltons, a rural community in northern British Columbia, Canada. Through a community survey that ranked potential solutions to improve food security and support climate action in the region, community composting was identified as a top priority. With an active agriculture sector, there is high demand for soil amendment in the community. In 2024, the organization applied for and received several grants to pilot a community composting programme for six months. They built a Community Composting Hub for preprocessing, composting, curing and postprocessing compostable materials. For the composting process, they used a passively aerated box. The organization instituted a pick up programme for businesses and a public drop off point at the composting hub to collect food scraps and other compostable materials, such as yard trimmings. During the six-month pilot, more than 7 000 kg of compostable material was collected. This included materials that were placed into the compost boxes and brush that was chipped as bulking material. Three compost boxes were filled, and the active composting and curing processes were completed. The finished compost will be screened and distributed in the spring of 2025. Besides providing benefits to local residents by creating local, nutrient-rich fertilizer, this programme also reduced 28 tonnes CO2eq of greenhouse gas emissions by diverting organic materials from the landfill and supported local "green jobs" for the staff running the community composting programme. The Community Composting Hub also acts as an event space for workshops and open houses to engage members of the public around composting and has served as a demonstration site for other rural communities seeking to start composting using an effective, low-tech method.

*Source:* Gallant, L., Shulman, T. & Li, B. 2024. Final Report MASH Community Composting Hub. https://drive.google.com/file/d/1t__Cn9fE69fpm-qRpN5c9qiHjTPC4RmR/view?usp=embed_facebook

## 4.5 ADDRESSING GENDER SPECIFICITIES



Gender is a cross-cutting dimension of efforts towards ETR in food systems. Initiatives across the world have highlighted how placing gender as a central consideration for resilience helps reduce risk and vulnerability among women and their families. In India, the Self-Employed Women's Association supports resilience building by increasing access to financial services, training and markets for participants. In Gaza, women are engaging in agroecology and leading businesses, including through the integration of the traditional baladi practice by making traditional flatbread (Shaban and McAllister, 2024). An initiative in the United Republic of Tanzania is also demonstrating how focusing on women and girls contributes to improving food system resilience (Box 24).

In Indonesia, food affordability is not the same for everyone. Rice, for instance, is unaffordable for many families. In response to these inequities, there has been a push to relocalize diets towards alternative native staple crops. In this context enbal, an indigenous crop on Kei Island, has re emerged as an important part of domestic diets. There have been calls to empower women as agents of change in reintroducing enbal in order to support food affordability and as a resilience strategy for families who may face food shortages due to climate change and market variability. The reintroduction of enbal will help build more equitable and reliable FSN and capacity on the way to building ETR in food systems (Soselisa and Ellen, 2013; Far, 2022).

Women's knowledge and roles in food systems (including as care providers) are key to enhancing

BOX 24

### PASTORAL WOMEN'S COUNCIL: BUILDING A BETTER FUTURE FOR MAASAI WOMEN AND GIRLS

The Pastoral Women's Council is a Tanzanian organization empowering over 7 000 Maasai women across Ngorongoro, Longido and Monduli. It champions the rights of women pastoralists and agropastoralists and works to further their economic empowerment and access to services. Many of the members of the organization are struggling against increasing droughts, which are decimating livestock and hindering their access to water. The women often have little access to health care facilities, resulting in negative maternal-health outcomes.

The Pastoral Women's Council has several programmes to respond to these needs and to build ETR in food-systems. The programmes are primarily focused on supporting climate-change adaptation, ensuring access to clean water, and instituting programmes to provide women with land allotments. In 2023, the organization provided 704 women pastoralists with land allotments. The organization also established gender-sensitive water committees, created boreholes and installed rainwater harvesting facilities in order to empower women and in view of the key role women play in managing the water needs of their families. In 2023, at the Conference of the Parties 28 summit, the Pastoral Women's Council was awarded the Local Adaptation Champions Award for re-greening desolate lands by establishing a women's cooperative focused on planting and cultivating grass seeds on 40 acres of land.

*Source:* Pastoral Women's Council. 2023. [Cited 12 June 2025]. https://pastoralwomenscouncil.org/

resilience (Bryan, Ringler and Meinzen-Dick, 2023). Boosting this resilience requires enabling women's agency by removing structural barriers within and outside households and promoting equitable power dynamics. This may include interventions aimed at increasing women's access to productive resources (including labour-saving technologies) as well as group-based approaches that increase women's access to shared resources and collective agency (Bryan *et al.,* 2024). Social protection programmes that combine a focus on peoples' empowerment through skill building and creating employment opportunities, with tackling the interconnected challenges of food insecurity, precarious livelihoods and environmental degradation, open pathways to transformation (see Chapter 3, Box 4).

In identifying pathways to ETR in food systems it is important to consider the differential nutritional needs of women, especially women of child bearing age, in particular during pregnancy and lactation (Oumachigui, 2002; Dearden, Bouret and Ozanne, 2018). As such, pathways to food system ETR must ensure gender-responsive and nuanced approaches that can increase women's empowerment and equity (Adam *et al.,* 2024). These examples emphasize the importance of gender, particularly in the context of enabling capacities and agency.

## 4.6 KNOWLEDGE SYSTEMS AND PROCESSES

Knowledge systems comprise the production, validation, dissemination and utilization of knowledge, fostering agency as well as connection to nature and its ecological processes. To achieve this, knowledge systems should incorporate local practices, research, innovation, collaboration and education – all of which are vital in guiding multi-actor processes of building ETR. The questions

of – what knowledge? whose knowledge? and innovation for whom? – are important to consider in decisions about which knowledge processes are best suited to build ETR. Knowledge systems have often been driven by an emphasis on technological change, generating gains in productivity but often with unforeseen impacts (Tonn and Stieffel, 2019). An ETR-based approach to knowledge systems should draw the best from science and technology, using a precautionary approach, and bring the contributions of science and technology into dialogue with local and Indigenous Peoples' knowledges to forge new pathways towards ETR.

### 4.6.1 RESEARCH: MOVING TOWARDS DIVERSE AND INCLUSIVE KNOWLEDGE-PRODUCTION SYSTEMS AND PROCESSES

Moving towards more diverse and inclusive knowledge-production systems and processes where local, experiential and place-based knowledge is equally important as – and brought into dialogue with – science is vital to building ETR (Anderson *et al.,* 2017). Democratizing research, respecting and building on the knowledge of farmers, Indigenous Peoples, women, consumers and other food providers can help rethink "research" so it sustains and regenerates traditional knowledge systems, including language and practices, traditions, ceremonies, culture, oral traditions and intergenerational elder–youth relationships (Brock *et al.,* 2024). In turn, investing in building these capacities for knowledge empowers communities with the connections and tools needed to respond to shocks and to support each other through the recovery process, building ETR (Box 25).

BOX 25

#### INDIGENOUS PEOPLE'S FOOD SYSTEMS IN CALIATA, ECUADOR

The Caliata Initiative (www.caliatainitiative.org), based in Chimborazo Province, Ecuador, revitalizes rural life and strengthens the food systems of the Indigenous communities of the region. Rooted in 7 years of participatory action research, the initiative draws on Indigenous Peoples' ancestral knowledge and Andean agroecological practices, maintained through a long history of resistance to input-dependent systems (Deaconu et al., 2021; Gallegos-Riofrio et al., 2024). The Kichwa-Puruwa community of Caliata, which inspired the initiative and remains at its core, integrates pre-Columbian terracing systems, which are resilient to hailstorms, droughts, pest outbreaks and frost, with ancestral practices, including agrarian calendars aligned with natural cycles to cultivate diverse, nutrient-rich crops that maintain biodiversity and keep soils healthy (Carrasco-Torrontegui et al., 2021; Gallegos-Riofrio et al., 2022). Despite being only 21 km from a city, households maintain minimally processed, nutrient-rich and diverse diets, ensuring dietary stability, low rates of chronic disease and long life expectancy (Gallegos-Riofrio et al., 2021). Grounded in a cosmovision centred on Pachamama (Mother Nature), Caliata exemplifies resilience, health and sustainability. The Initiative has advanced terrace preservation, elevated community voices, improved sanitation for vulnerable elders, and linked local agroecological practices with global frameworks to shape a five-year community vision (Carrasco-Torrontegui, 2025).

