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HLPE-FSN Report #20

BUILDING RESILIENT FOOD SYSTEMS

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This V0 draft may be thoroughly corrected, modified, expanded and revised after the present consultation.

In order to strengthen this draft, the HLPE-FSN would welcome submission of material, evidence-based suggestions, references, and examples, in particular addressing the specific questions of the e-consultation.

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Acronyms

CFS	Committee on World Food Security
COP	Conference of the Parties
COVID-19	Coronavirus disease 2019
CSO	Civil Society Organization
ETR	Equitably Transformative Resilience
FAO	Food and Agricultural Organisation
FSN	Food Security and Nutrition
GHG	Greenhouse Gas
HLPE or HLPE-FSN	High Level Panel of Experts on Food Security and Nutrition
IFS	Industrial Food Systems
IPES-Food	International Panel of Experts on Sustainable Food Systems
LAC	Latin America and the Caribbean
LMIC	Low- and Medium-Income Country
NCD	Non-communicable Disease
NGOs	Non-governmental Organizations
OECD	Organization for Economic Cooperation and Development
SDGs	Sustainable Development Goals
SEA	Southeast Asia
SES	Socioeconomic Status
SOFA	State of Food and Agriculture
SOFI	State of Food Security and Nutrition in the World
SSA	Sub-Saharan Africa
UN	United Nations
UNFCC	United Nations Framework Convention on Climate Change
UNFSS	United Nations Forum on Sustainability Standards
UPF	Ultra-processed Foods
WB	World Bank
WHO	World Health Organization
WIEGO	Women in the Informal Economy Globalizing and Organizing

Chapter 1 | Introduction

Key messages

- The current combined state of food security and nutrition and planetary health demands the adoption of policies, practices and changes that enable equitably transformative resilience in food systems.
- Building on existing HLPE-FSN reports, we define key terms including equitably transformative resilience (ETR), shocks, stresses, risks, vulnerability, differential vulnerability, sensitivity, and adaptive capacity as terms that are needed to understand and achieve ETR.
- **Equitably transformative resilience** (ETR) requires adopting multi-level policies and actions that redress differentials of power, capabilities, resources, rights and duties and go beyond bouncing back to the status quo. ETR acknowledges the interdependence between the resilience of human societies and ecological systems. It requires policies and interventions beyond food systems to transform social, economic, political and cultural structures, increase the agency of individuals, communities and ecosystems, and enable just, dynamic and adaptive socio-ecological response processes that last over time. ETR approaches to food systems help deliver food security and nutrition for all, ensure fair livelihoods, support human health, regenerate ecosystems, halt biodiversity loss and close the inequity gap. By 'bouncing forward' to a new state underpinned by equity principles, ecological integrity and human rights, ETR food systems can simultaneously improve human and planetary well-being and diminish both the frequency and intensity of shocks and stresses over the short and long-term.
- The proposed Theory of Change describes how to move toward equitably transformative food system resilience. This includes that interconnected, coordinated and iterative action is needed in three approaches of change 1. shifting structures; 2. fostering socioecological interdependencies and systems, and 3. enabling capacity, values and agency based on the core principles of human rights, ecological integrity, and care). Strategy and action, including policy and funding, action and advocacy, data and research, provide the change mechanisms to transform food systems towards equitable resilience and the realization of the six dimensions of FSN and, more widely, the SDGs.

1.1 HLPE-FSN scoping

The Committee on World Food Security (CFS) in its multi-year programme of work (2024-2027) has requested the High Level Panel of Experts on Food Security and Nutrition (HLPE-FSN) to develop a report to provide guidance on building resilient food systems. The specific request of the CFS is reported below.

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.

Given the increased frequency of shocks to agriculture and food systems in recent years and the growing risks from a range of sources, it is imperative to explore more deeply how they can be made more resilient – that is, more capable of recovering, adapting and transforming in the face of shocks – as well as more equitable and sustainable, so that they are able to support all dimensions of food security. Understanding the different types of vulnerabilities of agriculture and food systems, and their implications for the different actors involved, will enable CFS to provide a space for exchange and convergence on the policy measures needed to enhance the resilience of local, regional and global food supply chains, including consideration of inclusive and equitable employment opportunities, the role of trade, environmental sustainability, access to healthy diets and human rights.

The 2009 reform of the CFS led to extensive governance changes and enabled the development of "the foremost inclusive international and intergovernmental platform for a broad range of committed stakeholders to work together in a coordinated manner" (CFS 2009). One of unique elements of the reformed CFS was that the inclusive platform was made to "ensure that the voices of all relevant stakeholders – particularly those most affected by food insecurity - are heard" (ibid). In addition, the HLPE-FSN was introduced as the scientific body that supports the work of the CFS and therefore informs the CFS policy convergences process to develop recommendations on building resilience food systems. It is with this mandate in mind that the following report is written.

1.2 Toward equitably transformative food systems resilience

Equitably transformative resilient food systems offer a way forward in the face of converging crises, social, economic, and environmental. Latest data show that hunger, and moderate or severe food insecurity, have persisted after a sharp increase pre-, and then through the, COVID-19 pandemic. In numbers, between 713 and 757 million people (8.9 to 9.4 of the global population) are estimated to have faced hunger in 2023 (FAO et al., 2024). While the gap in food insecurity between men and women has narrowed, women are still more likely than men to experience moderate or severe food insecurity (ibidem). Multiple burdens of malnutrition are evidenced by the increasing prevalence of adult obesity alongside undernutrition and lack of nutrients (Ibidem). These conditions are exacerbated by already existing vulnerabilities especially for those who are marginalised and that the incidence of the shocks or longer-term crises (including conflicts) has increased in recent years and are projected to further increase (CFS 2015).

In addition to the hunger and malnutrition emergency, hunger presents very high hidden costs, which are estimated to be roughly $10 trillion USD, and include:

- unhealthy diets, high in ultra-processed foods, fats and sugars, leading to obesity and non-communicable diseases, and causing labour productivity losses. Such losses are particularly high in high- and upper-middle-income countries.

- one fifth of the total costs are environment-related, from greenhouse gas and nitrogen emissions, land-use change and water use. This is a problem that affects all countries, and the scale is probably underestimated due to data limitations.
- low-income countries are proportionately the hardest hit by hidden costs of food systems, which represent more than a quarter of their GDP, as opposed to less than 12 percent in middle-income countries and less than 8 percent in high-income countries. Iin low-income countries, hidden costs associated with poverty and undernourishment are the most significant (FAO, 2023).

The HLPE-FSN report entitled *Food security and nutrition: building a global narrative towards 2030* (HLPE, 2020) 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. viii)[1]. To address shocks and stresses, these policy shifts need to embrace and catalyse synergistic transformations, complexity and interactions across sectors, the broader context of food security and nutrition, and diverse policy solutions (p. xv). Leveraging the call for action and context laid out by the HLPE-FSN (2020), this report 'Building resilient food systems' recognizes the plurality and context-dependent nature of place-based change by offering a roadmap of examples from around the world of transformation as well as broad recommendations to support resilient food systems, in particular, the need for actions and policies that build equitably transformative resilience in food systems around the world. First, to set the stage, we provide the contexts that inform the need to move us towards equitable transformative food systems.

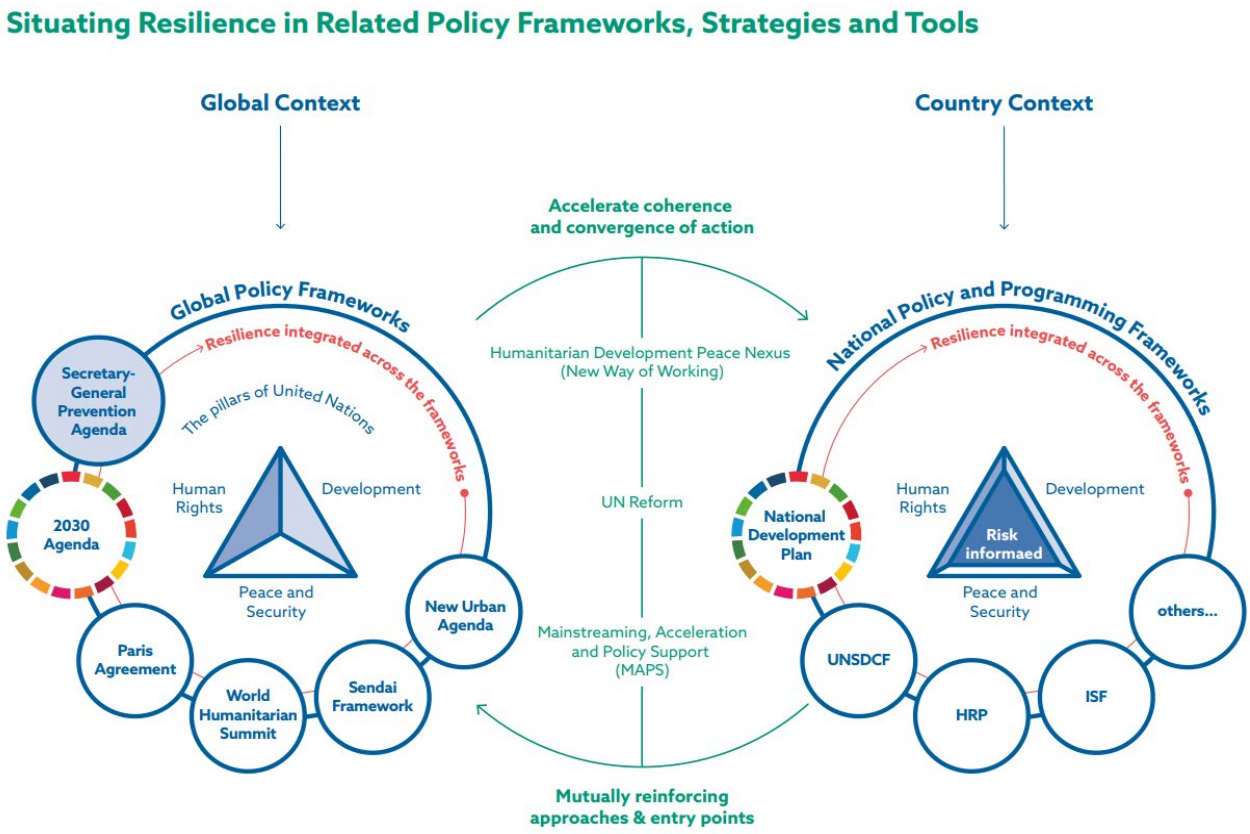
1.3 What is resilience

1.3.1 Resilience as a mainstream concept

Within the United Nations, resilience has become a common thread across the three UN pillars of development, human rights, and peace and security – and is reflected in many important global policy agendas and frameworks including Agenda 2030, the Paris Agreement, the Sendai Framework, and the New Urban Agenda. UN Resolution 71/226 on Disaster risk reduction stresses the importance of resilience as collaborative and multilateral cooperation that strengthens countries' preparedness for response and recovery to extreme weather events and risks. The 2020 UN Guidance on Helping Build Resilient Societies identifies four elements of building resilience, starting with "Understanding of the context and the multiple and interconnected dimensions of risk (Figure 1). Risks that can disrupt social, economic and environmental systems at local, subnational, national or regional levels, must be understood and analysed within specific political, socio-economic, and environmental contexts."

[1] The six dimensions of food security, as outlined by Clapp et al. (2022), are: availability, access, utilization, stability, agency, and sustainability. For more information on the six dimensions, please see https://www.sciencedirect.com/science/article/pii/S0306919221001445.

Figure 1: UN's elaboration of how resilience relates to policy frameworks, strategies and tools



Source: *UN Common Guidance on Helping Build Resilient Societies, 2021*

From the perspective of food systems, the 2021 UN Food Systems Summit devoted Action Track 5 to resilience and defined the concept as "The ability of individuals, households, communities, cities, institutions, systems and societies to prevent, resist, absorb, adapt, respond and recover positively, efficiently and effectively when faced with a wide range of risks, while maintaining an acceptable level of functioning without compromising long-term prospects for sustainable development, peace and security, human rights and well-being for all."

Beyond the UN, resilience is increasingly integrated in national and international organizations'[2] policies and programming frameworks, where it mostly appears as an umbrella term to integrate actions aimed at climate change adaptation, disaster response and planning hazard. For example, the German Adaptation Strategy to Climate Change (DAS) focuses on integrating resilience into national planning across various sectors, including water management, biodiversity, and agriculture. Bangladesh has developed the Bangladesh Delta Plan 2100 to enhance climate resilience through long-term integrated planning. Small Island States, such as Fiji and the Maldives, have prioritized resilience in their National Adaptation Plans (NAPs), focusing on community-led and nature-based solutions to

[2] See, for example, NATO, Resilience, civil preparedness and Article 3, 13 November 2024, available at https://www.nato.int/cps/en/natohq/topics_132722.htm

climate risks. Post Covid-19, the term has gained new traction and assumed a different connotation, moving away from the climate arena and expanding its reach to be associated with other forms of hazards and uncertainties. This has led to the adoption of Resilience and Recovery plans, especially in the Global North. For example, the European Union in the "strategic Agenda adopted on the 27th of June 2024 that sets the EU's political priorities for 2024-2029, including that the European Union will promote a competitive, sustainable and resilient agricultural sector that continues to ensure food security and vibrant rural communities." However, many states cannot afford or lack the capacity to develop such plans. The way resilience and recovery plans, and the associated funding, are unequally distributed across the world raises concerns as to who can actually plan for resilience and how historical and present inequalities can be reinforced at the time of higher need (European Commission nd). In addition to inequity across the ability to implement plans, the interpretation of the concept resilience itself is not uniform. In cases such as the recovery plans above, the term "resilience" is being employed across diverse sectors and by a variety of actors, often with vastly different meanings and purposes. This lack of consensus on the term raising concerns about the interpretation, solutions that are proposed, and the dilution as a concept in ways that will leave those most affected behind.

As this report will outline, realizing shifts to equitably transformative resilient food systems will require profound changes to the structures (institutional, social, and financial) that currently embed food system inequities. This transformation needs to be founded on the interdependencies between human societies and ecological systems and enable agency for the most affected (as outlined by the mandate of the CFS) by diminishing the impact of differential vulnerabilities (Thomas et al. 2019). For example, as outlined in the HLPE 14 report, adopting agroecology can regenerate soils, air and water, improve agricultural and ecosystem biodiversity, increase food security and nutrition for the most affected, improve and stabilize livelihoods, and reduce the need for inputs (HLPE 2019; FAO 2024). However, the diffusion of these practices has to be supported by policies and actions that guarantee the right to food for all.

For this report, the fact that resilience is becoming mainstream can be considered a positive event. However, if everything is increasingly resilient, what is truly resilient? And, when everyone speaks about resilience, are they speaking about the same thing? As Cutter noted, "there is little orthodoxy in the definition of resilience, let alone consistency in its conceptualisation and measurement. Such... elusiveness, on the other hand, begs two fundamental questions – resilience to what, and resilience for whom." (2016). Recognizing the risks of a diffuse, unclear term as well as the need to qualify both its meaning and purpose are addressed in Chapter 3 where outline the rationale for putting the concepts of equitable resilience and transformative resilience hand-in-hand so that shocks are not just responded to rather the impacts of future shocks can be mitigated or minimized through long-term policy change. By coupling of equitable and transformative notions of resilience, this report offers a contribution to both scholarship and practice through the introduction of the term equitably transformative resilience (ETR). For the moment, to lay the foundations for the rest of the report, we provide an overview of key concepts.

1.4 Key concepts

First and foremost, this report offers a defined, applied version of the concept of resilience (ETR) that draws from earlier work of the HLPE-FSN (2020) that shows solutions must focus on addressing both short-term challenges and long-term systemic change. There are a number of terms that are foundational to understanding resilience in food systems, especially the concept of equitably transformative food system resilience, which is central to this report. Defining

shocks, stresses, risks and vulnerabilities in the face of uncertainty lays out the threats to food security and nutrition.

Equitably transformative food system resilience can be defined as **when institutions, policies, people, ideas and practices uphold** the capacity of individuals, communities, nature, and socio-ecological processes to prevent, absorb, adapt, and transform in the context of multiple uncertainties compounded by structural and contingent shocks, stresses and 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. Equitably transformative food system resilience acknowledges the centrality of care[3] and the **interdependence** between human societies and ecological systems. ETR is founded in systems that foster multiple and diverse **pathways** to cultivate robust, diverse, redundant and socio-ecologically just food systems (see Chapter 4, Figure 1).

This resilience is built across multiple and inter-related scales, from local to global. It requires policies and interventions that **transcend food systems, transform** social, economic, political and cultural structures, reinforce dignity and individual and collective agency and **enable** dynamic, just and adaptive socio-ecological processes that are robust and last over time.

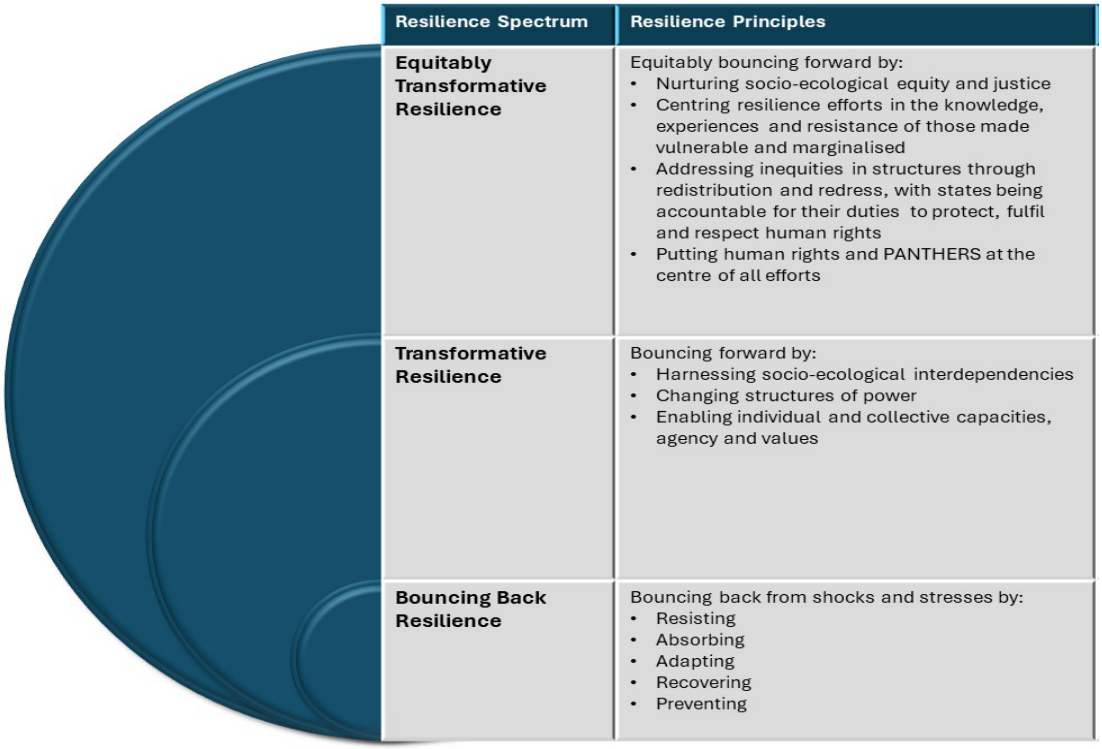
It aligns with a **comprehensive understanding of the six dimensions** of food security (2020), is rooted in the transformative potential of human rights, and is essential to ensure long lasting and equitable access to fair, adequate, nutritious, healthy and sustainable food for all. Building resilience is an **on-going process** informed by the duty to repair and restore historical **structural injustices** and promote a long-term vision that respects human rights, ecological integrity and planetary boundaries.

