HLPE EXECUTIVE SUMMARY 20

BUILDING RESILIENT FOOD SYSTEMS

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

Cover photo: Burariki, Kiribati, July 2022. © Karianako James.

In this summary, all references have been omitted to facilitate readability. The references are provided in the full report.

Referencing this report: HLPE. 2025. *Executive summary of the report Building resilient food systems*. Rome, FAO.

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.

Akiko Suwa-Eisenmann
Chairperson of the HLPE-FSN

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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.

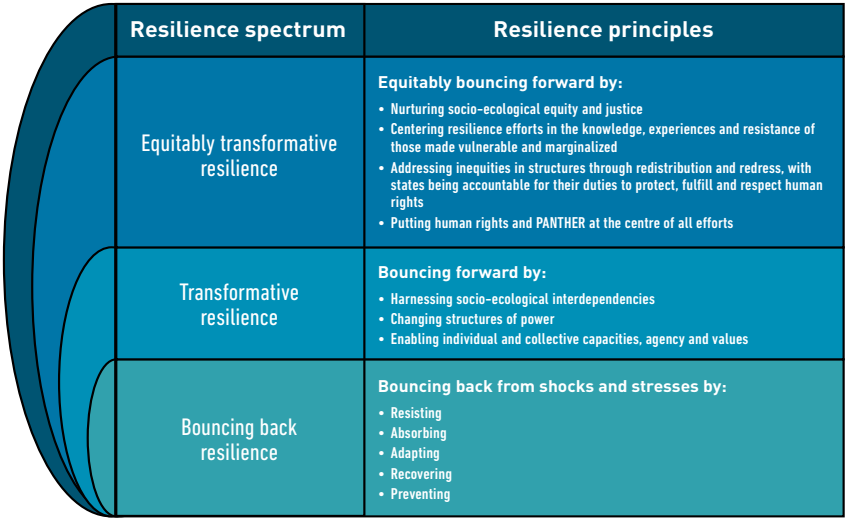
This report introduces the notion of ETR to guide the direction of change, emphasizing that bouncing forward is about transforming food systems such that they specifically nurture equity and justice and realize human rights, while remaining within planetary boundaries. This is in line with the visions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

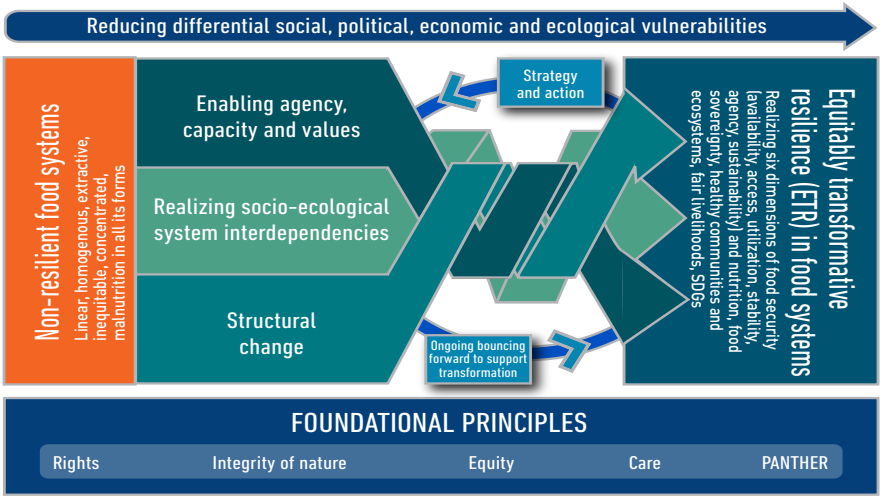
Reducing the underlying stresses will help communities respond meaningfully when shocks occur, minimizing the need for coping strategies that could have long-term detrimental effects on individuals or households, such as selling assets or compromising nutrition. Successful ETR interventions are holistic, 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.

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

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

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.

RECOMMENDATIONS

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 be built 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 above-ground 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 processes 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).

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.