*Sources:* Deaconu, A., Ekomer, Mercille, G. and Batal, M. 2021. Promoting traditional foods for human and environmental health: lessons from agroecology and Indigenous communities in Ecuador. *BMC Nutrition*, 7(1): 1. https://doi.org/10.1186/s40795-020-00395-y; Gallegos-Riofrío, C.A., Waters, W.F., Carrasco Torrontegui, A. and Iannotti, L.L. 2024. Encuentros impensados en la transición nutricional: agroecosistemas andinos en la Sierra central ecuatoriana. *L'Ordinaire des Amériques*, 232. https://doi.org/10.4000/123fl; Carrasco-Torrontegui, A., Gallegos-Riofrío, C.A., Delgado-Espinoza, F. and Swanson, M. 2021. Climate Change, Food Sovereignty, and Ancestral Farming Technologies in the Andes. *Current Developments in Nutrition*, 5: 54–60. https://doi.org/10.1093/cdn/nzaa073; Gallegos Riofrio et al., 2022, 2021.

Dialogue between food producers, scientists, agricultural extensionists and educators creates an active role for producers, through which they can test and scale out agroecological knowledge and practice by applying their own experiential know-how. Research methodologies for ETR in food systems emphasize participatory approaches to action, learning and analysis, with an emphasis on transdisciplinary ways of knowing that mobilize knowledge (Box 26).

## 4.6.2 INNOVATION SYSTEMS

Fostering responsible and diverse forms of innovation is important for ETR in food systems as it is the means to develop new practices, norms, markets and institutional arrangements that can improve resilience by reducing exposure to risks, building adaptive capacity and challenging existing structures (HLPE, 2019). Innovations rooted in ETR principles can foster new ways to bounce forward equitably in response to stresses and shocks. Innovation for ETR in food systems goes beyond the linear "technology transfer" approach.

### BOX 26
### PARTICIPATORY FARMER-RESEARCH NETWORKS

Participatory farmer-research and farmer-to-farmer learning is a long-term process linking food sovereignty, agroecology and resilience. For example, participatory action research on coffee systems in Central America showcases the role that farmer participation can play in developing food systems that promote autonomy and resilience, food sovereignty and equality (Mendez et al., 2017). The farmer research networks of the Global Collaboration for Resilient Food Systems combine scientific knowledge with Indigenous Peoples' traditional and local knowledge in communities of practice that span ten countries in the high Andes and Africa. In Bolivia, for example, one of the farmer research networks gathers local information and data about weather patterns and climate, provides weather forecasts for farmers and builds a knowledge base that brings together scientific, traditional and Indigenous Peoples' knowledge. When research is developed and conducted by farmers, as is the case in the farmer research networks, it becomes more relevant to the concerns, needs and interests of rural communities (Richardson et al., 2022). With greater engagement and ownership of the research, farmers are more likely to share and engage with others in "farmer-friendly" ways, for instance through farmer-to-farmer demonstrations and through the dissemination of educational resources covering solutions to agricultural problems of relevance to smallholders. Power dynamics are negotiated among farmers and scientists in a horizontal way, so that both can design and co create research and knowledge dissemination practices.

*Sources:* Bezner Kerr, R., Chilanga, E., Nyantakyi-Frimpong, H., Luginaah, I. & Lupafya, E. 2016. Integrated agriculture programs to address malnutrition in northern Malawi. *BMC Public Health*, 16(1): 1197. https://doi.org/10.1186/s12889-016-3840-0; Méndez, V., Caswell, M., Gliessman, S. & Cohen, R. 2017. Integrating Agroecology and Participatory Action Research (PAR): Lessons from Central America. *Sustainability*, 9(5): 705. https://doi.org/10.3390/su9050705; Richardson *et al.* 2022.



Rather, it is developed through more diverse, complex and ongoing processes of social learning and innovation, involving networks of diverse actors engaged in knowledge dialogues. Equitably transformative resilience emphasizes the need for innovation to be embedded in local circumstances (Joly, 2019; Faure *et al.,* 2018) and highlights the potential for innovation to especially support marginalized groups (Kilelu, Klerkx and Leeuwis, 2013; Elzen, Janssen and Bos, 2017). Innovation in ETR addresses the long-term needs of local communities, especially those most differentially vulnerable, thus promoting the democratization of innovation, co-production and sharing within and among communities across distributed networks, and inclusive and participatory forms of governance (von Schomberg, ed., 2011; Guston, 2006; Glover and Poole, 2019; von Hippel, 2005; Schot and Steinmueller, 2016) (Box 27).

Moving Feast began as a network of social enterprises established in the Australian state of Victoria in 2020 during the COVID-19

BOX 27

## COCINA COLABORATORIO – AN INNOVATION PLATFORM IN MEXICO

Cocina Colaboratorio was created in 2018 to develop innovative solutions for small-scale food systems, combining community-driven approaches and scientific expertise. Working in three Mexican territories (Loma Bonita, Chiapas; Santo Domingo Tomaltepec, Oaxaca; and Xochimilco, Mexico City), the organization aims to regenerate biocultural heritage, foster agroecological practices and create sustainable food systems by developing protocols, prototypes, media and manuals that inspire local-to-global movements.

Rooted in a bottom-up methodology, Cocina Colaboratorio works within three interconnected arenas, or spaces for exchange and experimentation: 1. The Kitchen, where food connects communities and territories through what they eat; 2. The Agroecological Plot, where regenerative, sustainable farming practices are collectively developed and applied; 3. The Living Biocultural Archive of knowledge, stories, seeds and traditions that celebrates local biodiversity and cultural heritage for future action. These arenas facilitate the formation of communities of practice – groups of individuals who come together to reimagine and enact the future of food systems. By empowering community leaders, practitioners, youth and academics, Cocina Colaboratorio strengthens their transformative agency and nurtures a vibrant network of changemakers. Innovations are scaled through translocal learning across the three territories and with partner organizations and networks nationally and globally.

Cocina Colaboratorio aims to transform the whole local food system by activating leverage points – key places in the food system in which small, focused changes can lead to system wide transformation. Changes in materials, for example, have included the diversification of ingredients for the recipes at The Kitchen, the diversification of the types of plants grown in The Agroecological Plot, and the diversity of seeds shared through The Living Biocultural Archive. Changes in practices have entailed culinary innovations, the adoption and refinement of agroecological practices, and the promotion of new networks of exchange of agricultural products. Changes in rules (norms, agreements) have occurred as men were invited to cook, women have become the leading agroecological innovators, and agreements have been established for collective action within the communities of practice. Through a collective process, new visions have emerged that explore alternative, equitably transformative futures.

*Sources:* Balvanera, P., Martinez Balvanera, M., Mesa-Jurado, M.A., Pérez-Volkow, L., Cadena Roa, A., Dominguez-Yescas, R., Guerrero Molina, E. et al. 2025. Cocina Colaboratorio: cooking transdisciplinary transformations of local food systems. *Ecology and Society*, 30(1): art17. https://doi.org/10.5751/ES-15829-300117; Fischer, J. and Riechers, M. 2019. A leverage points perspective on sustainability. *People and Nature*, 1(1): 115–120. https://doi.org/10.1002/pan3.13.



pandemic (Moving Feast, 2025). It is an example of grassroots social innovation, with civil-society organizations forming a network to deliver healthy and culturally appropriate food to residents of low-income public housing towers that were locked down in August 2020 as part of COVID-19 mitigation measures. The network developed a holistic model for delivering food relief, which included sourcing food from local farmers and community gardens. The network has evolved into a coalition with broader aims for the transformation of Victoria's food system, aiming to generate multiple social, environmental and economic benefits (Carey and Murphy, 2024). Box 28 describes different categories of social innovation.