Equitably transformative resilience (ETR) in food systems can help deliver food security and nutrition for the most affected and provide healthy diets, ensure fair livelihoods, support human health, regenerate ecosystems, halt biodiversity loss and close the inequity gap. By 'bouncing forward' to a new state underpinned by equity principles that address differing power, capacities, resources, rights and duties, ETR food systems aim to simultaneously improve human and planetary well-being and diminish both the frequency and intensity of shocks and stresses over the short and long-term.

ETR builds on the concepts of bouncing back and bouncing forward. **Bouncing back** from means to resist, absorb, adapt, recover, and prevent shocks and stresses while **bouncing forward** is defined as harnessing socio-ecological interdependencies; changing structures of power; and, enabling individual and collective capacities, agency and values.

[3] Care is defined as "a species activity that includes everything we do to maintain, continue and repair 'our world' so that we can live in it as well as possible. That world includes our bodies, ourselves, and our environment, all of which we seek to interweave in a complex, self-sustaining web". (Fisher and Tronto 1990: 40).

Figure 2 – Resilience spectrum



Resilience Spectrum	Resilience Principles
Equitably Transformative Resilience	Equitably bouncing forward by: • Nurturing socio-ecological equity and justice • Centring resilience efforts in the knowledge, experiences and resistance of those made vulnerable and marginalised • Addressing inequities in structures through redistribution and redress, with states being accountable for their duties to protect, fulfil and respect human rights • Putting human rights and PANTHERS at the centre of all efforts
Transformative Resilience	Bouncing forward by: • Harnessing socio-ecological interdependencies • Changing structures of power • Enabling individual and collective capacities, agency and values
Bouncing Back Resilience	Bouncing back from shocks and stresses by: • Resisting • Absorbing • Adapting • Recovering • Preventing

Shocks and stresses: shocks are abrupt, short-term, sometimes unforeseen, events that negatively impact human and/or ecosystem well-being. Examples of shocks are extreme weather events, geopolitical conflicts, or disease outbreaks in animals, plants or humans (UN Common Guidance 2020; FAO 2021; Zurek at al. 2022). **Stresses** are longer-term conditions or processes frequently linked to inequitable development and that serve to reduce capacities to deal with risks (UN 2020; Zurek et al 2022). According to the UN Common Guidance report, these can include poverty, weak governance and monitoring of risks, gender inequality, marginalization and socio-economic exclusion, climate change, political instability, unplanned and rapid urbanization, overexploitation and poor natural resources management (Pathways for Peace, p. 215; Sendai Framework, para 6; UNDRR Terminology on Disaster Risk Reduction, 2017). For example, acute food insecurity oftentimes linked to shocks exists when individuals face severe food deprivation that threatens their lives or livelihoods. Chronic food insecurity, oftentimes linked to long term stresses, exists due to the persistent inability to access sufficient diets for a healthy and active life, due to underlying structural issues such as poverty and marginalization.

Risk addresses the likelihood of negative impacts of shocks and stresses on communities, households or individuals. The probability of risk depends on the magnitude, nature and extent of the hazard, exposure to the hazard, the vulnerabilities and capacities of the socio-ecological systems impacted (UN Common Guidance 2020, SOFA 2021). Examples include unplanned urbanization as well as growing poverty and inequality that force the poor to settle on marginalized lands that may be exposed to flooding or landslides and that undermines HLPE-FSN (UNDRR, 2015: Global Assessment Report on Disaster Risk Reduction).

Vulnerability defines how susceptible an individual, household, community, or ecosystem is to shocks and stresses. It depends on the physical, social, economic, environmental and political conditions and capacities. Vulnerability is not a natural or inevitable condition, nor is equally distributed within households, communities and regions. Rather, it is frequently a combination of historical, structural conditions, uncertainty and more recent socio-ecological inequities (FAO 2021; Zurek et al 2022; Rigg et al 2016; Millar 2017).

Differentiated vulnerability (Thomas et al. 2019) means that susceptible individuals, households or communities have differentiated **exposure** and **sensitivity** to shocks and stresses and uneven adaptive capacity – all mediated by physical, social, economic, environmental and political structures, conditions and capacities. High exposures of communities and ecosystems to stresses and shocks, with high sensitivity and little adaptive capacity leads to high vulnerability. By contrast, higher adaptive capacity helps reduce the effects of exposure and sensitivity, and in turn reduces vulnerability and fosters equitable transformative resilience. We use the term **inequitable vulnerability** in explicit recognition that vulnerability is much more than a function of chance or individual conditions, but results from a combination of historical, structural conditions and more recent socio-ecological inequities (FAO 2021; Zurek et al 2022; Rigg et al 2016; Millar 2017).

Exposures are defined as the contact between a system, ecosystem, community, family or person and stresses and shocks.

Sensitivity is the degree to which a system is affected by exposure to stresses or shocks.

Adaptive capacity refers to the ability of an individual, household, community, and ecosystem to express or develop resilience and adjust to exposures and sensitivities to interacting stresses and shocks. Increasing adaptive capacity also reduces sensitivity.

Frequently, shocks and stresses interact and compound one another when considering the risk and vulnerability an individual, community, region, country, or ecosystem face. Highlighted in Chapter 2 and 3, the food system is embedded within broader contexts and histories that leave individuals differently vulnerable to shocks and stresses. Once a shock (e.g. hurricane) occurs, those individuals who were already vulnerable – due to underlying stresses (e.g. racism, intersectional considerations) – are left further exposed (e.g. damaged home or loss of assets without financial means to recover) to future shocks. This in turn increases their risk for negative outcomes (e.g. loss of livelihoods) in the next shock or the inability to recover from the initial shock (e.g. fall into poverty).

1.5 Towards equitably, transformative resilient (ETR) food systems: theory of change

It is well understood that the industrial food system (IFS) is not sustainable for people or the planet as it is susceptible to social and ecological uncertainties, undermines socio-ecological resilience and contributes to both acute shocks and underlying, long-term stresses (World Bank Climate Change 2024). There are global food system inequities, with significant populations

unable to afford a healthy diet residing in low-income countries (71.5 percent) and lower-middle-income countries (52.6 percent) compared to 21.5% and 6.3% in upper-middle-income countries and high-income countries, respectively (FAO et al. 2024). Estimates are that 582 million people will be chronically undernourished by 2030, more than 50% of them in Africa. Additionally, the global food systems fail to deliver diets for nutrition and health resulting in undernutrition and stunting (FAO et al, 2024). The food system contributes more than a third of greenhouse gases to the climate crisis (Crippa et al 2021), destroys biodiversity (FAO 2019) and soil health (Tayoh 2020), and reinforces growing inequity (HLPE 2022, 2023).

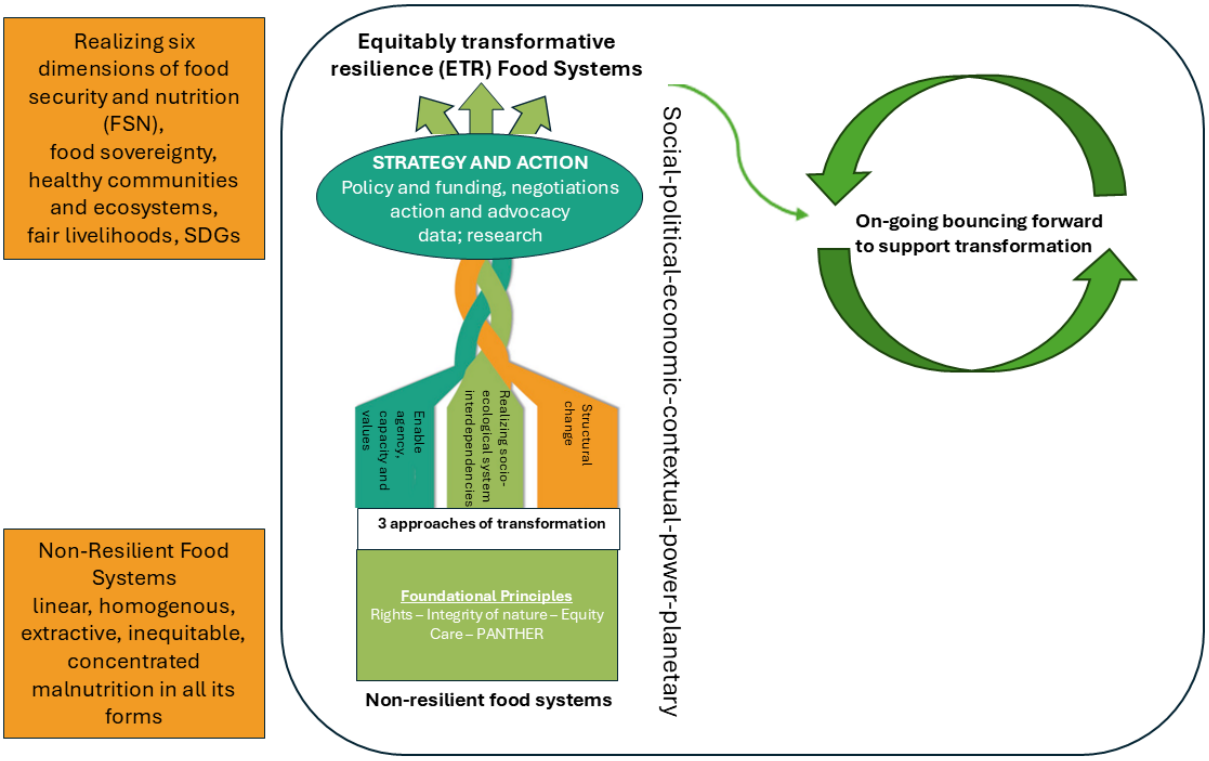
However, this trajectory is not the only possibility for the future of food systems and for collective futures of people and planet. It is recommended that efforts to accelerate food systems transformation to increase resilience will be central to addressing these challenges (FAO et al. 2024). Through applying equitably transformative resilient (ETR) principles, it is possible to build a food system that captures the synergies between complex socio-ecological systems to the benefit of all. An equitably transformative food system engages three dimensions of change: structural, systemic, and enables agency, capacity, and values. In many cases, this will require policy shifts and the attention of states.

1.5.1 Building equitably transformative resilient food systems: theory of change

To move towards ETR, it is useful to describe the changes and processes needed to achieve equitably transformative resilient food systems so that we have pathways for transformation (Figure 3). This includes addressing the broader context in which food systems are situated, impacted by, and contribute to including circumstances linked to historical and geographic contexts.

Non-resilient food systems are linear, homogeneous, extractive, rooted in - and often perpetuate- inequities and degrade the environment. By comparison, ETR food systems are grounded in recognizing the need to exercise change as the structural, systemic and enabling approaches to create the conditions for individuals, communities and ecosystems to be more robust vis-a-vis uncertainties, reduce the role of food systems in producing shocks, and being capable of reverting the current trends. Realizing equitably transformative food systems resilience is an iterative process that requires changing existing non-resilient food systems towards the realization of ETR principles. These principles are grounded in human rights, the integrity of nature, equity, care and the application of PANTHER (see below). ETR principles can support the realisation of the six dimensions of food security.

Figure 3. To progressively work towards equitably resilient food systems



Notes: To progressively work towards equitably resilient food systems, interconnected and coordinated action is needed in three dimensions of change based on core principles. This provides the basis for the transformation of food systems towards equitable resilience and the realization of the six dimensions of FSN and, more widely, the SDGs.

PANTHER principles support the six dimensions of food security by creating equitable and transparent processes. Governance processes need to be underpinned by the PANTHER principles, that is Participation, Accountability, Non-discrimination, Transparency, respect of Human dignity and EmpoweRment (PANTHER) (FAO 2014). PANTHER principles emerged from the need to operationalize and move towards human rights-based processes and outcomes.

Source: Author's elaboration

The three approaches of transformation (as inspired by Scoones et al. 2020) can be described as:

1. Structural dimensions that refer to ways in which food system dimensions are governed, organized and practiced.
2. Systemic approaches refer to intentional change towards normative goals, where changes are targeted at the interdependencies of socio-ecological interdependencies including institutions, technologies and actors within complex systems.
3. Enabling approaches that develop and support human agency, values and the capabilities needed to manage uncertainty and collectively built pathways towards desired futures. The focus of enabling approaches is on capabilities rather than goals.

These multiple approaches are intertwined and rely on foundational principles in the construction of ETRs. First, the protection, respect and fulfilment of human rights for all (FAOa 2024, FIAN 2024), in particular, and consistent with the CFS mandate, the right to adequate food, as well as the rights of nature as a way to increase the integrity and thriving of ecosystems. What is clear is that the right to adequate food is a legal obligation under international law. In 1966, the International Covenant on Economic, Social and Cultural Rights was adopted, guaranteeing the fundamental right to adequate food as per Article 11, and the right to be free from hunger. Thus far, 171 state parties have ratified the covenant (FAO, nd), yet despite this legal commitment, the lack of political and institutional pressure to ensure the right to foo have meant that global food insecurity is still prevalent and increasing (FAO, 2024).

The foundational principles of ETR rest on pluralistic, interconnected commitments to care, repair, and equity. These multifaceted principles are integrated so that they "maintain, continue and repair 'our world' so that we can live in it as well as possible. That world includes our bodies, ourselves, and our environment, all of which we seek to interweave in a complex, self-sustaining web". (Fisher and Tronto 1990: 40).

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Given the multi-functionality of food systems and their ability to address many challenges simultaneously (Knezevic and Blay-Palmer, 2015), working toward ETR will help us realize food sovereignty, the six dimensions of food security, the SDGs (in particular SDGs 1, 2, 3, 4, 5, 8, 11, 12, 13, 14, 15, 16,and 17), as well as build healthy communities and ecosystems.

ETR food systems can be fostered through structural, systemic and enabling transformations that can happen simultaneously or independently, depending on contexts. ETR focuses on social innovation in processes that harness scalable, accessible technology and the power of place-based change. Political and economic structures and processes that support non-resilience need to change in favour of structures and processes that realize the rights of people and nature. Supporting this shift towards ETR means realizing a road to achieving food security and nutrition for all within planetary boundaries while improving livelihoods, agency across scale, and strengthening more equitable governance for a better tomorrow.

In part, this will necessitate fostering complex, multi-scalar synergies between socio-ecological interdependencies and connections across geographies and time through explicit institutional changes to realize ETR food systems. 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 food systems (Scoones et al 2022). Supportive strategy and action, underpinned by appropriate policy levels and adequate funding, are required to make this a reality.

Supportive strategies and action should involve actors at all scales – from the local to the global, international organizations such as the United Nations, community groups, not-for-profits, private firms, and individuals such as farmers and fisherfolk, community leaders, and peasants around the world who are agents of change. Within this broad set of change makers, governments

play a particularly unique role of regulator, funder, enabler, and negotiator among other roles. For governments to play a role in achieving ETR, structural and systemic policies beyond funding will need to be leveraged in combination with one another to foster change. Governments can bundle different policy tools in tandem to support both acute (short term) and chronic (long term) ETR goals. For example, a devastating flood could suddenly wipe out crops in a region impacting food and nutrition security resulting in acute food insecurity. This could happen in addition to chronic food and nutrition insecurity where, for example, national debt and agricultural policies compel farmers to focus on export markets. For example, in sub-Saharan Africa, "increased export production caused a decline in per capita food production" resulting in chronic food and nutrition food insecurity (Bjornland et al 2022). Under these circumstances, appropriate **funding** is an important lever for building community infrastructure (e.g. universal access to adequate food in public school canteens; cold chain for community kitchens; territorial food markets) other policy tools are equally essential to building ETR food systems. **Regulating** markets, e.g. for seeds, processing, and retail to address concentration (Clapp 2021) while enabling small to medium sized operations by **reducing barriers** to entry and having **scale-appropriate food safety**[4] that balance safety and accessibility are critical. For example, Bjornland et al. (2022) note that "Farming needs to be profitable, which includes farmers being connected to domestic supply chains and market signals, local value-adding, and post-harvest storage. This will create jobs and increase income earning capacity, which is the key to households' food security."

COVID-19 taught us important lessons about how to build resilience including the need to diversify food supply chains, especially where there is a reliance on global food sources. "[T]here is increasing recognition of the need for some degree of food system relocalisation to strengthen local food systems and reduce dependence on distant sources of food." (Carey et al. 2020: 2). While some markets continued to function during the pandemic of COVID-19, weaknesses were revealed throughout the food system. What the restrictions put in place during the pandemic pointed to is the need for diverse market connections from local through to regional, national and global that engage multi-pronged approaches for resilience building as food systems move towards ETR (Webb et al. 2021). This is particularly true as, "Millions of Africans derive their livelihoods from the micro, small, and medium enterprises (SMEs) that process, trade, and deliver 85% of the food in FSCs (food supply chains) (Reardon & Liverpool-Tasie, 2020). Jobs in FSCs account for 65% of all rural employment FTEs (full-time equivalents) in six African countries (Ethiopia, Malawi, Niger, Nigeria, Tanzania, and Uganda), composed of 40% in own-farming, 5% in farm-wage-labour, and 20% in post-farmgate FSC employment. The latter forms 25% of FTEs in urban areas (Dolislager et al., 2020). Finally, FSCs condition the incentives for yield enhancements of millions of African small farms." (Liverpool-Tasie et al. 2020: 205-206). Using a conservative interpretation of FAOSTAT data on food imports, the researchers conclude that Nigeria and Ethiopia rely on imports for only 7.3% of their food. In Malawi imports account for 1.8%, in Tanzania 4.3% and in Uganda 6.5%. For some specific commodities the numbers are much higher, e.g. 60% of rice and most of the wheat is imported.