## BOX 28
## SOCIAL INNOVATION AND COLLABORATIVE PARTICIPATION

While there are various definitions of social innovation, Westley and Antaze (2010) define it as "a complex process of introducing new products, processes or programmes that profoundly change the basic routines, resource and authority flows, or beliefs of the social system in which the innovation occurs". Successful social innovations are durable and have broad impact, with the potential to disrupt and change the broader system (Westley and Antadze, 2010). There are many categories of social innovation, including: incremental innovations, institutional innovations and disruptive innovations (Nicholls, Simon and Gabriel, 2015).

Incremental innovations build on existing trajectories, while disruptive innovation goes in new, radical directions (Vercher, Bosworth and Esparcia, 2023). For example, food banks and food charities are incremental innovations that can address immediate needs (such as hunger) and shocks (such as natural disasters). However, food banks do not necessarily address or disrupt the broader system that may be causing long-term stresses that lead to food poverty and chronic hunger (Riches, 2018). Incremental innovations can also be considered stopgap solutions, much like bouncing back.

Institutional social innovations include initiatives such as publicly funded and mandated school meals in Brazil (Locatelli, Canella and Bandoni, 2018). In this case, directives from a governmental institution can re tool existing economic structures to fund universal school meal programmes that benefit all children. This intervention, in turn, can positively impact children's health and well-being, hence constituting a mechanism for "bouncing forward".

Disruptive innovations transform the system through economic, regulatory or governmental policies that have broad impact. An example of this is the Land Back movement that aims to enable affected Indigenous communities to achieve climate justice and food-system resilience (Racehorse and Hohag, 2023). Land Back initiatives are disruptive and transformational social solutions, aligned with ETR.

The social and solidarity economy has been recognized for its role in providing decent work opportunities for all, in particular for those who are most vulnerable. Rossi et al. (2021) found that initiatives in Italy grounded in social and solidarity economy focused on "de commodification" of food so that entirely new systems and relationships between actors evolved and challenged the commodification of food. Solidarity-economy initiatives created counternarratives to the dominant extractive system and developed collective agency to spread this innovation broadly (Rossi, Coscarello and Biolghini, 2021). This approach moves beyond stopgap solutions that have provided free food (food solutions) to address lack of food access caused by poverty, aiming instead to achieve long-term transformation and resilience through income-based solutions.

*Sources:* Westley, F. and Antadze, N. 2010. Making a Difference: Strategies for Scaling Social Innovation for Greater Impact – *The Innovation Journal: The Public Sector Innovation Journal*, 15(2). https://innovation.cc/document/2010-15-2-2-making-a-difference-strategies-for-scaling-social-innovation-for-greater-impact/; Nicholls, A., Simon, J. and Gabriel, M. 2015. Introduction: Dimensions of Social Innovation. In: A. Nicholls, J. Simon & M. Gabriel, eds. *New Frontiers in Social Innovation Research*. First edition, London, Palgrave Macmillan UK. https://doi.org/10.1057/9781137506801; Riches, G. 2018. *Food bank nations: Poverty, corporate charity and the right to food*. UK, Routledge. https://www.routledge.com/Food-Bank-Nations-Poverty-Corporate-Charity-and-the-Right-to-Food/Riches/p/book/9781138739758?srsltid=AfmBOopft69JYJJi96ufGdjg6_vOWDw_3wNujhDu5IRNlau7EgE3ODeT; Locatelli, N.T., Canella, D.S. and Bandoni, D.H. 2018. Positive influence of school meals on food consumption in Brazil. *Nutrition*, 53: 140–144. https://doi.org/10.1016/j.nut.2018.02.011; Racehorse, V. and Hohag, A. 2023. Achieving Climate Justice Through Land Back: An Overview of Tribal Dispossession, Land Return Efforts, and Practical Mechanisms for #LandBack. UNM School of Law Research Paper 34 COLO. *Colorado Environmental Law Journal*, 175 (2023). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4575288; Rossi, A., Coscarello, M. and Biolghini, D. 2021. (Re)Commoning Food and Food Systems. The Contribution of Social Innovation from Solidarity Economy. *Agriculture*, 11(6): 548. https://doi.org/10.3390/agriculture11060548

### 4.6.3 TECHNOLOGY

Appropriate technology contributes to ETR by embedding local adaptability, redundancy, ecological sustainability, equity and a focus on the agency of users into its design and application. Appropriate technology is not merely about tools – it is about rethinking how and why we innovate, placing people and ecosystems at the centre (Sinclair and Coe, 2019; Montenegro de Wit, 2022). Technologies can, for example, contribute to the diversification of production methods and serve as a complementary tool for sharing resources and knowledge, to analyse data faster and to facilitate access to food in remote communities or extreme environments (Council of Canadian Academies, 2024). These tools and technologies may include apps to support food recovery or estimate food loss (Hook and Soma, 2022), remote sensing technologies to analyse crop yield (Weiss *et al.,* 2020), early warning systems (Box 10) and controlled-environment agriculture (Benke and Tomkins, 2017). For example, controlled-environment agriculture can extend growing seasons and facilitate access to diversified fruits and vegetables (McCartney and Lefsrud, 2018). Digitalization in supply chains helps monitor production, processing, storage and transportation, and helps companies anticipate and respond to risks such as crop failures, contamination or disruptions due to extreme weather. Digitized supply chains can enable efficient coordination between producers, distributors and retailers.

However, technology needs to be applied using a precautionary approach so that it does not result in unintended negative consequences. A recent study of a crop-intensification programme demonstrated how the intensification of smallholder agriculture by foregrounding technology and management adjustments reduced smallholder resilience by inhibiting sovereignty over land use, decreasing livelihood flexibility, and constricting resource access (Clay and Zimmerer, 2020). While appropriate technologies can play a role in ETR, it is essential to critically assess the limitations, long-term risks, true costs and the dynamics of ownership and access in the use of different technologies (Benyam *et al.,* 2021). Disruptive technologies can entrench the dependency of farmers on suppliers and undermine autonomy, agency and economic viability (Hackfort, 2023; Rotz *et al.,* 2019; Stoc *et al.,* 2021; Clapp, 2025).

The rapid proliferation of novel agricultural technologies has prompted critical questions regarding their ethical, social, political and environmental implications. Innovations such as gene editing, precision-agriculture tools (such as drones and sensor-based irrigation), robotic harvesters, artificial intelligence, blockchain technologies, and other forms of automation are reshaping agricultural practices in profound ways. Yet, as these technologies continue to evolve and be integrated into food systems, we are only beginning to understand the full extent of their disruptive and transformative potential – both beneficial and harmful (Biradar *et al.,* 2023; Lioutas *et al.,* 2021). Questions regarding who manages data governance (HLPE, 2022), who owns knowledge and intellectual property, and what are the rights of citizens to use, modify and repair technologies have all been raised as important issues to consider (Carolan, 2024). These questions signal the importance of data sovereignty (Canfield and Ntambirweki, 2024), the data commons and open access approaches (Box 29).



BOX 29

#### OPEN ACCESS APPROACHES TO TECHNOLOGY

The Open Food Network is an example of an innovative, free, open-source software platform that strengthens local and regional food supply chains (Open Food Network, 2019), operating in Australia, Belgium, Brazil, Canada, France, Germany, Greece, Ireland, Italy, New Zealand, Portugal, Russia, Spain, Switzerland, the United Kingdom of Great Britain and Northern Ireland and the United States of America. By connecting farmers and wholesalers directly to consumers, the Open Food Network builds food-system resilience, making healthy, local food more affordable. It was a critical contributor to the resilience of community food enterprises during the COVID-19 pandemic, enabling them to move their businesses online (Murphy et al., 2022).

*Sources:* Open Food Network. 2019. Home. In: *Open Food Network.* [Cited 7 July 2025]. https://openfoodnetwork.org/; Murphy, M., Carey, R. and Alexandra, L. 2022. *The resilience of Melbourne's food system to climate and pandemic shocks.* Melbourne, University of Melbourne. https://doi.org/10.46580/124370

There are concerns around the loss of employment and of entire agricultural professions, as well as the loss of associated knowledge. For example, reliance on artificial intelligence to assess, evaluate and determine courses of action for farmers in the field could replace agronomists (Ryan, 2023). Increasing reliance on these tools in the future erodes the human ability to retain this knowledge and FSN and further contribute to the loss of critical local and Indigenous Peoples' knowledges that are essential to food-system resilience, as highlighted for instance in the Kunming Montreal Global Biodiversity Framework. Other concerns include vulnerabilities to cyber hacking or sabotage which can have global repercussions (Carolan, 2020), and the sustainability of tools which incorporate artificial intelligence (namely the non-renewable energy and the pollution caused in making these technologies and in repairing and disposing of such tools) (Ryan, 2019).

Given these broader concerns, the most important questions when it comes to the relationship between technology and ETR may not centre so much on how to rapidly adopt new innovations, but on what needs to be done so that they do not undermine but strengthen ETR. Participatory technology assessment, viewed through the lens of technological sovereignty seeks to democratize decisions about which technologies are appropriate, who benefits from them, and under whose control they should operate (Montenegro de Wit, 2022). This approach shifts the emphasis from technological efficiency to public accountability and self-determination. Deliberative approaches can provide opportunities for the public to engage in vital debates on the role of technology in society. For example, a citizens' jury on genetically modified cotton in West Africa brought farmers, citizens, scientists and policymakers together to deliberate and make policy recommendations on the future of genetic modification technology in Malian agriculture. Designed as a bottom-up and participatory process, the outcomes significantly changed national policy on the release of genetic modification technology and have had an enduring influence in Mali (Pimbert and Barry, 2021). These precautionary and deliberative approaches foreground collective well-being, environmental sustainability, and the rights enshrined in instruments such as the UNDROP and the UNDRIP (UNHCR, 2018; UN General Assembly, 2007).

### 4.6.4 SEEDS AND GENETICS

It is vital to uphold farmers' rights to exchange seeds and animals. Traditional seeds and Indigenous Peoples' livestock breeds have evolved over generations to be more resilient to local climate conditions and diseases. While modern breeds may be more productive in controlled environments, they often introduce vulnerabilities such as susceptibility to pests or diseases (Liverani *et al.,* 2013; Stevenson, 2023). In contrast, traditional breeds and seeds enhance adaptation and reduce dependency on external inputs, fostering long-term resilience (Kliem and Sievers-Glotzbach, 2022; Kleim, 2024; Phiri *et al.,* 2021). The ongoing importance of farmer seed systems was evident in a study of five countries in Africa and in Haiti that found that farmers access 90.2 percent of their seed from informal systems, 50.9 percent of which are derived from local markets (McGuire and Sperling, 2016).

Increasing access to seeds that are resilient to pests, diseases and climate shocks and stresses is important to ensure FSN. The Wiphala Paper on Indigenous Peoples' food systems outlines the central role of seeds within Indigenous food systems (FAO, 2021c). In many countries Indigenous Peoples' crop varietal mixtures and species mixtures have been used for thousands of years by farmers to mitigate risk and increase adaptive capacity. For example, sorghum varieties are planted in mixtures by farmers in 14 African countries, with some farmers planting over 30 varieties together. In the Andes, it is not uncommon for farmers to plant over 40 potato varieties together (McAlvay *et al.,* 2022; Dawson *et al.,* 2023). These strategies have been disincentivized or actively discouraged in many countries due to a focus on single breeder's varieties grown in monoculture and an emphasis on production for markets (McAlvay *et al.,* 2022). Community seed banks are an increasingly important way to support diverse seed systems that are adapted to the territorial context and are affordable and accessible to farmers (Box 30).

BOX 30

### AN EXAMPLE OF SEED BANKING IN THE PHILIPPINES

Community-based seed systems are key to achieving food sovereignty and to protecting culinary traditions and local knowledge systems. Yet local seed networks worldwide face many challenges, including social institutions, policies and legislation that favour formal seed systems and dependence on external funding. As a farmer-led network that has been around for more than 35 years in the Philippines, Magsasaka at Siyentipiko para sa Pag-unlad ng Agrikultura (Farmer Scientist Partnership for Development, known as MASIPAG) has overcome many of these obstacles. It has been developing climate-change-resistant cultivars through close scientist–farmer partnerships. In 2019, the network unveiled its collection of 74 adapted rice varieties, each resistant to an environmental or climatic stress such as drought, flooding, pests, disease and saltwater intrusion. These locally developed, organically farmed varieties demonstrate that agroecological practices can contribute to adaptive capacity to climate change, resulting in increased resilience to climate stresses and shocks.

*Source:* Global Alliance for the Future of Food. 2021. MASIPAG: Empowering Farmers to Breed Local Rice Varieties. https://futureoffood.org/insights/masipag-empowering-farmers-to-breed-local-rice-varieties/

## 4.6.5 FARMER LEARNING AND SHARING

Farmer field schools, a widely adopted, participatory approach to agricultural extension and training, enhance the capacity of smallholder farmers to manage soils, practice agroforestry and conserve water, among other capacities. As a result, farmers participating in farmer field schools have achieved more independence from commercial seed markets, while protecting agricultural and ecosystem diversity (FAO, 2025). In Andhra Pradesh (India), the Community Natural Farming movement conducts farmer-to-farmer agroecological training through community workshops and champion farmers. Through these community-led learning processes, farmers learn how to cultivate crops without synthetic inputs, reducing farming costs and enhancing long-term sustainability.

The international peasant movement, La Via Campesina, has developed a worldwide agroecology learning network through peasant-to-peasant processes that have been described as the "motor" of agroecological scaling (Val *et al.,* 2019). The network advances knowledge from the perspective of farmers' experiences in their own territories, then disseminates it among territories, regions and countries. La Via Campesina has become, along with other social movements and food-producer organizations, a key protagonist in developing agroecological knowledge and mutual learning.

# 4.7 CONCLUSION

This chapter provided examples from around the world about how to move towards ETR in food systems. By exploring approaches to coherent governance; elaborating how emergency preparedness, contingency planning and foresight address shocks and stresses; describing the role of diversified systems; and understanding the need for inclusive, equitable knowledge systems, specific pathways to ETR in food systems were identified. These examples demonstrate how to enable capacity development and agency, grounded in local values, and how to build socioecological interdependencies and change structures on the path to ETR.

# CHAPTER 5

Huatapampa community and small family farmers with diverse ecotypes of beans, potatoes and other tubers, September 2024. Lake Titicaca, the Plurinational State of Bolivia.

Actions to build ETR should combine short-term responses with longer term structural reforms that integrate across socioecological systems; enable capacity and agency and the expression of values among all actors along the food system; and are adapted to the specific circumstances of each place.

Interventions to build ETR have three characteristics:

**First, they reduce the probability and impacts of future shocks,** by:

- simultaneously strengthening equity for all actors in all the stages of food systems;
- relying on synergies between socioeconomic and ecological systems; and
- being inclusive and advancing the right to food.

**Second, they prepare food systems and actors for future and uncertain shocks** as they:

- promote diversity of actors throughout food systems;
- systematically anticipate what risks or shocks might become important and why, and prepare for these as part of anticipatory governance;
- introduce fallback options that can alleviate the impact of shocks, if needed; and
- manage stresses that impair resilience or exacerbate the effects of shocks by eliminating, mitigating or allowing for positive adaptation to those stresses.