[4] Scale appropriate food safety puts in place food handling and processing measures that can be taken up by all sizes of enterprises along the food chain. For example, in Canada, the government provides guidelines to people wanting to start home food businesses (https://www.ontario.ca/files/2024-03/moh-guide-to-starting-home-based-food-business-en-2021-11-01.pdf)

In some sub-Saharan Africa regional food systems, there is an active and growing network of SMEs engaged in processing and distribution in support of regional food systems. Surveys in Nigeria in 2017 of lateral supply chains showed that there was rapid growth in feed mills with a 6-fold increase (from 300,000 to 1.8 million tonnes) between 2007 and 2016. Additionally, a 1000 km supply chain emerged from northern maize producers connected to southern feed and flour mills that generated thousands of rural aggregators and urban maize traders. These are largely micro businesses with only 5%– 10% of city-based maize traders owning trucks or warehouses so that 85% of the transport and storage comes from thousands of SMEs through third party logistic services (Liverpool-Tasie et al., 2017). As Liverpool-Tasie et al. (2020: 210) note, "this [FSC] activity remains largely absent from the policy debate: a "hidden middle" (Reardon, 2015), not a missing middle." Further, the incredible diversity and redundancy in the system increases resilience. (Chapter 5 for related Policy Recommendations) These findings are supported by Elton and Evans (2023) who found resilience in connections between the existing connections between farmers and distribution hub Ontario Food Terminal – the third largest of its kind in North America – but caution that these connections are only as resilient as the people they rely on. This points to the importance of human capacity and personal resilience suggesting the need to consider an ethic of care proposed in the Theory of Change.

As will be discussed in Chapter 2, policy (e.g. funding, regulations, staff capacity) can reallocate or reprofile across levels of government while also exploring the additional funding to support the shift towards ETR food systems. Governments can also foster values aligned with ETR. In addition, they should promote locally developed knowledge and access to outside knowledge and technology. These factors are very important for preparedness for future shocks or to deal with chronic stresses.

Even within conflict and crises situations, a lens of community wellness can be used that – while it may not be achieving all elements of ETR – supports a community's ability to bounce forward post-crisis as quickly as possible. As elaborated in Chapter 3, bouncing forward includes harnessing socio-ecological interdependencies; changing structures of power; and enabling individual and collective capacities, agency and values (Scoones et al. 2020). Policy decisions and interventions by states and international organizations (such as the United Nations) could be aligned with the principles of equity, transformation and long-term equitable and transformative resilience. For example, implementing a decision chart for adequate, nutritious food aid could ensure continued access to education for children living in conflict and crisis, and the need to preserve and restore key infrastructure are all ways to ensure communities can maintain and restore capacity quickly and be ready to move beyond bouncing back once stability is restored. To that end, funding and support by the international community needs to remain long after conflict has subsided to ensure the capacity to bounce forward rather than back into conflict. However, the attention should also be on the root causes of the conflict and the way in which structural issues – including climate change, prolonged illegal occupations, the liberalization of trade in food – may have a compound effect on food insecurity before, during and after the conflict.

Policy decisions are often laden with sectoral politics that play into who can access policy processes effectively and how states approach their agricultural and food systems policies. Social movements, independent farmers, small to medium sized private entities, Indigenous Peoples, and fisherfolk often lack the resources (e.g. time, access, funding) that larger organizations possess, and specific attention needs to be devoted to ensure their voices and concerns are heard. The imbalance of resources between large corporations and social

movement actors makes it difficult to foster equitable participation and representation from the most affected without addressing governance processes (Lambeck 2024). However, implementation requires resources and political will as well as the engagement of actors including peasants, communities, Indigenous People and others – such a change demands shifts in multiple directions. On farm, it requires Indigenous and local community knowledge to transition from single crop fields reliant on fossil fuels and chemicals to small-holder and family farms based on diverse agroecosystems that use natural inputs and locally adapted seeds to build rich, healthy soils and healthy diverse crops resilient to climate change and other shocks and stresses including droughts and floods (Hertel et al. 2021). Working at the territorial level, agroecosystem diversity provides more nutritious, culturally appropriate, diversified diets to ensure food security and nutrition for all. Getting food from farms to consumers via co-operatives, local processors, and distributors, helps support local economies and sustainable livelihoods. This radical transformation requires shifts in policy and structures that reach beyond food systems to enable lasting, just, and adaptive socio-ecological processes that increase diversity, redundancy, and food sovereignty (Nimmo et al. 2020; Dower and Gaddis 2021).

Governments across the world, international institutions, and organizations can choose to support the process of ETR to bounce forward towards a world where the underlying stresses that threaten food and nutrition security are increasingly diminished and in doing so transform communities, so they are more equitably resilient in the face of shocks and stresses

Equitably resilient approaches to food systems can help address the accelerating effects of climate change and build governance structures that reduce impacts and incidences of severe weather events like droughts and floods, leaving food systems better able to cope when they do occur (Box 3 from HLPE 19, page 32). 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 toward a genuinely sustainable future.

1.6 Report overview

'Building resilient food systems' began in **Chapter 1** with a brief overview of key concepts and definitions including an introduction to equitably transformative resilience in food systems. This chapter also provided a Theory of Change describing how to move towards more for non-resilient food system toward equitable transformative food system resilience (ETR).

Chapter 2 provides an overview of the systemic and structural factors that shape inequity and results in differential vulnerability in non-resilient food systems. Food systems are not an island, but embedded in wider historical, spatial and inter-sectoral dynamics that give shape to food systems. This wider lens is important to avoid a narrow diagnostic frame that fails to understand root causes operating at multiple scales and thus lead to prognoses that will fall short in building equitable transformative resilience.

Chapter 3 provides a deep dive into the rationale for equitably transformative food system resilience. The chapter elaborates the multiple understandings of resilience describing the prevalent approaches that emphasise the ability to withstand disturbances and '**bounce back**' to restore a pre-disturbance status. Given the nature of shocks, stresses and structural vulnerabilities, mainstream resilience thinking is not enough to ensure that food systems deliver on their multidimensional goals, including food security and nutrition for all, nature recovery and human rights.

Chapter 4, by providing current and historical examples from around the world, illustrates how individuals, communities, organizations, and governments are participating in new, equitable ways to transform food systems. A key question moving along this road is, how can equitable transformative resilience (ETR) help build food systems that respect planetary and social boundaries and are better able to respond to future shocks and stresses while also address the root causes of ongoing vulnerabilities and risk and the way in which they are differentially experienced by individual, communities and ecosystems. The report elaborates on humanitarian aid as a key consideration in building ETR.

Using the HLPE 2020 Sustainable Food Systems framework, this chapter provides multiple examples as roadmaps to ETR. The report will provide conclusions and recommendations in **Chapter 5** (this will be completed in the next version).

Chapter 2 | Overview of critical issues: shocks, stresses, and vulnerabilities

Key messages

- A short-term approach to resilience thinking in food systems often fails to recognize the deep historical factors that structure today's food system and is characterized by exploitation, extraction and displacement.
- Shocks including economic pressures (e.g. market failures, poverty and power imbalances), social pressures (e.g. racialization, digital divide, gender), environmental pressures (e.g. biodiversity loss, extreme weather and climate events) are interconnected.
- The exposure to shocks and stresses in food systems and the vulnerability of people and communities is highly conditioned by systemic inequities between the global north and south.
- Shocks, stresses, and pressures adversely impact food systems resiliency and communities differently depending on their geographies, income, and other demographic backgrounds.
- Environmental pressures, including climate change, invasive species, biodiversity loss, land and soil degradation, pandemics and others, contribute to the transgression of planetary boundaries.
- Shocks, stresses, and pressures impact food systems resiliency and impact communities differently depending on their geographies, income, and other demographic backgrounds.
- In a more technologically interconnected world, negative impact on one system may reverberate and increase vulnerabilities globally. In addition, technologies such as Artificial Intelligence (AI) and digital technologies could impact food systems resiliency and create shocks that are currently unknown.
- However, moving towards equitably transformative resilience offers an opportunity to discuss and address some of the broader context presented here by offering new ways of incentivizing, governing, and connecting solutions that support those most affected by the current industrial food system. Throughout the chapter, there are text boxes that highlight how different policy levers, processes, and norms can shift towards helping address inequities and harm.

2.1 Shocks, stresses, vulnerabilities

The 2019 HLPE report on "Reducing inequalities for food security and nutrition" expressed how food systems are marked by highly uneven power relations where disadvantage accrues systematically, based on asymmetries in social position, discrimination and power. Differentiated vulnerability is inherently contextual (Tucker et al. 2015), characterized by an underlying set of structural conditions (Joakim et al. 2015:147) that mediate how stresses and shocks are experienced and that shape the "responses available to adapt" (Ford et al. 2010:377). 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.

The pursuit of equitably transformative resilience requires a conceptualization of a historically aware and spatially embedded food system that is attentive to equity, the structural roots of differential vulnerability and considers the planetary processes that undermine resilience due to anthropogenic influences. The following section provides a critical overview of non-resiliency, followed by an exploration of the ecological, socio-economic and political factors that expose people, communities and ecologies to shocks and stresses that structure inequitable resilience.

2.2 Critical overview of broad structures within which food systems non-resilience arises

Food systems are enmeshed in wider multi-scalar social, culture, economic and political issues and systems that give shape to food system dynamics (HLPE 2023; HLPE 2022: IPES-Food 2016; Willett, 2019; Swinburn et al., 2019). Yet, food systems are often implicitly conceptualized as a closed system of discrete activities. To achieve equitable transformation requires understanding and addressing systemic drivers and root causes of inequity (e.g intersectional, intergenerational, interterritorial inequity, temporal, inter-sectoral) despite these drivers being non-food specific (HLPE, 2018HLPE 2019), This wider lens is important to avoid a narrow diagnostic frame so we can address root causes operating at multiple scales, and that leads to prognoses that build lasting change through equitable transformative resilience. This section will identify some of these historical drivers of non-resilience.

The following sub-sections outline stresses and shocks that have a significant impact on food system resilience, including ecological crises, the impact of colonization, corporate concentration, wealth inequity, indebtedness, harmful subsidies, loss of local knowledges, and forced migration.

2.2.1 Planetary-scale ecological crises

First introduced in 2009 (Rockström et al., 2009), the planetary boundary framework provides a science-based analysis of the risk that human activity imposes on the stability of the Earth System at the planetary level. Planetary boundaries delineate “safe operating spaces” in the earth’s biophysical and biochemical systems within which the risk of human activity threatening the resilience of the Earth System remains low. Nine such planetary boundaries have been mapped out: climate change, biosphere integrity (genetic diversity), stratospheric ozone depletion, ocean acidification, biogeochemical flows (nitrogen and phosphorous cycles), land-system change, freshwater use, atmospheric aerosol loading, and novel entities (defined as new or modified substances that could have adverse geophysical or biological impacts. This includes synthetic chemicals such as microplastics). Among these, climate change and biodiversity loss are considered "core" boundaries due to their interaction with other boundaries and essential role in maintaining the overall stability of the Earth System (Rockström et al., 2009). Presently, 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). The push into unsafe operating space at the planetary scale is significantly shaping the exposure of food systems to stresses and shocks and undermining their capacities to respond.

The industrial food system is a key contributor to exceeding these boundaries. Between 1960 and 2015, global agricultural production increased more than threefold, driven by technological advancements and extensive use of land, water, and other natural resources for agriculture (FAO,

2017). However, this expansion in agricultural production has also meant that agriculture is a key driver of planetary boundary transgressions, significantly impacting land-system change, freshwater use, and climate change. Croplands and pastures cover about 40% of the Earth's land surface, making agriculture the most extensive land use globally (Foley et al., 2005), often at the expense of vital ecosystems like rainforests and savannas. Agriculture is also responsible for 70% of global freshwater withdrawals, with substantial regional variations (World Water Assessment Programme, 2012). Additionally, nitrogen (N) and phosphorus (P) use in agriculture leads to pollution and biodiversity loss. Furthermore, agricultural practices contribute to ocean acidification through CO_2 emissions and nutrient runoff. Greenhouse gas emissions from agriculture, including both non-CO_2 gases and CO_2 from deforestation, amount to 11-24% of global emissions, or up to 29% when the entire food system is included (Vermeulen et al. 2012).

Climate change

Climate change exerts systemic environmental pressures on a planetary scale. Current greenhouse gas concentrations are driving the planet toward a 3°C rise in global temperatures by the end of the century (UNEP, 2023; Richardson et al., 2023). At global warming levels beyond 1.5°C, between 330 and 396 million people may face reduced agricultural yields, and 314 to 706 million could be exposed to habitat degradation, significantly impacting livelihoods (Hoegh-Guldberg et al., 2018).

Climate change interacts with other planetary boundaries by amplifying environmental pressures across the board (e.g. biodiversity loss, increased water scarcity, land degradation, and ocean acidification) through shifts in weather and climatic patterns that occur differentially across the planet. These changes have multiple and interacting impacts on individuals, populations, communities, landscapes, ecosystems, and food systems. The induced changes may be gradual, affecting temperature, precipitation patterns, melting glaciers, rising sea levels, and changes in ocean salinity, or they may be abrupt changes in weather or climate extremes that may be catastrophic (IPCC, 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 extreme heat waves and droughts that may be exacerbated by uncontrolled fires, while others are suffering catastrophic floods, landslides, hurricanes, or cyclones (Seneviratne et al., 2021). By 2050, climate change, under a high-emission scenario, is projected to render 10% of currently suitable land unsuitable for major crops and livestock, rising to 34% by 2100 (IPCC, 2022). In Africa, agricultural productivity growth has declined by 34% since 1961 due largely to climate change, with future warming expected to shorten growing seasons and increase water stress (IPCC, 2022).

The IPCC emphasizes that intersecting factors like 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). In an era of unequal and escalating climate impacts, building equitable resilience has become critical wherein social and economic factors that drive vulnerability are addressed (Matin, 2018; Lipper and Cavatassi, 2024). Both shocks and stresses disproportionately harm low-income people, cause displacements, eliminate crops or livestock, and disrupt food distribution chains. Shocks and stresses also exacerbate land and water scarcity, reduce agricultural land suitability, heighten

competition for irrigation, and accelerate groundwater depletion, thereby worsening poverty, food insecurity, and biodiversity loss (FAO, 2018; IPCC, 2022).

Climate risks pose challenges not only to productivity and economic growth but also to social and environmental justice. Women, for instance, bear disproportionate burdens during climate-related hazards, such as increased workloads during heatwaves. Their limited access to resources, land rights, and decision-making processes heightens their vulnerability and diminishes their capacity to adapt to climate change (FAO, 2023). Heat stress not only widens the income gap between male- and female-headed households but also increases children's labour in agriculture (FAO, 2024). Poor households disproportionately lose income to heat stress and floods, worsening income disparities by billions annually (FAO, 2024). Climate change impacts are projected to push an additional 32 to 132 million people into extreme poverty by 2030 (Jafino et al., 2020) and research by Hallegatte and Rozenberg (2017) indicates that the poorest 40 per cent in developing countries are likely to experience income losses 70% higher than the average income loss in the population.

Accounting for complexity in policy for climate change

The poor bear a disproportionate share of the costs associated with adaptation and mitigation, thus climate change responses can further deepen inequalities, if not carefully designed. For example, policy such as the removal of fossil fuel subsidies often raise the cost of essential goods like food, housing, and transportation. This disproportionately impacts low-income groups, who spend a larger share of their income on basic necessities and can result in increased food insecurity if not offset by compensating policies (Hasegawa et al., 2018). Mitigation measures, such as afforestation (planting trees on lands where there were no trees before) for carbon sequestration on agricultural lands can affect those depending on farming in these areas. Decisions/policies about land use and carbon sequestration based on opportunity cost calculations may undervalue agricultural land used by small-scale farmers (Lipper and Cavatassi, 2024). By 2050, stringent climate mitigation measures could potentially have a greater negative impact on hunger and food security than climate change itself (Hasegawa et al., 2021). This emphasizes the urgency for inclusive and equitable climate action.

There is often a tendency to respond to climate change as an isolated issue but in fact, these interventions can distract from the underlying problems. It is important for states and non-state actors to respond in a coordinated way that deals with complexity, finding policy interventions that support a gender-responsive, biologically diverse, and economically prosperous way forward for communities most affected. For example, mandatory carbon offset programmes have been challenged for being exclusionary in nature due to burdensome reporting standards, increasing land competition (e.g. for conservation versus community) and the threshold for participation. However, these programmes could be developed with a community-first model in mind that allows for lower, more flexible reporting standards and conservation that includes community (e.g. agroforestry). In addition, governments should be hesitant of focusing on one element of climate change alone (e.g. carbon capture) and technologies as these will address the symptom of a recurrent problem. For carbon capture technologies to work, they must also be bundled with policies that address racism, gender inequity, biodiversity loss, soil erosion and pollution, as well as a host of other policy challenges rather than implemented in isolation.

2.2.2 Corporate concentration and power imbalances

The global economy and its regional and national configurations can create conditions of precarity for the global majority and undermine resilience across all sectors, including food systems. IPES Food (2016: 57) argues that the concentration of power in the hands of a few transnational agribusiness corporations is the master lock-in that maintains industrial food systems. While this plays out in the food system in the form of corporate concentration of financial services, inputs, and markets, it also is reflected in the consolidated power of global and national economies that lead to fewer jobs, worsening working conditions, and lower wages for workers and small farmers (Clapp, 2021). Likewise, it has meant that farmworkers and food workers are among the most exposed to health issues related to the increasing use of chemical products (see also Racism, Elver et al. 2021; Barca 2024). Concentrated firms can exert disproportionate influence on market structures, regulation, science and innovation agendas, and policy and governance frameworks, in ways that perpetuate inequality.

This growing concentration control over food systems has direct implications on public policy processes and the rights of citizens. Corporate power has consolidated as a result of and impacts international trade configurations, intellectual property regimes, and financialization in the food system (Biovision Foundation for Ecological Development & IPES Food, 2020; Clapp & Fuchs, 2009; Clapp 202), growing levels of public debt (IPES Food, 2023) and the dismantling of protections for workers and regulations of finance and industry (REF). Rather than increasing the resilience of food systems, people and ecosystems, current governance and government arrangements are locking in the resilience of corporate power to the detriment of equitable transformative resilience. There are a range of measures to address corporate concentration, including strengthening antitrust legislation, to curb undue corporate influence on food systems (Clapp 2021).

At more local scales, power imbalance occurs when larger market players hold more influence over prices and terms than smaller participants, like smallholder farmers (Wood et al., 2021). This imbalance can impede or facilitate access to food and limits farmers' bargaining power, often resulting in lower prices for their goods and higher costs for inputs, reducing their income and stability (Merkle et al., 2022; Glavee-Geo et al., 2022). This drives their overall vulnerability and reduces their capacity to address shocks and stresses-imposed on food systems, leading to food insecurity. This precarity adds to the vulnerability of others in the food system such as smaller players throughout the whole value chain including eaters and people with less disposable income. Using empirical evidence from the cocoa industry in Ghana, Glavee-Geo et al. (2022) highlight the dark side of power imbalance regarding its consequences in agri-food supplier–buyer relationships.

Power imbalance creates ongoing financial stresses on small producers such as farmers limiting their ability to reinvest in their farms or adopt better practices, which weakens the overall sustainability of their operations (Quarshie et al., 2023). The unequal distribution of market power for smallholder farmers in developing countries can also impede their preparedness and adaptive capacity to sudden disruptions, such as market price crashes, climate-related impacts (like droughts or floods), or economic downturns (Tofu et al., 2022). It is important to stress that children, the elderly, youth and women maybe particularly disadvantaged because of power imbalances within societies (Gaventa, 2006).

Control of improved seeds and farm inputs for enhanced food production and food security may be compromised by the interest of large scale agri-food businesses and corporations who are primarily responsible to their shareholders rather than the public (IPES-Food, 2023). By controlling farm inputs, large corporations can dictate and influence the prices of farm inputs at the detriment of smallholder farmers. The 2021 Food System Summit brought to light how giant multi-national corporations could influence the decision-making process in the agri-food chain and undermine people's ability to engage with food systems (de Wit et al., 2021; Gumbert and Fuchs, 2018; IPES-Food, 2023).

2.2.3 Indebtedness

While in the global economy, interest rates can stimulate investment and ensure access to capital for borrowers, there are historical imbalances that should be recognised to ensure individuals and governments are able to access the necessary financial stability to achieve FSN. Currently, rising debt and interest payments in many global south countries trap them in a "vicious cycle" and create barriers that hinder them from investing in initiatives to support climate and food systems resilience (Vasic-Lalovic et al, 2023). The burden of service interest on debt makes it difficult for these governments to serve their populations with basic services such as food, housing, education and healthcare. This system increases uncertainties and exacerbates vulnerabilities and risks to shocks. As Perry (2024) noted, high levels of debt servicing and payment of compounding interest to international financial institutions such as the World Bank (WB) and International Monetary Fund (IMF) prevent countries from investing in a just energy transition and trap them in a cycle of further debt and exploitation making them less resilient. For example, populations living in Caribbean islands face increased displacement, debt burdens and dispossessions due to climate shocks and policies that will result in many people becoming climate refugees (Perry, 2023). Yet their indebtedness to financial institutions has made it difficult for these countries to fund climate adaptation and mitigation strategies or to invest in equitably transformative resilient food systems.

2.2.4 Accounting for externalities

While there has been a trend towards circular economy thinking, the global economy is largely based on a linear model that facilitates industrialization and homogenization, that increase its vulnerability or precariousness as a system (Walker et al. 2004; Jacobi et al., 2018). In food systems, this shows up as a continued liberalization focus on the maximization of yields and calories that relies on simplified landscapes of monocultures (Lundqvist and Unver 2018, Kummu et al. 2020) rather than the benefits from diversity and micronutrients. This homogenization externalizes costs and creates new exposures related to market volatility for single products (e.g. quinoa boom and bust), to the increased emergence of disturbances (e.g., pests) (Fraser et al. 2005).

Beyond the explicit government subsidies that can contribute to environmental decline and increased vulnerability, there are also implicit subsidies through the inability to address negative externalities in policy development. According to the FAO, the hidden costs of food systems are valued at $10 trillion, yet low-income countries disproportionally bear this burden where these hidden costs are equal to more than a quarter of their GDP, whereas middle-income and high-income countries are 12 and 8 percent respectively. It also produces social inequities, poor human health, ecosystem contamination, water distribution inequities, and contamination. Harmful (explicit) and hidden (implicit) subsidies converge when it comes to the impact of

unbalanced international markets. Subsidies provided to farmers in industrialized countries also make their products cheaper vis-a-vis other trade partners further disadvantaging farmers in the Global South.

2.2.5 Homogenization of food systems

The industrialization of food production also drives the homogenization of agricultural and food systems and the erosion of vitally important ecological and social-economic diversity. Fields, substrates, and feeds are standardized, intentionally excluding non-domesticated species. This reduces biodiversity, and particularly the functional diversity of trophic networks. This makes cultivated species more susceptible to pests and diseases (Allen et al., 2022). Additionally, new varieties of domesticated species are developed outside farmers' fields, protected by intellectual property rights systems that further reduce control over local crops (Mulvany, 2005; Salazar et al., 2007). As a result, genetic diversity is diminished, and farmers lose control over genetic resources; they are forced to purchase patented seeds or special breeds and the necessary technology to grow or raise them. This homogenization further increases the vulnerability of food systems to environmental and socioeconomic shocks. These practices stand in stark contrast to non-industrial food systems, where species are domesticated in situ by local farmers and pastoralists who apply and develop local knowledge to diverse crop and farm animals adapted to heterogeneous landscapes (Fisher et al. 2017) (Textbox Chapter 4). Additionally, the knowledge needed to manage homogenized systems is often supplied by external sources such as input suppliers. In contrast, the traditional knowledge of local farmers—accumulated through generations and based on an understanding of land heterogeneity, soil health, landraces, local biodiversity, ecological interactions, and agroecosystem management—is often lost. The loss of this knowledge increases farmers' vulnerability to external, potentially inappropriate, technological inputs and knowledge from external providers, further compromising the resilience of local agroecosystems.

The contribution of local knowledge to resilience in agroecological farming territories and systems

The domestication of crops involves systematic detection and fostering of crop variants or wild species with cultural or ecological value for agriculturists (Casas et al., 2007); they adapt the emerging varieties to the heterogeneous landscapes they manage and promote the variability of crops and domesticated animals by sharing or exchanging new varieties with other farmers or pastoralists from the same or other communities (Louette, 2000; Salazar et al., 2007). Domestication occurs continuously in non-industrial agroecosystems (NIA) that include agricultural parcels, home gardens, and natural vegetation surrounding agricultural communities. This heterogeneous landscape favours different crop or wildlife variants that, once selected and fostered, spread risks occurring from natural environmental biotic and abiotic fluctuations (Baumgärtner and Quaas, 2010). For example, the diversity of plants in a Mexican home garden improves the resilience of the agroecosystem (Aguilar-Støen, Moe & Camargo-Ricalde, 2009). Also, farmer's selection of varieties adapted to various microclimates and other agricultural practices increase the resilience of their agroecosystems (Lin, 2011; Ponce, 2020; Vásquez-Garcia and Elizondo 2022).

Since socio-ecological systems are dynamic, producers have acquired the knowledge to manage the recurrent or directional disturbances associated with the perturbation regime and gradual climate change. Producers also know the heterogeneity of their production units and manage and adapt crop or livestock varieties to the heterogeneous landscapes in terms of soils, hydrology, and topography (Ceccarelli, 1994; Altieri, 2004; Lin, 2011; Torricelli et al., 2014).

2.2.6 Marginalization of Indigenous food systems

Indigenous Peoples globally, continue to be deeply affected by colonial history. Colonization included processes whereby land dispossession, marginalization of Indigenous knowledge, historic and ongoing resettlement, landscape fragmentation have curtailed and, in some instances, severed links to place, territory, culture and knowledge systems that are deeply tied to Indigenous foodways. Colonial public health and dietary norms, guidelines and policies imposed culturally inappropriate and unhealthy, western diets, significantly undermining the resilience of Indigenous food systems (Dennis and Robin 2020).

2.2.7 Land use change, urbanization and displacement

Indigenous food systems are further comprised and disconnected by land use changes. Urbanization, land degradation, rising demands for pasture, industrial use, or conservation areas put pressure on land (Meybeck et al., 2024). Understanding land use and linkages in urban and peri-urban areas is critical for an equitable and accessible food system (HLPE, 2019). The scarcity of available land for food access is further complicated by unequal access, disproportionately affecting women, Indigenous groups, and poorer households who already face constraints in accessing other resources. One of the key environmental pressures and stresses impacting food systems resiliency is land use change. Over 50% of the global population live in urban areas, with the majority of this population growth occurring in Africa and Asia. In 2050, it is projected that the number will be 2/3 of the global population (UN, 2018). The rapid transition to urbanization, as Seto and Ramankutty (2016) argue, impacts our relationship to

food, what people consume, create new habits and preferences, and also results in the expansion of urban areas into prime farmland. For example, it is estimated that by 2030, built-up areas will triple compared to 2000, an increase of 1.2 million km^2 (Seto et al., 2012) resulting in the loss of croplands further exacerbating food insecurity. Moreover, it is not just croplands that are displaced, land conversion has displaced some of the most vulnerable populations who rely on those lands to survive (Aiken and Leigh, 2015) often through shocks such as force and violence (Thomson, 2014; Milgroom, 2024). Land grabs and displacements are also connected to economic pressures such as large-scale investments/speculations (Mendonça and Pitta, 2022) that increases risks for poverty and a decline in agricultural viability. For example, pastoralist communities and their land use are often seen as "unproductive", devaluing their important role of stewarding the lands (Abbink et al., 2014). Changes in land use intensify human and wildlife conflict through encroachment on animal habitats (Ogutu et al., 2014) which negatively impacts the resiliency of pastoral communities and their access to food. Indigenous approaches to land use and forest management through the cultivation of forest gardens have been shown to have significantly higher plan and functional trait diversity, even more than 150 years after management ceased (Armstrong et al., 2021). Therefore, pathways to food systems resiliency via land use can highlight the positive legacy of Indigenous management on ecosystem health and diversity (Armstrong et al., 2021).

2.3 Ecological sources of stresses, shocks and differential vulnerabilities

This section expands on the ecological stresses, shocks, and differentiated vulnerabilities outlined in ecological crises section above (2.1.1). As mentioned earlier, environmental pressures contribute to the transgression of planetary boundaries, affecting the equity, resilience and transformability of food systems. Environmental and social pressures often coincide and interact with each other, leading to a loss of biodiversity, ecosystems and social ecological-systems resilience (Pörtner et al., 2021; Rocha, 2022; Søgaard Jørgensen et al., 2023) or push the systems beyond safe and just Earth system boundaries (Rockström et al., 2023). To be most effective, efforts to mitigate ecological shocks and stresses should be taken holistically, as independent measures for each stress can frequently be counterproductive or ineffective (Pörtner et al., 2021). This section (2.2) covers some of the core environmental-related pressures such as soil ersion, and extreme weather that impact food systems resiliency, recognizing that many of these pressures are interconnected to other pressures (e.g. economic, social found in 2.3) and may impact communities differently depending on their geographies, income, race, gender and other demographic backgrounds. Addressing and identifying these environmental pressures can support the transition toward an equitably transformative and resilient food system.

2.3.1 Water and weather: scarcity and flooding

Climate change forecasting signal an increase in the frequency and intensity of climatic hazards such as flooding, droughts, and extreme weather events. Human activities such as agriculture and energy production disrupt the water cycle. Construction of dams result in declining river connectivity and biodiversity and shrinking river deltas. Changes in soil moisture, associated with land degradation, soil salinization and deforestation, also exacerbate freshwater challenges by disrupting moisture recycling (Tomalka et al. 2024). Moreover, increasing incidence of flooding can render previously highly valuable and fertile valley agricultural land as uninsurable and functionally impractical compromising resilience.

Certain regions already face acute water scarcity and related stresses. Water tables have declined significantly in many parts of the Near East, North Africa, and China. In Northern Africa, irrigation withdrawals exceed renewable supplies, depleting groundwater beyond sustainable levels (Meybeck at al., 2024). The current rate of extraction of groundwater exceeds replenishment in 47% of global aquifers (Rockström et al., 2023), threatening food production in many countries. Under a business-as-usual scenario, available land for rain-fed crop expansion will be exhausted before 2050 (FAO, 2018). The Special report also documented that Drylands, covering 46% of Earth's land and home to a third of the global population, face escalating pressures from drought, desertification, and land degradation, which reduce soil's water retention and agricultural productivity. Further, large scale irrigation systems in South Asia withdraw over 90% of local freshwater, intensifying water scarcity. There is an overlap between areas of rising food insecurity and resource depletion. This is in part due to water-intensive crops being produced for export onto the international market (see trade, 2.1.5) meaning that as water becomes scarcer the depletion of resources has a cascading effect onto local production.

Further, water scarcity is accentuated by unequal distribution, restricted access, the privatization of water, and poor water quality, influenced by socioeconomic factors, with lower-income countries being more vulnerable. Environmental issues like water scarcity often have cross-border effects; for example, over 80% of Germany's blue water consumption is imported in the form of textiles and agriculture, affecting water scarcity in regions like the Ganges, Indus, and Nile River basins. This differential vulnerability highlights the need for integrated approaches across political-social-environmental systems (Tomalka et al. 2024).

Hurricanes destroy crops, cropland and terrestrial and marine ecosystems, with food security strained in their immediate aftermath (Ortiz et al. 2022). Agricultural land can also become infertile over extended periods of time due to vegetation loss and coastal erosion caused by storm surges, violent winds and saltwater intrusion resulting in persistent stresses. In the context of disaster, farmers themselves may be vulnerable to food insecurity and unable to contribute to domestic markets. In a study of the aftermath of 2017's Hurricane Maria in Puerto Rico, the hurricane's impacts (winds, rains, and landslides), led to at least one month of food insecurity for 69% of farmers, and 38% reported persistent food insecurity (three months or more). This study highlighted unequal vulnerability where social factors, such as age and constrained access to external sources of support, are linked with persistent food insecurity. This suggests that the biophysical impacts of the hurricane interact with existing infrastructure and social resources to affect farmer vulnerability and the food environment in different ways (Rodríguez-Cruz et al. 2022).

Early warning systems and robust social infrastructure

Early warning systems and weather data are critical for crisis response planning. These systems help identify a threat and warn populations before it arrives. However, as seen in natural disasters throughout modern history, these warnings are only as good as the individual's ability to respond – both in terms of evaluating and recovering from the crisis. Ensuring there is publicly funded and publicly owned data on weather and environmental stresses is essential to monitor and prepare for natural hazards. However, these systems must be coupled with strong systemic responses that build resilience. Trade (within the country including local or external to the country), public stockholdings, and ways to earn monetary income so to be able to afford food are part of longer-term resilience.

A natural example of this is the removal of mangroves along coastal water ways in favour of sea walls – allowing residents to enjoy uninterrupted views of the ocean and easily dock their watercrafts. However, mangroves naturally increase soil retention and reduce the erosion of shorelines during extreme weather events. By removing them, residents make themselves and the surrounding infrastructure more vulnerable to the impacts of hurricanes. Rebuilding ocean ecosystems to include healthy mangrove forests and making the removal of these species unlawful is a necessary step to protect coastal areas and must be done in concert with early warning systems.

While a different context, early warning systems in food security and nutrition – for example, famine early warning systems – play an important role in readying a response from international and national actors. However, the erosion of local food systems, knowledge, and production capacity makes communities more vulnerable to famine. This is especially true when considering a differentiated vulnerability lens and the impact famine has on women, children, the elderly, members of marginalized communities. By having robust local food systems, communities can build resilience against – or mitigate the worst effects of - famine through crop diversity (pest-induced famines), water harvesting, crop cover and soil health measure (famine through drought), and ensuring strong local markets that are driven by and for local consumers and producers (political-induced famine). If local food systems are strong and resilient it is much more difficult to use food as a way to control communities during crisis, as these communities would be less dependent on external or direct food aid and the politics that surround its allocation. Famine early warning systems are an essential part of planning and responding to crisis, however building resilient food systems are the necessary step to minimize their frequency and create more resilience when famine does occur.

2.3.2 Biodiversity loss

The diversity of living beings is known as biodiversity and includes everything from genes to species, from viruses to mammals. Complex networks of interactions among these species (competition, mutualism, etc.) produce ecosystem benefits that sustain life on Earth and benefit humanity (Pörtner et al. 2021). Biodiversity loss results in impoverished food (trophic) webs, which affects resilience in both natural and socio-ecological systems (Allen et al., 2022).

Since the 1960s, pressures from increased consumption and population growth have further intensified land use, driving the system further into zones of increasing risk and decreasing resilience. In agroecosystems, biodiversity loss includes the loss of genetic diversity within crop and livestock species, non-crop species (e.g. weeds and hedgerow species), pollinators, beneficial insects, mycorrhizae and other beneficial microbes, and soil biome or microbiome

species. Local extinctions caused by agroecosystem mismanagement or invasive species often go unnoticed until pre-existing ecosystem benefits fail or disappear.

In addition to ecosystem failures, key ecosystem benefits such as pollination, pest and disease control, and soil fertility are managed separately in industrial food systems through rented beehives, pesticides, and synthetic fertilizers. Monocultures of genetically uniform crops or livestock not only promote disease and pests but also displace local landraces (locally adapted variety of an animal or plant species), reduce agricultural biodiversity, and undermine local knowledge and farmer stewardship of the agroecosystem. These management techniques negatively affect the species that provide ecosystem benefits and compromise ecological integrity and resilience.

Invasive species can aggravate the socio-environmental effects of climate change by inhibiting ecosystem recovery, altering food production, or promoting epidemics (Zizka et al, 2011; Díez et al, 2012) as their spread negatively impacts ecological and food system resilience. Major international efforts to manage the adverse impacts of invasive species and to prevent their introduction and spread to new areas include the Convention on Biological Diversity, which requires country-developed national invasive species strategies. These are directed at prevention, early detection and eradication, contention, and mitigation and are implemented at the national, regional, and local levels using risk analysis, legal regulations, and grassroots or official organizations (Roy et al., 2024). Despite these efforts, invasive species continue to spread around the world. As a result, many biological invasions are dealt with in a reactive manner (Roy et al., 2024). Subsistence farmers and fisherfolks (Liberti, 2024) may be disproportionately impacted by the rise of invasive species, and crop loss could further exacerbate food insecurity in vulnerable communities.

The loss of pollinators in agricultural landscapes is one of the crises facing food systems, as 43 of the 82 major crops are highly dependent on pollinators (Klein et al., 2007), and 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 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, native and introduced pollinators are threatened by invasive pests and diseases such as Varroa destructor, which is destroying the productivity of hives in Mexico and other countries (Peña-Chora et al., 2023). For many global south countries that are reliant on export crops and commodities, the loss of pollinators is particularly damaging due to reduced crop yields and subsequent income losses. Agroecological practices recommend increasing agrobiodiversity to restore or transform degraded agroecosystems and increase resilience capacity. Increasing biodiversity needs to include increasing functional diversity in ecological networks and should be the recommended action (Espinosa-García, 2022).