**Third, they provide stronger foundations and enable the capacity** of food systems and actors for swift, equitable responses in the event of shocks such as emergencies.

Equitably transformative resilience should happen before, during and after crises. Transforming food systems requires a combination of structural, systemic and enabling interventions that increase functional diversity and redundancy across food systems, while reducing dependency and homogeneity of production, distribution and consumption. The recommendations below are grouped into four thematic areas, following the examples presented in the report.

### *Governance and policy*

Governance is central to resilience building as it helps define whose problems are considered, how solutions are built, and what priorities are addressed. Governance can build futures that support resilience or undermine it. Reforming governance structures in line with equity and participatory principles, guided by a systemic understanding of food systems, is an essential first step to achieving ETR. Strategies include:

Strengthening policy coherence, by:

- embedding ETR in food systems and the right to food into national polices and action plans, such as climate, One Health, and other action plans, and into global financial mechanisms for development;
- assessing and modifying government policies to coherently address environmental, health and equity impacts; and
- directing subsidies, programmes and other support towards nutrition sensitive agroecological practices and other innovative approaches to reduce dependency on external inputs and enhance climate adaptation and mitigation, while improving equity in resource allocation and availability processes.

Ensuring inclusiveness and meaningful participation of all actors in food systems, by:

- creating participatory, locally driven decision-making processes that ensure those most affected by shocks and stresses are central to food system transformation and resilience planning;
- promoting financing mechanisms for debt relief – including forgiveness, restructuring and cancellation – to facilitate the reduction of and adaptation to stresses and shocks; and
- strengthening inclusive access to fair and democratic, multilateral financial tools for

smallholder farmers and micro, small and medium sized enterprises throughout the food system.

Protecting the vulnerable and marginalized, by:

- strengthening access to universal, adequate, comprehensive and sustainable social protection;
- ensuring that food system workers are covered by national labour legislation that is consistent with international labour standards; adopting due diligence and sanctioning violations; and ensuring non-discrimination, the elimination of child and forced labour, freedom of association, and health and safety, including by regularizing undocumented workers; and
- expanding social protection coverage to all workers across food systems, including those in informal, seasonal and precarious employment, enabling access to comprehensive and adequate social protection benefits. Commit to guaranteeing a living income for all food workers, especially in global value chains.

### *Emergency response, contingency planning and foresight*

The approach to foresight, emergency preparedness, contingency planning and disaster risk reduction should go beyond reacting to crises. It should identify and manage risks and differential vulnerabilities emerging from food systems, as well as build ETR against shocks and stresses that have accumulated over time. Foresight approaches can help better anticipate future risks and stresses. Vision building around ETR could use exploratory foresight together with back casting (planning backwards from a desirable future) to find robust solutions and support resilience building through actions that:

- undertake careful, anticipatory action planning for interventions in food system resilience, considering production, transformation, distribution and consumption; and develop contingency plans that distinguish responses according to major classes of shocks;
- integrate agroecology into contingency planning for food crises, ensuring resilient systems for the multiplication and propagation of plants and animals, including by establishing community seed banks, developing neglected crops, enhancing food processing facilities and reinforcing local distribution networks;
- foster cross-sectoral coordination and integrated planning across the humanitarian, development and climate sectors, to enable timely and effective responses before crises escalate, and strengthen delivery systems to reach the most vulnerable;
- invest in disaster resilient infrastructure, such as transportation networks, storage facilities, water sanitation, cold chains and food markets;
- develop and fund multihazard comprehensive early warning and early action systems that provide timely alerts for impending risks, and link forecasting data with preplanned interventions, ensuring that resources are mobilized ahead of a crisis and reducing the impact on vulnerable populations; and
- proactively and comprehensively integrate food system resilience into all aspects of urban disaster risk management by utilizing the Disaster Resilience Scorecard for Cities and its Food System Resilience addendum.

### *Foster diversity in production, markets and diets*

Actions are needed to help producers, processors, distributors, markets and consumers build resilience by using the diversity of markets to enhance the availability of and access to healthy diets in support of FSN. The following actions are needed:

Supporting diverse systems, building on socioeconomic and environmental synergies, including:

- programmes to rehabilitate, restore or rebuild productive systems where

aboveground and below ground ecosystems have been compromised, including support to smallholder farmers and agroecological producers for crop and breed biodiversity;

- investment in diverse food production systems, supply chains and infrastructure (including grading, sorting, processing, food handling, cold storage, packaging and storage) that meet the nutritional needs and that are affordable to local consumers and fair to micro, small and medium sized businesses;
- strategies that enable the participation in food systems of marginalized and excluded groups by providing access to local markets, financing, training and other forms of support;
- legal, legislative and regulatory means (including through the protection of customary and common land systems) that ensure that all people have access to and rights to use land, water, seeds and other resources; and agency over production practices; in order to empower communities to invest in sustainable land use and land rehabilitation and restoration, and to build long-term resilience to climate and economic shocks;
- the integration of a One Health approach in food systems to protect against and prevent zoonotic disease transmission; and
- support for small scale, diversified farms, fisheries and forests that protect livelihoods, health, ecological integrity and biodiversity.

Better use of market mechanisms to increase stability by:

- analysing the determinants of price volatility and restructuring markets to address market power imbalances and concentration;
- establishing and enforcing commercial rules and regulations that reduce market concentration, facilitate collaboration and fair competition, and prevent price gouging and distortion measures in trade regulations;
- supporting mechanisms that stabilize market access for smallholders and micro, small and medium-sized enterprises and that distribute risk between actors over longer time periods, such as long-term purchase agreements between producers and sellers, public procurement, and contracts that distribute risks, especially climate risks, among different nodes and actors in food supply chains;
- strengthening the use of insurance by engaging communities in participatory process to identify areas of change, including through public support programmes, to shield food sector actors from multiple risks (e.g. climate events and price volatility); and embed insurance products with seasonal credit to alleviate the need to pay the insurance subscription upfront;
- facilitating local and territorial trade (including between bordering countries) of nutrient dense products such as legumes, nuts, vegetables and fruits, dairy and small fish, while prioritizing the rights of smallholder farmers and local communities and the protection of ecosystems; and
- strengthening territorial food markets that are accessible to smallholder farmers and food producers and promoting circularity, aiming to reduce the environmental costs of transport and storage, food safety risks and food loss and waste, and to improve access to affordable, nutrient dense foods.

Facilitating access to diverse nutritious foods, by:

- supporting vibrant food environments through the diversification of food sources that uphold healthy, culturally appropriate food options to foster FSN through policies that integrate action across sectors, consumer education, the diversification of retail choices and increasing the accessibility of nutritionally adequate and culturally appropriate diets;
- using public procurement to stabilize livelihoods for small scale farmers and businesses and to ensure access to healthy

food for those most affected by shocks and stresses;

- providing opportunities for diets supported by diverse cropping systems and gastronomic food cultures, valuing and recovering forgotten practices and knowledge; and
- supporting consumer education and information on diverse foods.

### *Knowledge systems for equitably transformative resilience*

Knowledge systems should promote resilience and inform evidence-based governance and policies on production, markets and diets. In particular, the following actions should be carried out with regard to knowledge systems.

Focus research on resilience, moving away from a production-centred focus. This entails:

- investing in country wide, representative, disaggregated and longitudinal data collection and improving domestic capacity to analyse the data for shock preparedness, contingency planning and foresight;
- investing in innovations that promote resilient food systems (potentially including regenerative farming practices to improve soil health, such as crop rotation and organic fertilization), and actively support the wide diffusion of innovation;
- enhancing biodiversity to improve pest resistance, including practices such as polycultures, agroecology, intercropping and natural pest control methods, to reduce dependence on synthetic pesticides and strengthen the resilience of agricultural systems; and identify alternative crops that ensure stability of yields under changing conditions, and animal breeds that are more resilient to a changing climate; and
- undertaking participatory assessments of new and emerging technologies that may have negative impacts, adopting the precautionary principle to avoid unintentionally undermining resilience in the long term.

Ensure ethics and data governance, by:

- incorporating ethics and equity into intellectual property rights, by:
  - recognizing the rights of Indigenous Peoples to their own collective information,
  - protecting local knowledge and preventing biopiracy and the patenting of local crops and genetics, which undermine the rights of people and communities,
  - promoting the responsible roll out of technologies in communities, including benefit sharing,
  - requiring ongoing prior informed consent,
  - ensuring the right to repair and the right to data for both public and individual goods,
  - recognizing the rights to the commons;
- supporting responsible data governance that empowers farmers and communities in food systems, respects privacy and ensures data rights for use and sharing; and
- developing open access platforms for sharing agricultural knowledge and good practices, expanding digital literacy programmes, and using local languages and culturally relevant communication methods.

Broaden and democratize dominant knowledge systems by fostering knowledge co-creation, using transdisciplinary and participatory approaches. This can be done by:

- acknowledging, valuing and harnessing marginalized knowledge, ways of knowing and social technology, including traditional, Indigenous and local knowledge systems, through
  - empowering communities to lead, co-lead and contribute to research,
  - promoting social and grassroots innovation and technologies,

  - developing community knowledge hubs based on scientific and traditional practices to guide responses to shocks in food systems,
  - allocating public funding to participatory knowledge creation processes,
  - prioritizing the needs of marginalized social groups in line with equity principles;
- working with policymakers and land use planners to support national and territorial food systems and honour Indigenous Peoples' food infrastructure and traditional food practices;
- supporting food diversification through research on forgotten crops and seeds, by supporting biogenetic conservation – including animal and plant gene banks managed by communities and Indigenous Peoples, by upholding farmers' rights to save and exchange traditional farm saved seeds, and by strengthening both formal and informal seed systems; and
- investing in open access data systems, either enhancing existing systems or improving access to them,

Enhance education to support food system resilience, by:

- facilitating access to education and training (including postsecondary) that includes the skills required in professions related to food system resilience (e.g. circularity, agroecology, practices to ensure the nutritional quality of food supply), as well as skills required to transition to new systems and for adaptation and mitigation; and
- supporting formal and informal education, from youth to adult learning, to build the capacities to respond to stresses and shocks, including agricultural extension and training to support farmers in diversifying to non agricultural activities.

Develop a monitoring and assessment system for resilience, which includes the following components:

- indicators to monitor and assess ETR developed through a participatory approach based on PANTHER principles that engages all food system actors, especially those most exposed to shocks and stresses, to ensure resilience assessment processes are socially legitimate and ethically grounded, as well as context-specific; and
- indicators should consider structural inequalities as well as local, experiential knowledge about vulnerability to shocks and stresses alongside scientific data, ensuring that monitoring becomes a transformative process (see Annex 1 for more details).

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# GLOSSARY

**"Bouncing back" resilience** is often defined by the system's capacity to provide food security over time despite disturbances (Tendall *et al.,* 2015).

**"Bouncing forward" resilience** puts an emphasis on the capacity to transform in the face of shocks (FAO, 2021). Resilience as an ability to **bounce forward** recognizes the need to support individuals and food systems more broadly to transform to a better state.

**Differential vulnerability** means that susceptible individuals – particularly women, children and marginalized people, households or communities – have differentiated exposure and sensitivity to shocks and stresses and uneven adaptive capacity (Thomas *et al.,* 2019).

**Diversity** is characterized by variation in categories and their function, balance between the various categories to provide evenness in distribution, and disparity to ensure breadth of adaptability options. Increased diversity and redundancy in nature, markets, available seeds, food stocks and livelihood sources, for example, are associated with enhanced resilience in the face of stresses and shocks, including future possible shocks (Hodbod and Eakin, 2015).

**Equitably transformative resilience in food systems** is a dynamic condition that can be achieved when institutions, policies, people, ideas and practices uphold the capacity of individuals, communities, nature and socioecological processes to prevent, absorb, adapt and transform in the context of multiple uncertainties, compounded by structural and contingent shocks and stresses and differential vulnerabilities. It goes beyond "bouncing back" from immediate disruptions and requires food systems to "bounce forward" in equitable ways that redress unequal distribution of power, capabilities, resources, rights and duties, while harnessing socioecological synergies so that food systems are less prone to shocks in the future.

**Redundancy** refers to the replication of pathways, functions, or components which enhance a system's ability to continue to function in the face of shocks and stresses (Kharrazi *et al.,* 2020; 2016).

**Risk** is the likelihood of negative impacts of shocks and stresses on communities, households or individuals.

**Shocks** are abrupt, short-term, sometimes unforeseen events that impact human and/or ecosystem well being.

**Stresses** are longer term conditions or processes frequently linked to inequitable development that reduce capacities to deal with risks.

**Vulnerability** is widely understood in the environmental change literature to be a combination of exposure, sensitivity and adaptive capacity (Smit and Wandel, 2006).

# ANNEX: EQUITABLY TRANSFORMATIVE RESILIENCE MONITORING AND ASSESSMENT

Assessing and monitoring changes in food systems over time can help countries, territories and food system actors understand whether they are moving in the direction of ETR or not. The assessment process should be based on place specific indicators co constructed and mobilized by key actors, including civil society organizations, farmers and their associations, local businesses (including cooperatives), consumers and their groups, and policymakers and decision makers from multiple scales. Engaging with this broad range of actors helps ensure that the assessment and monitoring process includes the voices of vulnerable food system actors and supports structural changes; enables agency and capacity building and the exercise of values; and fosters and builds interdependent socioecological synergies. Overall, the assessment and monitoring process should centre on the well-being and prosperity of those most affected and on the planet. As such, it should include a wide range of ecological, social, cultural, governance and economic indicators from across the food system.

It is also important to consider the barriers and challenges that may be faced in developing, monitoring and gathering, as well as updating, the necessary data. Some possible challenges include: difficulty in obtaining reliable and updated data, different definitions and perspectives used in indicator development, and the diversity of views on how indicators should be used (Armstrong and Francis, 2003). For example, as it pertains to how an assessment is framed, the question of who is engaged in the process of determining the indicators is important as this can influence how a problem is understood and what indicators are identified.

## 1. Possible approaches

The complexity of food systems and of working towards ETR demands an equally complex monitoring process that accounts for healthy ecosystems, economic factors and social dimensions, as well as equity considerations grounded in ETR principles. Recognizing and supporting the realization of the right to food and FSN for the most affected should remain central to the monitoring process, regardless of scale. Monitoring and assessment approaches must be sensitive to power dynamics and historical data collection bias to ensure that they support the development of interventions that help redistribute resources, empower marginalized groups and promote systemic change.

Monitoring and data collection must be centred on place based, integrated efforts that reflect the realities of communities, territories or countries as they move towards ETR. The key is to provide evidence for informed decision making. It is also important to balance the need for information with a manageable number of indicators, so the data are informative but not too difficult to collect or too unwieldy. Attention should be paid to developing indicator frameworks that provide decision makers with the smallest possible set of decision relevant indicators that are developed in communities or are aggregated from a wider set of scientifically sound metrics and data.

There are different options to assess and monitor a food system as it moves towards ETR. Being clear from the beginning about the purpose of the monitoring initiative will determine what kind of data to collect and analyse; for instance: Will the monitoring be used to raise red flags around vulnerabilities of certain groups? Is the assessment aimed at monitoring the impact of certain resilience building measures? The collaboration and deliberation of the actors involved in making monitoring decisions is crucial to ensure authentic and connected versions of ETR measurements. Those most affected must be central to the deliberation and decision making process, with robust resourcing and space for agency for them to make a genuine contribution. The monitoring system must help identify points about when, where and how actions should be taken to address vulnerabilities and enhance resilience.