2.3.3 Land and soil degradation

Land degradation is “the reduction or loss of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from a combination of pressures, including land use and management practices” (UNCCD, 1994). The special report on land (Tomalka et al., 2024) for the 16th meeting of the

Conference of the Parties to the United Nations Convention to Combat Desertification (UNCCD) emphasized that integrity of land systems, including soil, water, and biodiversity, is important for both human well-being and the Earth System's stability. Land degradation affects 1.2 billion people and 1.5 billion hectares globally, with an annual increase of 100 million hectares (UNCCD, 2023). Declining land productivity pushes rural households to intensify land use, further accelerating degradation. Meanwhile agricultural expansion, particularly deforestation, further drives environmental degradation, with net forest loss of 0.8 million km^2 alongside cropland and pasture expansions of 1.0 million km^2 and 0.9 million km^2, respectively (Tomalka et al., 2024). Land degradation reduces soil fertility, lowers crop yields, and diminishes food quality and nutrient value, compromising food security and triggering poverty, conflicts, and migration (Lal 2009). In turn, degraded soils require more inputs, encourage further land conversion, and decrease water retention, which is particularly problematic in drought-prone areas. The special report (Tomalka et al, 2024) called for addressing land and soil degradation with a shift to sustainable agriculture that balances productivity with reduced environmental impacts, and for stabilizing crop yields under climate variability. This balance would improve socio-ecological resilience improving food system's capacity to bounce back, or even bounce forward.

2.3.4 Soil pollution

Soil pollution threatens critical ecosystem benefits such as food production, clean water, and biodiversity. Major sources, in order of global importance, are industrial activities, mining, waste treatment, agriculture, extraction and fossil fuel activities. While soil can naturally filter and degrade contaminants, excessive pollution can overwhelm this capacity, turning soil into a source of contaminants for air, water, and food, ultimately harming ecosystems and human health (FAO and UNEP, 2021). Soil pollution threatens food security by reducing crop yields due to toxic contaminants and making crops unsafe for consumption. Contaminants like nitrogen, phosphorus, heavy metals, and organic chemicals can leach into water supplies, causing eutrophication and health risks from polluted drinking water. Soil biodiversity is harmed as pollutants disrupt microorganisms and soil organisms, leading to land degradation and, in severe cases, land abandonment. (Rodríguez-Eugenio, et al. 2018). Contaminants entering the food chain pose major health risks, especially for vulnerable groups like children and pregnant women, and contribute to chronic illnesses with long-term economic costs. Impacts are more severe in low- and middle-income countries and marginalized communities, deepening health inequities (FAO and UNEP. 2021) and adding to vulnerabilities to shocks and stresses.

2.3.5 Global zoonotic diseases

The emergence of Global zoonotic diseases (or cross animal–human diseases) have had devastating food systems impacts. Farms and people more generally are exposed to direct impacts on human and animal health and indirect impacts through disease eradication programs (e.g. mass culling of livestock), market mediated crisis (e.g. commodity price crashes through suspending trades with affected countries, and regulatory change (Anderson and McLachlan 2012). Livestock-related diseases (e.g. foot-and-mouth, blue tongue), zoonotic diseases (e.g. BSE, avian flu, and swine flu) undermine the stability of trade. Despite international efforts to control zoonotic diseases, they continue to spread and reemerge as global livestock trade expands and intensifies (Delgado et al.,1999). These risks have been further exacerbated as industrial farming can create the ideal conditions for the emergence of new pathogens (Wallace 2016) and where the speed, scale, and complexity of animal and meat trade have accelerated the emergence of zoonotic diseases as a global environmental problem (WHO, 2004). Exposure to

disease impacts is also highly differential. Dzingirai, et. al (2017) demonstrated how landscapes of disease and vulnerability, created greater exposure to particular places and people in the cases of Ebola, trypanosomiasis and Lassa fever. Precarity pushes displaced and marginalized farmers further into untouched forested and co-habitation in environments favourable for wildlife reservoirs of disease such as swamps. COVID demonstrated the need for well-functioning food systems to prevent zoonotic spillovers (Webb et al. 2021).

2.4 Social-economic-political sources of stresses, shocks, and differential vulnerabilities

There is a range of social, economic and political dynamics that have significant impacts on the entire food system from the point of production to the end of consumption. These can increase peoples' vulnerabilities to food systems issues, often refracted through inequities that are exacerbated in the face of shocks and stresses (Tarasuk and Davis, 1996), where some groups are afforded choice and agency, while others are systematically and structurally marginalized or suppressed. As such, it is critical to first identify and address deep rooted social issues that negatively impact food systems resiliency by making communities more vulnerable to changes. Deep rooted social issues can also influence how problems are framed, what solutions get deployed, who benefits, and who are included in the decision-making process. This section will therefore address several social pressures that make the current food systems less resilient to identify possible pathways for equitable food systems transformation.

2.4.1. Racism and discrimination

Racism, namely discrimination or antagonism by individuals, communities, or institutions against people based on their membership in a racial or ethnic group, and a belief that racial differences produce an inherent superiority of a particular race over another, is pervasive globally (UN, 2024; Law, 2013). Racism can impact who has access to lands and resources to grow food (Agyeman and Simons, 2016), everyday food access and where people live (Shaker et al., 2023), the types of employment opportunities available (Yearby, Lewis, and Gibson, 2023), where waste is situated (Pulido, 2017), whose knowledges matter (Grosfoquel, 2013), and who gets to make associated decisions around food governance (Haysom and Battersby, 2023). The status quo in countries where racism is prevalent, has meant that communities who are viewed as "inferior" by those in power are discriminated from accessing the resources needed to become food secure and resilient. When these structural issues are coupled with shocks such as natural disasters, pandemics, or conflicts, many marginalized peoples are disproportionately impacted and receive less assistance (Asi, 2020).

For agriculture, this may mean differential access to land and loans to grow food based on race or ethnicities. For example, a study found that discriminatory lending policies systematically denied Hispanic farmers and ranchers subsidized loans and reinforced ethnic tensions (Waddell, 2019). In the dominant food system, racism against food labourers is pervasive, especially discrimination against farm labourers and migrant workers who are relied upon to grow food across North America, Europe and the Middle East (Rye and Scott, 2018; McLaughlin and Weiler, 2017). Several studies documented migrant farm workers deaths due to pesticide exposure (McCauley et al., 2006), harsh weather during heat waves (Pradhan et al., 2019), and the significantly higher incidence of COVID-19 rate in counties with more agricultural workers (Lusk and Chandra, 2021) all of which is compounded by discriminatory labour laws (Basok et al., 2023).

Beyond land-based agriculture, it is important to consider the blue economy, and "blue justice," particularly in light of oceans contributing a projected US$ 3 trillion by 2030 (Bennett et al., 2019). Racism, human rights violation, and discriminatory practices is prevalent in fisheries. For example, modern slavery, labour rights violation, human trafficking and debt bondage impacting predominantly African and Asian crews is widespread (Tickler et al., 2018). Discrimination occurs also at the processing, retail and distribution level. The outsourcing and racialization of workers in the meat processing sector is documented across Europe and North America (Piro and Sacchetto, 2021). Migrant and racialized workers are disproportionately exposed to occupational risk. For example, COVID-19 related fatalities in meat processing facilities were amplified where meatpackers were deemed as "essential workers" and workers, circumventing public health measures that protected workers in other industries. One meat processing plant was identified as the largest single site of COVID-19 outbreak in North America with 1100 confirmed cases (Rinaldi and Fernando, 2023). Food workers such as servers, grocery workers, and those working in the service sectors are often paid sub-minimum wage (Jayaraman and Sebastian, 2021.

2.4.2 Gender

At the current rate, it is estimated that it will take 286 years to remove discriminatory laws and to close gaps in legal protection that negatively impact women and girls (UN, 2023). Gender inequality impacts food systems resiliency, in particular FSN (HLPE 2023), as studies have shown that women farmers are disproportionately impacted by climate shocks and seasonal changes (Nkengla-Asi et al., 2017). For example, women are more vulnerable than men during climate shocks as they may have the primary responsibility for managing household well-being (Nkengla-Asi et al., 2017). Gender roles influence women's mobility and decision-making which impacts food provisioning strategies. For example, women, especially in rural areas may have little to no control over the household budget, or gendered food allocation may privilege males with higher quality and quantity of food even from an early age (Levay et al., 2013). When shocks occur that results in male out-migration, these migrations also increase burden within the households as women are left behind. When coupled with gender discrimination outside of the household, women may not be able to alleviate their situation as there may be stigma around participation in formal labour markets and political organizing or governance (Eastin, 2018). Issues around land rights impact women differently too. For example, women are often denied access or excluded from land ownerships due to discrimination. Currently, less than one in five landholders are women despite representing half of the farming labour (Halonen, 2023). Without land tenure or ownership, they face a disproportionate burden from food insecurity, water scarcity and forced migration due to land degradation (Halonen, 2023).

Gender-based violence is also prevalent globally, and may impact women's food security, and nutrition, with studies showing associations between an increase in gender-based violence, climate change, and food insecurity, as well as an increase in violence during shocks like the pandemic (Agrawal et al., 2023). It is documented that female children and women are first to be abandoned, abused, or negatively impacted during times of climate-induced food insecurity (Beaumier and Ford, 2010). On the nutrition side, nutrition needs also impact women differently, especially during pregnancy, breastfeeding, and child-bearing age (Oumachigui, 2002; Dearden et al., 2018). In particular, the neonatal environment, which entails access to nutritious foods also have long lasting impact beyond the utero and demonstrates the connection between child malnutrition and gender discrimination (Mehrotra, 2006). As a demographic, women are the most food insecure, despite being key contributors to food security globally (Visser and Wangu, 2021). As such, approaches to identifying pathways to food systems resiliency should ensure

gender sensitive, gender responsive and nuanced approaches that can increase women's empowerment and equality (Adam et al., 2024).

Pastoral Women's Council: building a better future for Maasai women and girls

Pastoral Women's Council (PWC) is a Tanzanian membership organization empowering over 7000 Maasai women across Ngorongoro, Longido and Monduli. It champions pastoralist and agro-pastoralist women's rights, economic empowerment, and access to services. The organization assists pastoralists women, many of whom are struggling as they face increasing droughts that are decimating livestock and making access to water difficult. Moreover, health care facilities for women are hard to reach, which results in negative maternal health outcomes. PWC has several programs related to food systems resiliency, namely by supporting climate change adaptation, as well as ensuring clean water access, and programs to provide land allotments to women. In 2023, PWC provided 704 pastoralist women with land allotments. The organization also established gender sensitive water committees, in addition to creating boreholes and installing rainwater harvesting, to empower women who play a key role in managing water for their families. They recently won the 2023 Local Adaptation Champions Awards at the COP 28 summit for re-greening desolate lands by establishing a women's cooperative focused on planting and cultivating grass seeds on 40 acres of land.

2.4.3 Loss of food systems knowledge

Food literacy refers to the idea of proficiency in food related skills and knowledge (Truman et al, 2017). This may entail the knowledge and the capacity to grow, harvest, process, cook, and identify edible plants and animals, and their nutritional value, within a particular area, whether it be on the land or water. Food literacy is critical for food systems resiliency as it may include how to produce, harvest and process food in a more sustainable manner, while integrating culture and place-based knowledge. Unfortunately, the process of distancing due to rapid urbanization and monocultures has led not only to spatial, but also mental distancing that has led to a disconnect and in some cases, a loss in knowledge, especially for the youth (HLPE, 2021). While many countries may be familiar with concepts and school curriculum focusing on home economics (Richards, 2000) or formal food and nutrition education such as the *Shokuiku* program in Japan (Miyoshi et al., 2012), food literacy also includes informal education through land-based learning, from elders and Indigenous knowledge keepers, as well as handed down by families, including mothers/matriarchs (Soma, 2016). Levkoe (2014) argues that food literacy also includes reviving and protecting cultural food practices, which is key in the context of many Indigenous communities whose traditional food systems knowledges have been disrupted, suppressed, or viewed as "backwards" through colonialism (Bartlett et al., 2012). For example, in North America, residential schools and boarding schools for Indigenous children were meant to assimilate Indigenous children and lasted for over a century (Nagy and Sehdev, 2012). These schools disrupted intergenerational and Indigenous knowledge by prohibiting the consumption of traditional food and food practices, as well as restricting the use of local languages (Mosby and Galloway, 2017).

UNESCO 10th World Water Forum: Indonesia commit to maintaining Subak preservation as world cultural heritage

In collaboration with the Indonesian government, The United Nations Educational Scientific and Cultural Organization (UNESCO) expressed their commitment to preserving Subak, a traditional form of agricultural irrigation system, based on a cooperative system practiced in Bali, Indonesia since the 9th century. Through this commitment, UNESCO and the government of Indonesia recognized this traditional knowledge as part of the world's cultural heritage. Initiatives to preserve the Subak system includes educational assistance, facilitation of cross-border water cooperation, and capacity development.

The traditional practice of Subak and the associated knowledge have been practiced for millennia in Balinese society. Subak is based on the philosophy of Tri Hita Karana (balance and harmony between humans, environment and God). The system governs water sharing and pest control, connecting rice production with canals, weirs, and temples. With the support of UNESCO and the government of Indonesia, preserving local wisdom and local knowledge on water management can serve as a "library of civilization," thus contributing to knowledge, better water preservation and more resilient agricultural practices. (Salamanca et al. 2015)

2.4.4 Economic stresses, shocks and inequitable vulnerabilities

Economic pressures, such as power imbalances, market failures, income disparity and poverty, can create both shocks and stresses on food systems in a world characterized by uncertainty, volatility and climate change. Such pressures exert disproportionate effects on food systems resilience across different socioeconomic sectors of society. This stems from systemic inequities that often compromise access to entitlements that can facilitate individual efforts aimed at building resilience in food systems (HLPE, 2023). This section examines the extent to which economic pressures shape actions on equitable and transformative food systems resilience.

2.4.5 Market failures and volatility

Market failure occurs when the market fails to allocate resources efficiently, leading to negative economic consequences for producers, consumers, and the overall system (Nkegbe and Mumin, 2022). Market failures can have adverse repercussions on access to food (Yıldırım et al., 2023; Blay-Palmer, 2016), and result in escalating rates of diet-related disease, including diabetes and obesity. This can occur when there are imbalances such as lack of competition, poor access to markets, or information asymmetries that prevent fair transactions (Mayer, 2021). This inefficiency strains farmers financially and restricts their ability to operate sustainably (Dzanku et al., 2021). Market failures create ongoing inefficiencies, such as high transaction costs, poor access to credit, and unreliable pricing. This, in turn, reduces the ability of food systems' actors to invest in better farming practices, plan, or improve productivity (Boansi et al., 2023).

As a shock, market failure exacerbates the effects of sudden disruptions, such as extreme weather conditions, price volatility, or economic downturns. When markets are already inefficient, these external shocks become more severe, as farmers and consumers cannot adapt

or recover quickly. This deepens food insecurity, reduces stability, and weakens the resilience of the food system in the face of future challenges (Acheampong et al., 2022). The negative effects of food price volatility, resulting from macroeconomic shocks, such as global supply shocks and abrupt policy changes have also been documented (Amolegbe et al., 2021). Food price volatility resulting from these shocks can create conditions hostile to the most vulnerable in society.

2.4.6 Income disparities and poverty

Poverty, wealth and income disparities create inequalities and inequities that can compromise the resilience of food systems (Chen et al., 2023; Picketty, 2013)[5]. This stems from the lack of opportunities for farmers in accessing essential inputs like seeds, fertilizers, tools, or technology needed for efficient production. Income disparities refer to the unequal distribution of income within a population. This inequality creates financial strain for lower-income groups and drives their overall vulnerability to food system shocks and stresses (Antwi-Agyei et al., 2021). This is particularly critical for women, children, the youth and less abled individuals who may have limited financial resources to enhance their overall resilience. Limited purchasing power and access to essential productive and economic resources can help them address food insecurity challenges (Mumuni et al., 2016; Akrasi et al., 2020), and restricts their ability to recover from shocks, such as crop failure or market downturns (Ansah et al., 2023).

Poverty can force farmers to operate with limited resources, often leading to lower productivity, poor-quality crops, and a lack of investment in improvements or climate adaptation strategies (Addai et al., 2022). The financial strain of poverty makes it difficult for farmers to recover from crises like extreme weather events, market price fluctuations, or crop failures, deepening their vulnerability and further destabilizing the food system (Asodina et al., 2021). This reduces food security and weakens the resilience of the entire system. Income disparities result in financial and resource limitations for low-income farmers and communities and reduces their resilience and the overall efficiency of food systems. Income disparities amplify the effects of disturbances such as natural disasters on food systems resilience, where poor and lower income households may struggle to recover from the losses, thereby experiencing disproportionate hardships (Cappelli et al., 2021). Due to limited financial reserves and restricted access to credit, these vulnerable groups face significant barriers to recovery, resulting in extended periods of food insecurity and heightened economic instability (Setsoafia and Renwick, 2022).

[5] The 2022 World Inequality report shows that the world's richest 1 percent owned 47.5 percent of all the world's wealth and the wealthiest 10% of the world population owns 76% of the global wealth (Chancel et al 2022). Today, 8.5 percent of the world population, or 692 million people, live below the extreme poverty line of $2.15 per person per day (World Bank, 2024). These inequalities are refracted through racial, gender and other axes of difference. Thus, conditions of extreme wealth accumulation are juxtaposed against increasing conditions of extreme poverty and growing food insecurity. The report also notes that 2020 marked the steepest increase in global billionaires' share of wealth on record, reflecting the reality that the rich are often shielded from the effects of crisis, recover more quickly, and indeed can capitalize on crisis to consolidate wealth and power (Klein 2007). These conditions create an overall fragility and undermine the resilience of all.

2.4.7 Livelihood threats

One of the key factors that can compromise the resilience of food systems within the household and community relates to livelihood threats. Livelihood may be defined as "the capabilities, assets (stores, resources, claims and access) and activities required for a means of living" (Chambers and Conway, 1991, p. 6). Livelihood threats refer to factors that jeopardize the ability of individuals or communities to sustain income-generating activities essential for survival (Gyapong, 2021). These threats can include job insecurity, low wages, limited access to markets, environmental degradation, and lack of resources, all of which reduce financial stability (Koomson, 2021).

As a stressor, livelihood threats create persistent and often compounding challenges for smallholder farmers and rural communities, particularly those who rely on agriculture as their primary source of income, as witnessed in many regions across the developing world and particularly in sub-Saharan Africa. These communities often face financial instability due to low incomes, unpredictable market prices, or inadequate access to resources such as credit, land, and technology (Anku, 2022). Without stable financial resources, it becomes difficult for them to make essential investments in farming improvements, such as purchasing high-quality seeds, upgrading farming tools, or adopting modern agricultural practices that could increase productivity and sustainability (Salifu, 2024). Livelihood threats significantly amplify the impact of shocks, creating a vicious cycle of hardship for rural communities and smallholder farmers who are already vulnerable.