Aligning ETR with existing monitoring frameworks can follow the ETR phases to include equity; enable capacity building, agency and the exercise of values; realize rights; and ensure ecosystem integrity and system interdependencies. Importantly, achieving ETR requires different combinations of policies and innovations, depending on the context.

Building food system resilience should be understood as a dynamic and continuous process – one that requires an equally dynamic approach to assessment. Rather than a static evaluation, the assessment should focus on the progression of resilience over time. This includes tracking the shift from the ability to bounce back after shocks and stresses, to more transformative types of resilience where people and systems "bounce forward", and do so equitably (ETR).

As a starting point, this annex provides links to existing evaluation tools that are most relevant for assessing bouncing back, bouncing forward and transformation, and ETR. The tools provide a starting point for developing indicators and highlight the need for community led monitoring processes.

As stated, developing indicators to monitor and assess ETR requires a participatory approach that engages all food system actors, with a particular focus on marginalized and vulnerable groups – those most exposed to shocks and stresses – in defining what ETR means in their specific contexts. This ensures that resilience assessment processes are socially legitimate and ethically grounded. Moreover, the process of indicator development should reflect the PANTHER principles; that is, the process should be: participatory, accountable, non-discriminatory, transparent, respectful of human dignity, empowering, and in adherence to the rule of law. Operationalizing the PANTHER principles involves questioning whose knowledge counts, who benefits from the monitoring outcomes, and who has access to the decision making process. Methodologies must address structural inequalities and validate local, experiential knowledge about vulnerability to shocks and stresses, alongside scientific data. In doing so, monitoring becomes a transformative process – shaping not only what is measured, but how resilience, as a capacity, is built and sustained over time. This approach fosters more contextually relevant and empowering resilience strategies, rooted in the lived realities of diverse communities.

Evaluating ETR in food systems requires a mix of quantitative and qualitative indicators based on multidimensional frameworks. Indicators can consider short-term recovery and long-term transformation, as well as the space in between. Ideally, the approach should explore absorptive, adaptive and transformative capacities and the interdependence between social and ecological processes. Data collection can take place using existing data or by collecting new data through interviews, workshops and focus groups that strengthen the contextual nature of the information and the legitimacy of the interventions. Several dimensions can be considered in developing indicators to assess and monitor whether there is change or not in the direction of ETR, including structural change, system dynamics, and the enabling of capacity building, agency and the exercise of values. More work is needed around ETR evaluation so that better interventions can be created.

Several approaches can be used to identify and develop indicators. Three are provided here, but more are possible. It is likely that all these approaches will be used in some combination during indicator development. One option to assess if a food system is moving towards ETR is to track a number of indicators that monitor food system outcomes over time, such as the FSN status of different groups, or the monitoring of the environmental integrity of the ecosystems supporting a particular food system. While a number of resilience monitoring systems provide guidance on this type of data at the national scale, there is a critical gap in community led approaches that focus on the well being of the household, community and ecosystem, which build an overarching narrative rather than focusing on aggregable data. However, it is important to note that it will be difficult in our complex food systems to trace changes in indicators back to particular measures or particular combinations of measures. In cases such as Andhra Pradesh (India), monitoring efforts have used integrative, community led approaches that have treatment and control areas to help decipher how policy changes and programmes fare. Depending on how the metrics are analysed, monitoring assessments could also allow an evaluation to understand if a system is bouncing back, bouncing forward, or moving towards ETR.

Another way of assessing ETR is by monitoring the effect of ETR measures as applied in a specific food system. Here, a measured change in equity, rights system interdependencies, capacity, agency, the exercise of values, and ecosystem integrity would be assessed using a combination of existing data sets and monitoring frameworks. As mentioned, however, these will need to be complemented by community led data processes to provide all the needed indicators. This type of assessment would move the analysis towards shifts in characteristics of a given system (e.g. is a system equitable? are rights of food system actors observed?) and would rely on qualitative indicators to capture change.

A third way to assess whether a system is moving towards ETR characteristics could be to monitor structural changes in more detail. In this case, for example, the number and type of food system actors who are active in a specific system could be monitored, together with how they interact with each other. Social network analysis and mapping can be very useful in this context. Assessing whether changes occur in the system, together with monitoring change in food system outcome measurements (such as environmental or economic outcomes), would allow for a fuller characterization of the impacts of resilience building measures and pathways to change.

Overall, the goal of any monitoring process is to collaboratively develop baseline data, indicators, and a report back process. In developing collaborative efforts in monitoring, it is necessary to ask: data for whom? data by whom? data for what? In addition, capacity building must be a key factor in the process to ensure that data collection is reasonable for the community to undertake.

## 2. Assessment and monitoring tools

This section provides links to existing evaluation tools that are relevant for assessing bouncing back, bouncing forward and ETR. While none of these tools are adequate on their own, as indicated, each provides inspiration and a starting point for developing indicators, as well as highlighting the need for community led monitoring processes.

### *2.1 Bouncing back*

Many tools already exist for assessing resilience as an ability to bounce back at multiple food system levels and in relation

to different dimensions of FSN. These are tools to scope out change in the short term, for example, in emergencies.

1. Resilience Index Measurement and Analysis (FAO)
   Scale: household
   Indirect measures: descriptive analysis of household resistance to shocks
   Direct measures: uses statistical inference to predict resilience
   https://www.fao.org/agrifood-economics/areas-of-work/rima/en/
2. FAOSTAT (FAO)
   Scale: country
   Since 1961 provides production, trade and consumer and food security statistics for 245+ countries
   https://www.fao.org/faostat/en/#home
3. Disaster Resilience Scorecard for Cities: Food System Resilience Module (United Nations Office for Disaster Risk Reduction)
   Scale: city
   Helps cities evaluate and enhance food system resilience to shocks and stresses, including: food system capacity, infrastructure, stakeholders and planning; ecosystem services, finance, resilience capacities and food system outcomes of previous disasters (as available); climate change-related assessments; emergency management planning and procedural documentation
   https://mcr2030.undrr.org/food-system-resilience-scorecard
4. Measuring Well-Being and Progress (Organisation for Economic Co-operation and Development, [OECD])
   Scale: national (OECD member countries)
   Well-being dimensions, including: equality, social cohesion and resource access; social, human, economic and natural capital in the context of risk; resilience
   https://www.oecd.org/en/topics/measuring-well-being-and-progress.html
5. Global Goal on Adaptation (FAO)
   Scale: national
   Focuses on SDG indicators to assess progress on the Global goal on adaptation of the 2015 Paris Agreement, including goals on agriculture
   https://openknowledge.fao.org/server/api/core/bitstreams/069a0618-1154-4b81-91f4-db84e4dbcdb0/content
6. Global Standard for Nature-based Solutions (International Union for Conservation of Nature [IUCN])
   Scale: national, territorial, project, city, community
   Assumes monetizing nature; no equity considerations
   https://portals.iucn.org/library/sites/library/files/documents/2020-020-En.pdf
7. Online Nature-Based Self-Assessment Tool (ICUN)
   Scale: project
   Eight criteria for project management
   https://nbs-sat.iucn.org/
8. Land Health Monitoring Framework (ICUN)
   Scale: local/ecosystem level
   Indicators to monitor land health functioning as part of agriculture https://portals.iucn.org/library/sites/library/files/documents/CGA-001-En.pdf
9. Common ground: restoring land health for sustainable agriculture (IUCN)
   Scale: national
   Describes the imperative to preserve soil through agricultural systems
   https://portals.iucn.org/library/sites/library/files/documents/2020-023-En.pdf
10. Assessing the biodiversity agriculture nexus: an overview of international and European Union methods (Section 4.1 and Section 4.2) (IUCN)
    Scale: national, state and municipal
    Monitors and evaluates FSN at multiple scales
    https://portals.iucn.org/library/sites/library/files/documents/CGFAS-002-En.pdf
11. The Integrated Food Security Phase Classification
    Scale: global, regional and national
    Identifies situations of famine
    https://www.ipcinfo.org/ipcinfo-website/ipc-overview-and-classification-system/en/

### *2.2 Bouncing forward*

While tools to assess and monitor bouncing back provide crucial resources, there is a need to expand them to incorporate an assessment of resilience as a capacity to transform to a better state over time. Drawing on the notion of transformation adopted in this report, this involves scrutinizing structural change in food systems and their ability to harness socioecological interdependencies and enable agency, capacity building and the exercise of values.