Long term climatic stresses including rainfall variability and increasing temperature patterns can further constrain the capacity of households and individuals in achieving positive livelihood outcomes including increased food security and enhance incomes (IPCC, 2021). This is particularly critical for low-income families in developing countries whose livelihoods are directly linked to climate-sensitive livelihood activities and sectors such as agriculture and forestry. People's ability to meet their basic needs and to afford the cost of living may be constrained by short term economic shocks (Mayrhofer and Wiese, 2020). These economic pressures are also felt in the Global North through recession, and the global financial crisis (Vogel et al., 2024).

2.4.8 Global trade and power imbalance in food systems

Food regime scholars (McMichael 2009; 2010; Friedmann 2016) have widely discussed the close link between the internationalization of trade and the establishment of the contemporary global industrial food system. Since the end of the cold war, the acceleration of globalization has significantly increased international trade in agri-food products, with several authors and organizations concluding that this has enabled countries across the globe to overcome deficits in local food supplies and increasing the level of food security and nutrition (Porkka et al., 2017). The link between international trade and resilience is contentious along a spectrum that ranges from assertions that only by strengthening international trade and making it climate and shock proof can food security be guaranteed, and another side highlighting that international trade is not only fragile but also a contributor to social and ecological inequities and therefore should not be consolidated but rethought.

At the UN level, international trade is often described as a tool for food security. For example, the UN High Level Task Force on the Global Food Security Crisis in their 2010 Updated Comprehensive Framework for Action noted that "more liberalized international markets would

contribute to global food and nutrition security through increased trade volumes and access to diverse sources of food imports" (UN, 2010). Likewise, the 2011 Inter-agency report for the G-20 stated that "trade is an essential component of any food security strategy" and that "Policies that distort production and trade in agricultural commodities potentially impede the achievement of long run food security" (FAO et al., 2011). In 2011, the then UN Special Rapporteur on the Right to Food, Olivier De Schutter, warned that food security was impeded by international trade and that the current system was intensifying dependency and thus non-resilience. The G20 has acknowledged that, "excessive reliance on food imports has left people in developing countries increasingly vulnerable to price shocks and food shortages" (OHCHR, 2011, np). Strengthening this argument, the first report of the current UN Special Rapporteur on the right to food, Michael Fakhri (2020), concluded that the application of the Agreement on Agriculture for more than 25 years was not ensuring fair international markets nor stability of domestic markets, two key elements of an equitable and resilient food system. Especially given the close connection between the construction of an international system of trade in agri-food commodities and the establishment of a financial market for the same goods. The 2024 HLPE report is equally adamant in recognizing the tensions between the liberalization of trade in food and the construction of equitable and resilient food systems.

Along with dependency on trade and the intensification of intra-states inequalities, colonialism and trade liberalization have also consolidated inter-state inequalities, where developing countries mostly supply raw materials and export crops while importing finished goods, often at unfavourable terms. For instance, in Ghana, the effects are evident in the reliance on imported rice and poultry, which undermines the viability of local agriculture, while the focus on cocoa as a cash crop leaves smallholder farmers exposed to fluctuating global prices (Heirman 2016). These dynamics perpetuate poverty, limit agricultural diversification, and exacerbate food insecurity and climate change vulnerability. Multinational and or national agribusinesses dominate critical inputs like seeds, fertilizers, and pesticides, marginalizing smallholder farmers who lack the resources to compete. Control of seeds and farm inputs for food security may be compromised by the interest of large scale cooperations with profit motivations. By controlling farm inputs, large corporations can dictate and influence the prices of farm inputs to the detriment of smallholder farmers. A typical example is where local farmers may lose control of their seeds and must always purchase seeds from multi-national companies. To address these power imbalances in global trade, countries need to depart from the dependency on international trade and global competitiveness, promote socially and environmentally equitable trade policies that limit fragility and socio-ecological externalities, and promote investments in local food systems and territorial markets that are more resilient (IPES-Food, 2024; Ferrando et al, 2022; Ragasa et al., 2020; Onumah et al., 2022). The liberalization of trade has opened the doors to cheap and industrialized products, increasing the overall availability of unhealthy food, contributing to increasing levels of food and nutrition insecurity and significantly redefining the agricultural matrix in countries (Clark et al., 2012).

2.4.9 Political and institutional stresses, shocks and inequitable vulnerabilities

It is difficult to disentangle politics from the social, economic and environmental pressures that impact the food system. For example, political and institutional pressures that push urbanization and urban sprawl may impact local agricultural production through the reduction of agricultural farmland (Seto and Ramankutty, 2016) and thus are connected to environmental pressures. Meanwhile, the economic cost of political inaction to address labour shortages and proper wages in the food sector may contribute to the decline of local food businesses (Karan and Asgari, 2021).

Socially discriminatory policies enacted by policymakers and mobilized by institutions to target a particular group, or community, can result in the weaponization of food and result in famine (HLPE, 2024). While a wide range of political and institutional pressures may contribute to the stresses, shocks and vulnerabilities that negatively impact food systems resiliency, three main themes will be covered in this section, namely conflict, organized crime, and demographic changes due to displacement and migration.

2.4.10 Violence, war, conflict and displacement

Violence, war and conflict have a significant impact on the resilience of people, communities and food systems. These crises are mostly found in countries or regions which already suffer from detrimental climatic changes, are highly dependent on agriculture for food generation, and where violent conflicts coincide with a high degree of state fragility and history of pre-existing tensions and conflicts. Famine and food crises globally are often linked to wars and violent conflicts, which impact the entire food system and can range in scale in terms of the geography, the actors involved, and the duration of the conflict. Violent conflicts may be prolonged, while others may be abrupt and end shortly. Violent conflict occurs due to various reasons, whether it be for economic, environmental, political and or social reasons, and impact communities differently based on their level of vulnerabilities (HLPE, 2022; HLPE 2024). As of 2024, 135 million people in 20 countries are impacted by food crises due to war and protracted conflicts (HLPE, 2024). Conflict induced famine also results in long-lasting health repercussions, especially on children, the elderly, and pregnant women (IPC, 2024). As noted by Kemmerling et al., (2022), there are four key logics on how violent conflicts and wars can impact food security and food systems resiliency, namely through: 1) destruction; 2) the weaponization of food and hunger; 3) control, and 4) conflict induced displacement.

Displacement and migration are strongly connected to conflict and wars. According to UN Refugee Agency (UNHCR, 2023), by the end of 2023, an estimated 117.3 million people were forcibly displaced due to conflict, violence, persecution and human rights violations, an increase of 8 per cent compared to 2022. The occupation of territory through war typically involves control and appropriation of food systems or land grabs displacing local communities and Indigenous Peoples (Fakhri, 2024). In the last decade, the number of refugees has tripled (UNHCR, 2023). In the Middle East, years of conflict has resulted in mass displacement both internally and externally with over 1 million people including Lebanese citizens, Syrian and Palestinian refugees having to leave their homes, often only to bounce around from one war torn country to another exacerbating vulnerabilities (Diab, 2024). Some groups are more vulnerable than others in situation of displacement, with those having access to money being able to leave more swiftly, while migrant workers caught in conflict zones may face more barriers due to their temporary status and lower income (Diab, 2024). There are also preferential treatments when it comes to welcoming refugees and those displaced by wars, often impacting racialized migrants (Sales, 2023). Mass migration and displacement can also create additional shocks and economic stresses as it pertains to food and resources in the host country, especially where the host countries are under resourced (Alchatib, 2021).Beyond wars and conflicts, displacement and migration may also occur due to environmental conditions and poor agricultural practices, whereby communities must leave their homes due to the lands and territories no longer able to support human life. For example, the Dust Bowl mass exodus was one of the largest migrations in the United States, where 2.5 million people by 1940 had to move due to severe dust storms caused by a combination of drought, poor agricultural practices that did not prevent wind erosion, and the destruction of topsoil (Long and Siu, 2018). Local communities, typically

Indigenous, are also displaced in conservation initiatives when governments and local elites urge resettlement as the only alternative (Milgroom and Spierenburg 2008). Peasants, Indigenous People who once were supported through subsistence economies and local food webs are dispossessed from their lands and territories, eroding an important reservoir of resilience and exposing them to new risks.

Increasingly, there are concerns around displacement facing small island developing states as their geography makes them 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). Other forms of displacement have occurred due to settler colonization and laws promoting settlers to move into new territories (Veracini, 2013), which creates a significant shift in the demographic of the population in the area, and displacement faced by pastoralist communities under the guise of conservation and grazing bans (Singh et al., 2022). During times of peace, immigration may also be encouraged to address issues in some countries such as the need to hire more labour for food production and to address the needs of an aging society which impacts the demographics of a nation and the resiliency of its food systems (Roberts and Fujita, 2024). Displacement and migration may contribute to vulnerabilities to food insecurity, faced by those who have migrated and are being displaced, but it can also create vulnerabilities for communities and families they have left behind (McLaughlin et al., 2017). In some cases, policies to encourage migration may not be coupled with enough resources (healthcare, education, housing) in the host country, therefore worsening food insecurity, sparking tensions and potential conflict with the local population (Kapinus et al., 2023).

African Women Rising (AWR): Permagardens for refugees

Founded in 2006, African Women Rising was founded to empower women who have been displaced by wars to ensure that they are able to escape poverty. The organization works in 79 villages where tens of thousands of families have been displaced by wars. Northern Uganda, the region where AWR operates is host to the most refugees of any African nation fleeing conflict and wars from DRC, South Sudan and other countries. In these refugee communities, the vast majority of the population are women and children under the age of 18. AWR is staffed by many of the former AWR participants with lived experience as refugees and thus expertise in the issue. While many of these women are provided with aid from World Food Programme (WFP) monthly, the food is insufficient and should deliveries be delayed, there is an increasing prospect of starvation. AWR offers several programs for refugees focusing on regenerative agriculture training and securing permagarden (permaculture and bio-intensive agriculture) lots to grow food for the refugees. The Permagarden Program is offered in the Palabek Refugee Settlement, in Northern Uganda. It is designed to harvest rainwater, build soil fertility, build biodiverse food forest and plant perennial plants/ trees. Participants are connected via AWR mentorship on agronomic principles. Assessment of the impact of the program found that permagarden ownership resulted in a 60% decrease of household consuming only one meal/ day and 179 percent increase in households that eat three meals/ day. It also reduced the need for food aid. Produce from the permagarden can also be sold and improve economic opportunities in addition to being consumed directly.

Source:https://cdn.prod.websitefiles.com/62758ccfb99bc03136010494/635307b1ff8832e9

2.4.11 Organized crime and food systems

In addition to wars between nations, organized crime affects food systems from production units, distribution chains, and direct marketing to consumers (Bakić Hayden, 2023; Rizzuti, 2022). The influence occurs mainly in areas dominated by criminal cartels that extort, kidnap, and terrorize producers and retailers, often forcing people to close their retail outlets or to sell their production units to the criminals by force and to migrate to cities or other countries to escape the violence. The overall effect is an increase in food prices due to the quotas imposed by criminals to allow the production, distribution, and retail of food and to food production and distribution shortages (Maldonado Aranda, 2014). Increasingly, activists, peasants, water and land defenders who interfere with state-led and corporate-backed development agendas find themselves victims of violence. The intimidation and murder of ordinary people demanding social justice or defending the environment, the peasantry or rural livelihoods have occurred through corporations hiring mercenaries, paramilitary, or private military to control lands, foods, and resources. Global Witness (2023) documented the murder of 193 people in 2023 who stood up to governments and companies.

2.4.12 Disruption from new technologies – stresses, shocks, vulnerabilities and potential opportunities

For some sectors, agricultural technologies may contribute to the diversification of production methods, and serve as a complementary tool to share resources, knowledge, analyse data faster and facilitate access to food where access may be limited such as 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), controlled environment agriculture (Benke and Tomkins, 2017) and others. Some technologies such as controlled environment agriculture is well established and may lengthen growing season and facilitate access to diversified fruits and vegetables where outdoor growing is not possible (McCartney and Lefsrud, 2018). The increasing number and types of data available through new technologies may in some cases support the evaluation and monitoring of policy impact, or the mobilization of data to contribute to enhancing food security nutrition (HLPE, 2022).

While appropriate technologies have the potential to increase equitably transformative resilience, it is important to also recognize the limitations of agricultural technologies and consider the associated long-term risks of technologies and their true cost (Benyam et al. 2021). A recent study of a Crop Intensification Program (CIP), for example, demonstrated how the intensification of smallholder agriculture by foregrounding technology and management adjustments have reduced smallholder resilience by inhibiting sovereignty over land use, decreasing livelihood flexibility, and constricting resource access (Clay & Zimmerer, 2020). It is also important to consider the material, infrastructure, and resources needed to produce, maintain and operate these technologies all of which impact both planet and people. There are other aspects to technologies that should be considered for resiliency, such as who manages the data governance (HLPE, 2022), ownership of knowledge and intellectual property, as well as whether there exists the right to repair (Carolan, 2024). The notion of technological sovereignty has been developed to consider how to assess whether an approach to technology is appropriate, adopted in the public interest and controlled by the public (Montenegro de Wit 2022). As noted by Clapp and Rudder (2020) technological lock-in, the double-edged nature of technology, and uneven power relations are important considerations to better understand the

risk and opportunities presented by these technologies. However, there are other technologies with potentially disruptive impact to food systems resiliency that may contribute to exacerbating shocks, stresses and vulnerabilities of which its impacts are still not fully understood.

With the rise of technologies such as Intelligence (AI) and machine learning, blockchain and its associated products such crypto, and various forms of automation through AI robotics, we are still learning new and unexpected ways that our food systems can be disrupted or improved (Biradar et al. 2023). Some scholars on AI ethics have raised concerns around predictive policing, surveillance and facial recognition AI tools that can be used to target historically marginalized populations and deprive them of aid (Martin, 2023). Also, there are concerns around the loss of employment and entire agricultural professions, as well as the loss of associated knowledge. For example, reliance on AI to assess, evaluate and determine course of actions for farmers on the field will replace the need for agronomists (Ryan, 2023) and further contribute to the loss of critical local and Indigenous knowledges recognized as essential to food system resilience (e.g. Kunming Montreal Globa Biodiversity Framework, 2021). Other concerns include vulnerabilities that can be exploited by cyber-hacking or sabotage which can have global repercussions (Carolan, 2020), and the sustainability of AI integrated tools, namely the non-renewables resources needed, and pollution caused in making these technologies, and the pollution that may be emitted after repair is no longer possible (Ryan, 2019). There are also sustainability concerns around the impact of AI integrated robot on non-humans, such as soil compaction, harm on animals, and crop damage. Due to its mechanical nature, farmers are responsible for making their farm format work with AI instead of the other way around (Stock and Gardezi, 2021).

Chapter 3 | From resilience to equitably transformative resilience

Key messages

- There are multiple understandings of resilience with prevalent approaches emphasising the ability to withstand disturbances and '**bounce back**' to restore a pre-disturbance status.
- Mainstream resilience thinking overemphasises the inevitability of shocks and overlooks how structural factors, including deep-rooted food system inequities, affect how disturbances impact people and nature, and condition their agency to respond.
- Furthermore, the most common resilience thinking that focuses on single food system components and that disregards how food systems are co-constituted with other systems (including ecosystems) is too restrictive. There is a need for holistic and integrated approaches to transform food systems in ways that bounce people and nature forward towards a socially and ecologically equitable state.
- Building resilience that allows for 'bouncing forward' requires to change structures, harness interdependencies (including human-nature) and enable individual and collective agency and inclusive and participatory processes. This is what **transformative resilience** is about.
- However, transformation alone cannot guarantee the construction of food system that are equitable both in terms of processes and outcomes. Food system transformation needs to be guided by equity principles that address the root causes of non-resilience for both people and ecosystems.
- **Equitably transformative resilience** (ETR) goes beyond 'bouncing back' and 'bouncing forward' and requires adopting multi-level policies and actions that redress differentials of power, capabilities, resources, rights and duties. It acknowledges the interdependence between the resilience of human societies and the resilience of ecological systems. It requires policies and interventions that go beyond food systems to transform social, economic, political and cultural structures, increase the robustness of individuals, communities and ecosystems, and enable just, dynamic and adaptive socio-ecological response processes that last over time.

3.1 Resilience as 'bouncing back' and its limitations

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. However, it would be a mistake to think that there is only one definition of resilience. Generally speaking, a distinction can be made between "thin" and "thick" descriptions of resilience, depending on the scope, purpose and approach to the issue.

As discussed by Irma-Serrano García (2020), thin descriptions of resilience refer mainly to "rebounding" or "bouncing back" from a crisis or disaster to return to the previous state of affairs or to a state of healthy functioning. By contrast, thick descriptions focus not only on the management of traumas, crisis or disasters, but often include the continuous resistance against structural issues and risk drivers that lead to or amplify the uncertainty and the fragility, such as chronic poverty, discrimination, and political repression.

Whereas 'thin' descriptions are attentive to the capacity of a system to promptly 'bounce back', 'thick' descriptions propose the idea of transformative resilience or "bouncing forward" — thus focusing on the need to transform and build positive changes in the face of shocks and adversity, recognizing that going back to the status quo may not adequately address the problem. However, moving 'forward' can go in multiple directions and be based on different assumptions, thus not guaranteeing the fulfilment of the six dimensions of food and nutrition security. For these reasons, this report uses the idea of 'bouncing forward' but adopt a qualified understanding of transformative resilience. As outlined in Chapter1, this report contributes to the discussion on resilience by introducing the concept of **Equitably Transformative Resilience (ETR).** The next three sub-sections are built around each of the three descriptions of resilience ('bouncing back', 'bouncing forward' and ETR) and present a brief summary of the main theoretical points to then provide examples of how they operate in the context of food systems.

3.1.1 Food systems' resilience as 'bouncing back'

'Thin' or 'first wave' descriptions of resilience have also been defined as 'engineering' resilience (Holling 1996) because of the way the term has been technically used in a narrow sense to refer to the return rate to equilibrium upon a perturbation. In this framework, the 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, in a way similar to the concept of robustness. The latter, on the contrary, focuses on the capacity of a system, individuals or communities to go through a shock, been changed or affected by it, and - fully or partially - restore its previous state (i.e., operational performance and trajectory) following a disruption, and thus to recover. A dynamic description of resilience recognizes that shocks and disruptions may lead to a change in the practices, activities and dynamics, and is usually measured by the length of the time to recover from disruption, the intensity of the disturbance and the capacity of the system to absorb the disruption to then fully recover.