1. Adaptive Cycle Framework (Resilience Alliance)
   Scale: ecosystem
   Addresses local resilience of social and ecological system dynamics, focusing on ecological systems with consideration of values
   Workbook for practitioners:
   https://www.resalliance.org/files/ResilienceAssessmentV2_2.pdf
2. The Food Systems Countdown Report (The Food Systems Countdown Initiative)
   Scale: national and global
   Predetermined indicators for five themes: diets, nutrition and health; environment, natural resources, production; livelihoods, poverty, equity; governance; resilience
   https://www.foodcountdown.org/about
   dashboard: https://www.foodsystemsdashboard.org/
3. Self-evaluation and Holistic Assessment of climate Resilience of farmers And Pastoralists, SHAPRP+ (FAO)
   Scale: household (adapted for local contexts and objectives)

Methodology evolved from socioecological interdependencies with focus on production and associated livelihoods and networks; resilience and the capacity to adapt and transform, determined using qualitative and quantitative indicators https://openknowledge.fao.org/server/api/core/bitstreams/70d979e6-a299-4aa5-8bd7-e8a018cacb3d/content

4. Multiscale Approaches for the Assessment and Monitoring of Social and Ecological Resilience to Drought (United Nations Convention to Combat Desertification)
   Scale: national, international
   Approaches to assess and monitor ecological and social resistance to drought using evidence, with particular attention to vulnerable populations and ecosystems https://www.unccd.int/sites/default/files/2023-09/UNCCD%20SPI%20Drought%20Resilience.pdf
5. Agroecosystemic Resilience Index (AgRI)
   Scale: community
   Socioecological biodiversity assessment tool; considers physical, biotic, socioeconomic and symbolic system components https://www.researchgate.net/publication/347349123_Agroecosystemic_Resilience_Index_AgRI_a_method_to_assess_agrobiodiversity
6. Aquatic Animal Welfare for Sustainable Development Goals (Aquatic Life Institute)
   Scale: international, national, community
   Sustainable production models within aquatic food systems including water quality, biosecurity, disease control, feed composition, antimicrobial resistance, climate change, food security, food safety, ecosystem health and livelihoods https://www.ali.fish/policy-resources/benefits-of-aquatic-animal-welfare-for-sustainable-development-goals
7. Milan Urban Food Policy Pact Monitoring Framework (FAO)
   Scale: municipal
   Covers the themes: governance, sustainable diets and nutrition, social and economic equity, food production, food supply and distribution, food waste https://openknowledge.fao.org/server/api/core/bitstreams/4239f2cc-dcac-402b-b956-21ed83908da4/content
8. Toronto Food Strategy Indicator Framework. Adapted from the Milan Pact Monitoring Framework (City of Toronto)
   Scale: municipal
   Measures the City of Toronto's programmes in achieving a healthy, sustainable food system https://www.toronto.ca/legdocs/mmis/2018/hl/bgrd/backgroundfile-118100.pdf
9. Inquérito Insegurança Alimentar São Paulo (Food Insecurity Survey São Paulo) (Municipal Council for Food and Nutrition Security of São Paulo, the Food and Nutrition Security Observatory of the City of São Paulo, Federal University of São Paulo, Federal University of ABC)
   Scale: municipal, household
   Assesses the prevalence and severity of food insecurity to improve nutrition in São Paulo and the region through policy interventions https://sites.google.com/view/situacaoalimentarsp/
10. City Region Food System Indicator Framework (FAO)
    Scale: territory
    Focuses on food value chain nodes, through indicators of natural resources and ecosystems, emergency food provisioning, and food system governance https://www.fao.org/fileadmin/user_upload/faoweb/ffc/docs/Tool_-_CRFS_Resilience_Indicator_Framework.pdf
11. Nairobi Early Warning Early Action Project: Food security and nutrition (Start Network)
    Scale: municipal
    Early warning system for Nairobi to build capacity for early warning systems and serve as a model for other cities https://cng-cdn.oxfam.org/kenya.oxfam.org/s3fs-public/file_attachments/UEWEA%20project%20profile%202017.pdf.

### *2.3 Equitably transformative resilience*

Another crucial improvement in resilience monitoring involves assessing whether resilience, particularly as the capacity to bounce forward, is being achieved equitably. This requires indicators that capture, for example, how agency, capacity building and the exercise of values are enabled across different groups, especially marginalized food system stakeholders. For instance, transformation as the enabling of agency necessitates the meaningful involvement of those most vulnerable to shocks and stresses in defining what transformation means, grounded in their lived experiences.

1. Women's Empowerment in Agriculture Index (International Food Policy and Research Institute)
   Scale: country, territory, region
   Measures gender equity in access to land, income, power to make decisions, control of income, how time is allocated, engagement in community leadership https://weai.ifpri.info/versions/weai/
2. Digital Toolbox on Indigenous People's Food Systems (International Fund for Agricultural Development)
   Scale: project
   Includes assessments of food biodiversity and dietary diversity; provides actionable guidelines on resilience building within Indigenous Peoples' food systems https://www.ifad.org/digital-toolbox/indigenous-peoples-food-systems/
3. True Value: Revealing the positive impacts of food system transformation (Global Alliance for the Future of Food)
   Scale: territorial/community
   Snapshot of health, equity and benefits and externalities for consumers, society and the environment https://futureoffood.org/publication-library/true-value-food-systems/

4. Agroecology Criteria Tool (ACT) and Business Agroecology Criteria Tool (B-ACT) (FAO)
   Scale: project-based
   Continuum of transition based on ten elements of agroecology
   https://www.agroecology-pool.org/b-act/; https://www.agroecology-pool.org/methodology/
   https://www.youtube.com/watch?v=Fxbm03usfLc
5. Land matrix
   Scale: national
   Land deals in more than 100 countries
   https://landmatrix.org/about/the-land-matrix-initiative/

This report, requested by the Committee of World Food Security (CFS), addresses the urgent need to enhance food system resilience amidst escalating environmental, political and economic challenges. It provides focused and action-oriented policy recommendations to build resilient food systems capable of withstanding shocks and stresses. It emphasizes the importance of equitably transformative resilience, which involves enabling capacities and agency, and strengthening socioecological interdependencies to ensure food security and nutrition for all, while respecting planetary boundaries.

The report highlights the need to shift from traditional resilience approaches, which focus on bouncing back to predisturbance conditions, to approaches aimed at "bouncing forward" by means of transformative changes that address structural and systemic vulnerabilities. The report underscores the importance of diverse and equitable food systems in improving livelihoods and food security, particularly for those most affected by shocks and stresses. The report also provides evidence-based pathways to ensure that food systems can adapt and transform in the face of uncertainties.

The main policy recommendations of the report include strengthening governance and policy coherence; fostering diverse food systems; enhancing knowledge systems and processes; science-based decision making; and improving emergency preparedness, contingency planning and foresight. The report advocates for inclusive and participatory decision-making processes, the protection of vulnerable and marginalized groups, and the integration of agroecology and circular food systems. It also emphasizes the role of social protection, public procurement and market mechanisms in building resilient food systems – all these efforts being at the very core of the CFS and HLPE-FSN mission and mandate.

In sum, the report calls for immediate and sustained action to build food system resilience and ensure the right to food for all and the well-being of the planet for future generations.