A 'thin' description of resilience has been often used to discuss food systems and food practices. The question is how do these contrasting approaches to resilience apply to food systems thinking and practice, and what the implications are when applying them? As we discuss, the idea of 'bouncing back' is still widely used, but inadequate to deal with the multiple and interconnected crises that characterize food systems. A widely cited paper by Tendall et al. (2015, 19) describes 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." This definition emphasises how disturbances impact food security and food systems' robustness or capacity to withstand those disturbances, their capacity to absorb them (by having elements that are replaceable or redundant), adapt to the effects of the disturbance and do so rapidly and flexibly. In the same vein, Béné et al. (2023, 1438) discuss food system resilience 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." Again, the emphasis is placed on recovery and return to the state prior to the disruption. The desirability of that stage and the distributive implications of the recovery process are concerns that need to be brought to the fore yet remain lacking in current concepts and understandings of food systems resilience.

These concerns for withstanding shocks and restoring disrupted functions are mostly found in perspectives on resilience that focus on specific elements of the food system, such as farms and value chains. From a farming systems perspective, bouncing back resilience may include the use

of drought-resistant crops to withstand disturbances in frequent drought areas, or promoting fortified food produced 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, 916).

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

Capacity

Capacity applies to both the scale of the individual and of collective groups (Béné et al. 2023). Individuals' resilience capacity may be shaped by factors such as resource ownership, access to credit, professional experience, and social networks. Subjective elements such as cultural identity, religion, or self-confidence may also shape individual resilience capacity. Collective resilience capacities refer to resources that are available at a group level. This may include for example self-organisation, cooperation, cross-subsidization and/or collaboration between groups in the food system, such as farmers or consumers. Capacity also refers to dynamic learning processes that occur in response to disturbances (Tendall, et al. 2015). Reactive action 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 of 'whose capacity' and 'how capacity is distributed' in food systems. While globalized food systems may offer a wide range of food for some, they are also defined by high levels of concentration of wealth and power, alongside the marginalisation and disempowerment of the majority (Patel 2013; Clapp et al. 2009; Leach et al. 2020). How resources and power are distributed in food systems and the associated inequities may condition the extent of resilience capacity. This needs attention as, inevitably, the capacity for resilience and, as a result, the relative desirability of bouncing back.

Social protection and resilience

People's capacity to withstand shocks and stresses is a core concern of social protection programmes targeting the most vulnerable social groups (Devereux 2024). Social protection can build 'bouncing back' resilience of individuals and households through asset building, social insurance and safety nets to protect assets against shocks and stresses.

Social protection is widely recognized as a critical policy instrument for building resilience. Although various agencies define social protection differently, there is broad 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). Broadly, it encompasses three types of programs: i) social assistance: non-contributory programs 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) labor market programmes: aimed at working-age populations that enhance employability and boost earning potential.

Increasingly, social protection instruments are being combined with complementary interventions in other domains such as nutrition, gender equality or livelihoods improvements, health, education including financial education (saving) and business training often referred to as cash plus programmes. The focus on livelihoods usually takes the form of economic inclusion programmes that address multiple barriers to accessing sustainable livelihoods.

Goals

Functional *goals* or outcomes is another significant element emphasised 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, and food systems that generate harm for people and nature and 'lock-in' people in unsustainable practices should not be made resilient (Oliver et al. 2018). Tendall et al. (2015) suggest prioritizing food systems that ensure sufficient, appropriate and accessible food to all, and in line with sustainability. Béné et al. (2023) add the generation of "decent livelihoods and viable incomes-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).

The emphasis on goals brings to light the normative character of resilience. The primary focus should therefore be on improving the resilience of food systems that generate beneficial outcomes, rather than those contributing to food insecurity or environmental degradation. But defining more concretely what beneficial outcomes are is an inherently subjective process – beneficial according to whose views and in what contexts? As Zurek et al (2022) put it, there may be "different perceptions of the desirability of those outcomes between different actors" (Zurek et al. 2022:527). The focus on normative food system goals highlights the contentious nature of resilience, indicating that desired food system goals and states should not be presumed as universally agreed upon.

Consensus on food system goals against which resilience can be assessed should not be taken for granted, and the goals cannot be disconnected from the way in which they are reached (e.g. processes, policy change). 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, 23). Building resilience in food systems is therefore an ongoing process infused with contestations and shaped by power dynamics and inequalities. Building resilience is not simply technical fixes but a political process, the outcome of which depends on how power is distributed in the system, and, specifically, how production, processing, distribution and consumption structures are organised.

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, local, regional and global transaction processes and market chains, 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 globalisation of quinoa illustrates how a focus on building resilience of value chains, without considering systemic attributes, can have negative consequences for resilience outside those chains, including for local communities and ecosystems (see box).

The globalization of quinoa

Quinoa, native to the Andes and cultivated for 8 000 years, has long been a staple for Indigenous Peoples. Recently, it has risen to global prominence as a superfood and meat substitute due to its high protein content, presence of all essential amino acids, vitamins, and being gluten-free. The FAO declared 2013 the International Quinoa Year, 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 mono-cultivation not only in South America but also in regions like the US, Asia, and Europe. As quinoa transformed into a global food commodity, the implications have been significant. For poor consumers in the Andes, the rising prices meant they had to replace quinoa with less nutritious foods. While rural producers initially benefited from the higher prices, they soon faced intense market competition. Bolivia, once a leading producer, saw its dominance challenged by Peru, where farmers are currently thriving. 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, like 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 introduce new pests, further complicating the 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 food system interconnections and feedback loops. It can be added that quinoa had also a major decline in demand subsequently. This in turn reflects the need to adopt a systemic approach when developing resilience strategies taking into account capacities, context, and socio-ecological independencies.

From a 'systems' viewpoint, 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 emphasised the need to acknowledge interdependencies between different parts of food systems at different levels. Some literature on resilience highlights trade-offs that are likely a symptom of practices that focus on the short term and disregard longer term and transformative solutions that recognise interdependencies. Trade-offs are framed as follows:

- crop diversity versus plentiful production and efficiency associated with specialised production (Zurek et al. 2022);
- food price and accessibility versus environmental impact of cheaply produced food (Zurek et al. 2022);
- downstream impacts of flood protection measures (Tanner et al. 2015);
- short-term vs long-term resilience – "the resilience of food system actors at one point in time may disadvantage, or make difficult, resilience in the long-term for other – or even the same- individuals and/or for the food system itself" (Béné et al. 2023: 1451);
- "subsidizing access to fertilizer to improve crop yield in the short-term as a strategy for improving farmers' resilience generally have negative impacts on the environmental integrity of the agroecosystem, thus jeopardizing resilience of the whole food system in the long-term" (Béné et al. 2023: 1451);
- "the costs of building resilience (due to investments in new systems, training, maintaining reserves, etc.) could potentially reduce economic efficiency, in which case production

and distribution is not performed at least-cost with respect to the market prices of inputs and existing technology." (Vroegindewey and Hodbod 2018);

- "Implementation of the diversity and redundancy principles might raise the relative costs for products that are otherwise associated with economies of scale (or scope), if it leads firms to maintain multiple heterogeneous production plants in lieu of larger facilities (or maintaining operations that are not complementary)." (Vroegindewey and Hodbod 2018);
- "Applying redundancy in procurement and distribution relationships may drive up the fixed costs of transacting with suppliers and buyers, and may complicate the task of managing food waste." (Vroegindewey and Hodbod 2018).

Although concerns about trade-offs are common in discussions about food system resilience, some perspectives suggest that this reasoning frames objectives in unhelpful binary terms that overlook interdependencies and other potential solutions (Hanspatch et al. 2017). Can long-term sustainability be genuinely compromised for short-term efficiency? And is there a genuine conflict between ensuring fair income for producers and affordable food prices for consumers? We return to the issue of trade-offs and alternative perspectives on synergies in the next section.

Another significant contribution from "systems" thinking is attention to human-environmental interactions (and interdependencies) in relation to food systems (Ericksen 2008). Ecological resilience, for example, is defined by Walker et al. (2004, 1) 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 feedbacks." In agroecosystems, the application of this definition incorporates the evolutionary changes in species that allow them to adapt to disturbances while maintaining their ecological function and thus their contribution to ecosystem services.

Economic resilience to the detriment of ecological resilience

Australia's Goulburn-Broken catchment within the Murray-Darling Basin has been described by some authors as an intervention that significantly contributed to the agri-food capacity of the area and positioned the state of Victoria as an agri-exporter (Walker et al., 2009). Activities such as dryland cropping, grazing, and irrigated dairy production have increased agri-food production and brought economic resilience.

However, Walker et al. highlight that agricultural resilience came to the detriment of the overall socio-ecological resilience and the robustness of the system. For the authors, a deeper social-ecological analysis reveals that this economic success is precariously tied to environmental degradation. For example, "the development path of the GB region has been marked by increasing investment in infrastructure and growing reliance on agricultural processing sectors that are vulnerable to a rising water table. This has reduced the intrinsic value of biodiversity. Irrigated agriculture produces very high levels of market values, in line with current social preferences. Diversions of water for irrigation reduced the resilience and compromised the intrinsic and other values of riverine ecosystems. Development has reduced options for the region and, therefore, its resilience" (ibid, p. 19).

The way in which anthropic activities intervened in the territory in the form of agri-food production poses risks not only to biodiversity but also to the long-term sustainability of agricultural productivity, upon which the region's economy depends. The degradation highlights the interconnectedness of socio-economic and ecological systems, emphasizing that resilience in one

domain cannot come at the expense of the other. These challenges underscore the importance of recognizing the interconnectedness between systems and promoting transformations that are embedded in both social and ecological integrity.

Systems thinking about resilience has been crucial to understand connections, feedback loops and tensions across food systems (and with other systems). But there is scope for extending these perspectives to give more attention to structural imbalances, power and politics and to build the type of resilience that allow people and systems to 'bounce forward' and not simply restore positions and functions that may be inadequate. The next section elaborates the notion of 'bouncing forward' resilience, discussing its significance in directing resilience efforts for the transformation of food systems.

3.2 Resilience as 'bouncing forward' for food system transformation

Holling (1973) proposed to move beyond the ability to bounce back to an equilibrium after a disturbance and instead offered the idea of ecological resilience as the capacity of ecosystems to retain essential functions, structures, and feedback while changing and transforming. Holling highlights that "an equilibrium centred view is essentially static and provides little insight into the transient behaviour of systems that are not near the equilibrium. Natural, undisturbed systems are likely to be continually in a transient state; they will be equally so under the influence of man. As man's (sic) numbers and economic demands increase, his (sic) use of resources shifts equilibrium states and moves population away from equilibrium." Like natural processes, socio-ecological systems (and food systems) should be seen in continuous transformation. A transformative approach to resilience looks at the capacity of the actors and of the overall system to bounce forward to a new system (Reyers et al. 2022, 657).

Transformability becomes therefore one of the characteristics of resilience, as recognized by the 2020 UN Guidance on Helping Build Resilient Societies:

> [t]he ability to create a fundamentally new system when ecological, economic or social structures make the existing system untenable. Transformative capacity is required when the change needed goes beyond the system's anticipatory, absorptive, adaptive and preventative abilities and when there is recognition that ecological, economic or social structures keep people trapped in a vicious circle of poverty, disasters and conflict and make the existing system unsustainable.

In relation to food systems specifically, several UN agencies and reports have highlighted how they are broken and need to be transformed to a better state (UNDP 2024 and FAO 2021). The 2021 SOFA report defines transformative capacity in relation to resilience as:

> The ability to create fundamentally new systems when ecological, economic or social structures make the existing ones untenable. Transformative capacity is required when the change needed goes beyond systems' anticipatory, preventive, absorptive and adaptive capacities and when there is recognition that ecological, economic or social structures trap people in a vicious circle of poverty, disasters and conflict, making current systems unsustainable. (FAO 2021, xiv)

The report notes that resilient food systems must not only have the capacity to prevent, anticipate, absorb and adapt to disruptions, but also transform, with the ultimate goals of

"ensuring food security and nutrition for all and decent livelihoods and incomes for agrifood systems' actors." (FAO 2021, xvi).

Negotiating food system transformation is inevitably a political process that is embedded in historical dynamics and path dependency. How transformation happens and where it takes the parties that are involved is thus not a given nor an inevitable journey. Scoones et al. (2020) propose three broad approaches to transformation towards sustainable futures that are relevant to consider in relation to food systems: structural, systemic and enabling (see Table). As mentioned in Chapter 1, structural, systemic and enabling approaches all need to be considered. (Table X).

While enabling approaches stress human agency and collective action, structural approaches highlight the structures and interests that may constrain space for action. Likewise, while structural and systemic approaches may neglect individual agency, enabling approaches may overlook structural obstacles to transformation and, with their emphasis on human agency and collective action, may over burden those with greatest vulnerability.

Table 1

Complementary lenses

Approach	Definition/emphasis	Pros	Cons	Example
Structural	Fundamental changes in the way production and consumption is governed, organized and practiced by societies	Highlights the prevalent economic and political processes and associated interests that serve to perpetuate current conditions	Lack of emphasis on environmental triggers and processes, individual agency and the possibilities of incremental change; historical studies may downplay the role of complexity and serendipity	Emergent discourses on decarbonization or zero- or degrowth economic structures Mass social mobilization around climate change and economic inequity
Systemic	Intentional change targeted at the interdependencies of specific institutions, technologies and constellations of actors in order to steer complex systems towards normative goals	Highlights interdependencies, connectivity across scale and geography, and the potential for non-linear shifts in system dynamics across scales. Emphasizes the role of ecological dynamics in social change and vice versa.	Critiqued for de-emphasis of individual agency, power and politics and/or overly managerial approach, glossing over differences in capacities, governance structure and politics	Low carbon energy transitions, focusing on technology-centred developments, modulated by incentives and disincentives enacted in policy mixes
Enabling	Fostering the human agency, values and capacities necessary to manage uncertainty, act collectively, identify and enact pathways to desired futures	Recognizes potential of human agents for collective action; explicitly addresses asymmetries in power and circumstances of social injustice	May neglect significant structural, political obstacles to social transformation; burdens those with greatest vulnerability with task of transformation	Community led environmental action; hacker/maker spaces for grassroots innovation; commoning approaches to sustainable local economies

Source: Scoones et al. (2020, 68).

Structural, systemic and enabling approaches are not mutually exclusive, but offer complementary analytical lenses on transformative change, as well as complementary approaches to understand and bring about real-world change. While systemic approaches highlight the need to account for connections between goals and spheres, structural approaches draw attention to pervasive and deep-rooted power dynamics that shape contestations regarding those goals. Enabling approaches emphasise resilience as capacity and agency, while structural approaches remind us about the differential abilities and capabilities to transform. And while these perspective on transformation emphasise the human and social aspects of transformation, there is a need to integrate an ecological lens and conceive human and ecological structures, systems and agency as interconnected.

Likewise, these three approaches indicate that there is no necessary sequence or logic to conditions that favour structural, systemic or enabling transformation. While in some cases,

change can be triggered by larger-scale ideological shifts and movements of capital, leading in turn to enhanced opportunity and agency for previously marginalized actors, in other cases, change may be more dispersed and grassroots in nature, cascading up from local innovations that disrupt system dynamics to create structural change.

Building on this and considering the gaps discussed in food system resilience thinking related to capacity, goals and systems (see previous section), this report proposes that a 'transformative' lens to food systems' resilience entails: (i) changing structures of power (ii) harnessing socio-ecological interdependencies; and (iii) strengthening capacity, agency and values.

3.2.1. 'Bouncing forward' by changing food systems structures

Structural changes to transformation can be conceived as efforts to change prevailing food system institutional structures that are inequitable and unsustainable. They refer to changes in the ways production, distribution and consumption are organised or governed, and how material gains are distributed, considering the distribution of power, prevailing interests and class structures. Changing food systems structures to build resilience of the transformative kind requires fundamental shifts to the ways food systems function within capitalism. These shifts may relate to property regimes (concerning land, water, seeds and knowledge), trade arrangements, consumption and wastage practices.

Community-supported agriculture (CSA): changing food distribution structures for transformative resilience

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 upfront to support production costs. In return, they receive regular shares of fresh, seasonal farm produce. CSA have been around for long, with its origins dating back to the 1970s and closely linked with the dissatisfaction towards industrialized food and the rise of the organic movement. Various CSA arrangements exist in different regions of the world, with variations on who drives the interventions (farmers or conscious consumers) and levels of engagement. While there are diverse arrangements in place, the model generally promotes a direct relationship between farmers and members, with the potential to enhance trust, transparency, and foster a sense of community while encouraging local and environmentally conscious food choices. A study on how the CSA structure in Germany can contribute to farm resilience finds that, although it is not a panacea (it may not increase farmers' income and it may rely on unpaid family labour), CSA strengthens resilience by improving reliability of income, market independence and greater satisfaction for farmers. The study also finds that CSA has positive impacts beyond farmgate including in community building and promoting crop diversification, which contribute towards making food systems more resilience (Rosman et al. 2024).

3.2.2. 'Bouncing forward' by harnessing socio-ecological interdependencies in food systems

While the issue of scales and domains (e.g. society and nature, policy and practice) gets much attention with regard to the capacity of food systems to bounce back, how social and ecological aspects of food systems interrelate is insufficiently explored. We should consider not just social actors' resilience but also the resilience of crops, soils, micro-organisms, among others and their

connection to human resilience in food systems and vice-versa. Aspects related to cultures, communities and organizations should be integrated to encompass a system composed by ecologies, humans and the interactions between them in an environment strongly influenced by political, cultural, and socio-economic factors. Food system resilience thinking has emphasized socio-economic components (Zurek et al. 2022), but those related to the ecology and evolution of natural and managed ecosystems linked to food systems need more attention (Holling 1973; Walker et al. 2004).

Socio-ecological interdependencies need deeper consideration in relation to the resilience of food systems and can shed a different light on the issue of trade-offs. The dichotomy between society and nature and between social and environmental goals is a misleading one. This is particularly true when considering that people and nature are understood to be interdependent and co-constituted in food systems—for example, the choice of which crops to grow is influenced by both ecological factors, such as climate and soil type, and social factors such as demand and cultural preferences; and the methods used in farming are influenced by ecological considerations as well as social conditions such as government regulation and incentives.

Relational approaches emphasize ethical obligations, responsibilities and care for these interdependent relationships (West et al. 2024). Incorporating relational thinking that accounts for socio-ecological interconnectedness and for reciprocity and mutuality between society and nature is essential to build a type of resilience that is systemically transformative. This means that policies and interventions that focus on food availability and livelihoods alone and disregard ecological integrity (or solutions that prioritise nature to the detriment of social goals) cannot strengthen resilience of the transformative kind. An example would be building livelihood assets through agricultural technologies that increase yield and income (e.g. high yielding varieties) but result in ecological deterioration; these may improve farmers' livelihoods in the short term but will eventually impact these negatively as result of environmental degradation. Another example would be policies that support export-oriented commodities that lead farmers to specialise their production for higher income but leave them more exposed to disturbances (in markets and climate) and destroy ecosystems, such as in the quinoa example earlier. By the same token, interventions to improve nature's resilience (e.g. rewilding of farmland) that overlook social impacts (e.g. land conflicts and negative implications for food security) cannot be considered transformative resilience.

Harnessing systemic socio-ecological interdependencies for greater food system resilience is therefore about prioritising policies and interventions that result in synergies or mutual benefits rather than trade-offs between goals. The box below 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). Yet, the study notes

> that despite the prevailing view of a trade-off between food security and biodiversity may fuel a self-fulfilling prophecy. At present, it appears that humanity primarily pursues strategies that lead to trade-offs (e.g. through agricultural commercialization and infrastructure development), while strategies that might lead to a "win–win" outcome exist but are neglected (…). We see an urgent need to more routinely bring social system characteristics back into existing discourses on food security and bio-diversity conservation – including issues related to justice, as well as social and human capital (…) (p.493).

Facilitating the envisioning and support of socio-ecological synergies and interdependencies requires a fundamental reassessment of policy options that acknowledge and work with the socio-ecological interrelationships within a given food system. This can then help to strengthen existing synergies to create win-win options while also unearthing hidden vulnerabilities that otherwise might have the potential to undermine system functioning in the long run. To this end, a systemic social–ecological perspective emphasising relational interdependencies can provide a useful way forward.

Interdependencies: food security and biodiversity conservation as mutually reinforcing goals

Food security and biodiversity conservation are often framed in the language of trade-offs, leading to solutions that focus on reducing trade-offs and overlook scope for synergies. 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 this conception fails to capture the synergies that exist between socio-ecological goals. The study carried out an online survey to obtain data on faming landscapes in the global South. It included 223 respondents, selected from self-identified experts on food security and biodiversity conservation, 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" (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" (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 synergies between food security and environmental conservation.

Source: Hanspach et al. (2017).

3.2.3. 'Bouncing forward' through enabling human agency, empowerment and rights

Tanner et al. (2015) emphasize improvements to livelihood opportunities and wellbeing 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."

The capacity of individuals and groups to bounce forward should not be examined in isolation but instead placed in socio-historical context—considering, for example, how colonialism established hierarchies in the global structures of food production and trade that constrain change (McMichael 2009).

A focus on agency as one of the dimensions of food security as defined by the HLPE-FSN allows for that recognition of how capacities may be unevenly distributed and structurally conditioned. HLPE-FSN (2020) defines agency as the capacity of individuals and groups "to act independently and make choices about what they eat, the foods they produce, how that food is produced, processed, and distributed, and to engage in policy processes that shape food systems". It highlights that agency is "constrained by local power dynamics, wealth disparities, gender norms, and governance structures (...). Societal inequalities often reflect differences in agency among different individuals, groups and government institutions, which in turn affect development opportunities and outcomes" (p.8). Strengthening agency for food system resilience is important not only because it connects to human rights and freedoms (Sen 2001), but also because it places individuals and groups in the drivers' seat of pursuing ways to improve their position in the food system – those who are particularly exposed to shocks and stresses are the agents of their own resilience strengthening.

Emerging efforts to enhance women's agency in agrifood systems under climate change are an illustration of the type of agency-enabling transformative resilience needed. Structural inequalities limit women's access to resources, services, and agency, affecting their experience of climate change. Many climate interventions overlook gender issues, worsening food system inequalities. Climate-smart technologies such as conservation agriculture, for example, may increase women's labour burden and reduce their control over income, time and decision-making (Bryan et al. 2017). Women's knowledge and roles in the food system (including as care providers) are key to enhancing food system resilience. Boosting this resilience requires enabling women's agency by removing structural barriers 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 building skills and creating employment opportunities, while tackling interconnected challenges of food insecurity, precarious livelihoods and environmental degradation open pathways to transformation, as the following box illustrates.

Integrated resilience in the Sahel: Burkina Faso, Chad, Mauritania, Mali, and Niger (G5 Sahel countries)

The Resilience Programme is designed to tackle interconnected challenges, such as food insecurity, malnutrition, and environmental degradation, by promoting ecosystem restoration and sustainable livelihoods alongside health, nutrition, and educational improvements. The linkages between food systems, education, and social protection enhance the overall system's resilience. It operates in collaboration with national governments, NGOs, and community leaders. From 2018-2023, it reached over 4 million people. It has three pillars described as:
Anticipate, Absorb, and Protect: Address immediate food security and nutrition needs amidst shocks and stresses through food assistance, integration with social protection programs, early warning systems, preparedness initiatives, and anticipatory actions.
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, home-grown school feeding programs, and comprehensive nutrition support packages.

Transform: Build and strengthen institutional capacities at local, national, and regional levels to enable long-term resilience. It also established establish the Sahel University Network for Resilience (REUNIR), which includes six universities in five countries.
Agency: The programme builds community resilience by empowering local populations through job creation, asset creation, skills training, and access to resources, markets, and services. It strengthens local, national, and regional institutional capacities which include early warning early action systems and anticipatory action.
Food Security and Nutrition Dimensions: **Availability**: The programme promotes sustainable agricultural practices and ecosystem restoration, enabling communities to restore land and improve food production. **Access**: Food assistance and conditional cash transfers are provided to vulnerable households, facilitating better access to food and improving nutrition. Additionally, support for smallholder farmers enhances access to productive resources. **Utilization**: Nutritional support, including school feeding and education on healthy diets, aims to improve food utilization, especially for children and mothers. **Stability**: Linking shock-responsive social protection and disaster risk financing. Decreased tensions within communities and fostered social cohesion among diverse identity groups as well as between crop farmers and livestock herders. **Sustainability:** The programme focuses on ecological restoration. It supports the Great Green Wall initiative to combat desertification.

The first phase of the programme was from 2018-2023, and the scale-up (2023-2028) will adapt support packages, expand activities to new sites, focus on stronger cross-sectoral integration and partnerships and will gradually phase-out from existing sites. The phase-out must ensure communities and governments are equipped to replicate and scale up efforts. Long term and predictable financing are critical to ensure sustainability. (World Food Programme 2023b)

The emphasis on agency also leads us to consider the values of individuals and groups and how these are mediated through relations and processes. Agency is not necessarily a rational decision-making process through which choices are made, but it is contingent on social structures that condition choice. Transformative resilience is concerned with nurturing relations and processes that enable individuals and groups to bounce forward through shared values and goals. These may include the type of relations of proximity between farmers and consumers that CSAs and other alternative food networks seek to establish around shared values of justice and place identity (Goodman and DuPuis 2011; Sonnino and Milbourne 2022). They may also include participatory decision-making processes that include otherwise marginalised voices and their values – Brazil's National Council for Food and Nutrition Security provides an illustration of a participatory policymaking space involving civil society and thereby ensuring transparency, social accountability and effectiveness of public policies for food security and nutrition (Food Foundation, 2021).

Finally, the emphasis on agency also suggests that building resilience is a continuous process as agency that is never fixed or static but is shaped by changing context and relations. Research on the resilience of pastoralists describes the dynamic character of resilience that is constructed, invented and reinvented as part of daily life. This research also highlights the relational nature of resilience, which involves constant adaptation and transformation to accommodate new conditions (Scoones, 2024).

'Becoming resilient' as everyday construction: the case of pastoralists

Pastoralists tend to live in marginal lands, often mountains and drylands, and have uncertainty and variability as part of their daily lives. This uncertainty may relate to changes in access to resources, markets, climate, and social relations. Pastoral ways of life are often threatened by land enclosures for farming, nature conservation and infrastructural development projects. And they are extremely vulnerable to the changing climate. Despite the multiple challenges, pastoralists show high levels of resilience and ingenuity. They contribute to food systems by providing nutrient-dense foods such as milk and meat. And they can provide essential ecosystem services by sequestering carbon and nitrogen in soil and enhancing biodiversity, and through proficient management of grazing and fire that can contribute to the preservation of open ecosystems (Scoones, 2023). Increasingly, pastoralism is regarded as a source of learning on how to live with uncertainty that can be applied in other walks of life (Nori and Scoones, 2019).

Research on pastoralism by the *PASTRES* project uncovers multiple ways of being resilient across six different contexts (China, Ethiopia, India, Italy, Kenya and Tunisia). Resilience is understood as living with uncertainty and constantly adapting to ongoing changes. It often requires "building on networks and relationships and the social fabric on which pastoralism is built" (Scoones 2024, para. 2). Semplici et al. (2024) analyse 'events' in pastoralists daily lives that illustrate their responsiveness to changing circumstances, related to weather, illness, tourism, and privatisation of land. For example, in Borana, southern Ethiopia, Bokayo, a female herder, faces challenges from variable rainfall which, along with socio-political constraints, affects resilience. Resilience is influenced by market networks, household labour, and kin support. Bokayo sells camel milk but struggles with resource scarcity, requiring her to send camels far away. Lacking older children, she must hire an experienced herder, using her savings, which carries risks. Her household herd's resilience depends on her decisions about strategy, care, and market conditions. The research shows that, across six different settings, pastoralists become resilient "through everyday practices, social organization and governance, socio-cultural dimensions, as well as ongoing overarching processes of reconfiguration" (Semplici et al., 2024, 11). It emphasizes the relational nature of resilience, showing constant adaptation to changing conditions through social networks and governance structures across different pastoral settings.

3.3 Equitably transformative resilience: a qualified 'bouncing forward' for food systems

While 'bouncing forward' transformative resilience outlined above set us in the direction of a better food system, does it go far enough in addressing food system inequalities and inequities documented in HLPE (2023)?

As discussed earlier, transformation and 'bouncing forward' are open-ended processes that can follow multiple directions, operate along different timescales, land in a multiplicity of contexts and scenarios, and produce manifold outcomes. This begs the questions of who are the winners and losers of such transformation, what principles should the transformation process follow, and what goals should it achieve? In this section we add equity as a qualifier of each dimension of transformative resilience (structural, systemic and agency), providing the conceptual basis for the guiding framework of this report (see Figure 2 in Chapter 1).

Equity adds emphasis on fairness and justice for and towards food system transformation, and to our transformative resilience perspective. Equity concerns are increasingly emphasized in relation to resilience and linked with the existing frameworks of international human rights, environmental and climate law. 'Equitable resilience' take 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-environmental system, and accounts for their realities, and for their need for a change of circumstance to avoid imbalances of power into the future." (Matin, Forrester, and Ensor 2018, 202).

The four principles that should be used to guide resilience interventions and move us toward increasing FSN are:

- Nurturing socio-ecological equity and justice (3.3.1);
- Centring resilience efforts in the knowledge, experiences and resistance of those made vulnerable and marginalised (3.3.2);
- Addressing inequities in structures through redistribution and redress, with states being accountable for their duties to protect, fulfil and respect human rights (3.3.3); and
- Putting human rights at the centre of all efforts (3.3.4).

We call this conceptual framework 'equitably transformative resilience' (ETR), synthesised in the figure 2 in Chapter 1, and elaborated in detailed in the sections that follow.

3.3.1. Socio-ecologically intertwined equitable resilience

As discussed earlier, transformative approaches to resilience must be informed by the interdependence between all living and non-living beings. However, an equitable approach to transformative resilience requires that policies and implementation of resilience thinking align both with social and planetary boundaries. As such, it must not only be informed by the need for social and ecological convergence and interdependence, but by socio-ecological justice.

A socio-ecological and holistic approach is needed that harnesses these interdependencies to achieve an equitable distribution of benefits and responsibilities. The implementation of policies and infrastructures that promote agroecological production and make it also accessible to the marginalized members of communities aptly illustrates the combined emphasis on equity and socio-ecological interdependencies. FAO and HLPE-FSN's framings of agroecology provide a holistic view that weaves together the resilience of people and nature and equity defined in terms of fairness, values and rights (Box). 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 that provides comprehensive solutions that emphasise ecological integrity alongside the rights of those pushed into conditions of vulnerability and most exposed to uncertainties, shocks and stresses.

Agroecology as an illustration of socio-ecologically equitable resilience

Agroecology has a long history and has been subjected to multiple interpretations, with varying emphasis on its scientific basis, practical applications and political motivations (Wezel et al. 2009; IPES-Food 2022). At its core is attention to balanced interactions between biological and human elements of agroecological systems, alongside normative concerns for fairness and justice in those interactions. Agroecology is not to be seen as a fixed package of techniques or practices, but a set of principles governed by social and ecological values. Efforts have been made to clarify agroecology's scope due to concerns that mainstreaming was diluting its more transformative elements (Rosset and Altieri 2017).

FAO's '10 elements of agroecology', developed through a four-year long consultative process, highlight that agroecology encompasses not only technical-ecological principles but also social justice. These comprise a set of elements describing common characteristics of agroecological systems, foundational practices and innovation approaches (diversity; synergies; efficiency; resilience; recycling; co-creation and sharing of knowledge); context features (human and social values; culture and food traditions); and enabling environment elements (responsible governance; circular and solidarity economy). They define agroecology as 'fundamentally different from other approaches to sustainable development. It is based on bottom-up and territorial processes, helping to deliver contextualised 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, 2). HLPE (2019) has then translated these elements into 13 operational principles to guide food system transformation, weaving together concerns for improving resource efficiency (recycling and input reduction), strengthening resilience (thorough soil health, animal health, biodiversity, synergy and economic diversification), and securing social equity and responsibility (through co-creation of knowledge, social values and diets, fairness, connectivity, land and natural resource governance and participation).

By integrating ecological principles, social inclusion, and participatory governance, agroecology is, by design, about making food systems resilient. It aims to strengthen local capacities to adapt to socio-environmental changes while promoting equity through fair access to resources, empowerment of marginalized groups, and democratized decision-making. Its holistic, place-based approach positions it as a sustainable and just counterpoint to industrialized agriculture.

At a policy level, the idea of socio-ecological equity resonates also with recent calls to adopt a 'One Health' approach as "an integrated, unifying approach that aims to sustainably balance and optimise the health of people, animals, and ecosystems. It recognises that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent." (e.g. One Health in Nigeria, Lucero-Rosino et al. 2023) One Health is based on the notion of interconnectedness that challenges the idea of a trade-offs between healthy ecosystems, healthy animals and healthy humans. Similar to the notion of ETR that we are developing, 'One Health' is multi-scalar and can be applied at community, subnational, national, regional, and global levels, and relies on shared and effective governance, communication, collaboration. Both One Health and ETR require the adoption of a broad ecological perspective that does not look at the symptoms alone, but engages with the structural causes of social and ecological inequities, especially when extreme climate events and shocks

that hit territories and communities. Compared to the most diffused One Health approach, an equitable and transformative approach to resilience requires, however, the centring power, history and human rights.

3.3.2 Centring resilience on the knowledge, experience and resistance of the marginalized

Consistent with the CFS mandate centring those most affected, equitable approaches to resilience need to centre the histories, wisdom and experiences of the people and ecosystems that are most exposed to the non-resilience of a system. Rather than resilience as an external expectation vis-à-vis individuals, communities, food systems and territories, the focus must be on the way in which people, ecosystems and socio-ecological interactions react and resist vis-a-vis shocks, risk and uncertainties.

If the focus is to support those who are most exposed, then it is crucial to hear their voices and learn about how they describe their conditions, and to ensure their requests for accountability, responsibility and transformation are followed. Policies and actions must recognize that the oppressed, occupied and marginalized may not see themselves as 'resilient' beings who adapt and find their way within structures of oppression, but as actors that resist, challenge and promote different and alternative futures that question the premises, implications and lived realities of the status quo.

Several authors and people living at the forefront of shocks and stresses are adamant that 'resilience' should not be used in a way which romanticizes or places undue burdens on those facing the harsh end of disruptions that they themselves did not cause. In this context, we argue that an approach that assumes resilience on the part of marginalized communities, peasants, fisherfolks, 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 the peoples' marginalised position. For example, Palestinian author Shwaikh (2023) underlines that "Romanticising Palestinians, expecting us to show our strength, resilience and patience throughout it all, imposes mythical terms on our experience and our everyday struggles. It obscures our humanity, reduces the depravity of Israeli violence, and ignores other forms of violence, especially the structural violence that we continue to face every day."[6]

Likewise, Indigenous Peoples' resilience is often identified as a source of inspiration and a space where to learn. Marjo Lindroth and Heidi Sinevaara-Niskanen's work on the global call for Indigenous Peoples to be resilient amidst changing conditions is a global one that offers a critical lens to enquire the social, economic and political implications of asking to build up one's resourcefulness and responsiveness, despite one's vulnerability and the historical and present conditions that have led many groups to lack rights, power and access.

Centring resilience on the knowledge, experience and resistance of the marginalized requires far more than merely "bringing people to the table" or sustaining the illusion of consensus in a context marked by inequality, inequity, and the uneven distribution of risks and responsibilities. It requires creating the conditions for those who are made vulnerable and marginalised to be at the forefront of resilience building efforts, valuing their knowledges and centring their

[7] Bhambra, G. K. (2022) A Decolonial Project for Europe. *JCMS: Journal of Common Market Studies*, 60: 229–244. https://doi.org/10.1111/jcms.13310.

experiences. Participatory approaches have a long tradition in rural development and agricultural innovation (Chambers 1983; Chambers, Pacey, and Thrupp, 1989) yet have often been used with the right to participate seen as given (by the powerful to the powerless) rather than claimed. Indigenous perspectives, combined with justice framings, shed new light on these issues. Movements towards *in situ* conservation of genetic material within communities provide an illustration. 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 knowledge with scientific research, fostering mutual learning and innovation. But this experience also draws attention to the need for historical reparations, for lost genetic material and rights.

ETR does not mean only adapting to shocks and uncertainties but also challenging the historical and structural underpinnings of the differentiated vulnerabilities that restrict the possibility to go beyond what is sufficient, and where differentiated vulnerabilities are not accepted as natural nor inevitable. This leads to the third component of 'equitably transformative resilience'. A vision of resilience that is rooted in the experiences of marginalised individuals and oppressed communities requires to go beyond coping, flexibility, and incremental change, and engage with processes of transformation of political and social relations (Pelling, 2011; Béné et al., 2014).

3.3.3. Redistribution of resources and power to tackle the root causes of non-resilience

ETR must tackle and prevent risks, shocks and uncertainties that impact food systems, but also address the structural inequalities and root causes of individual and collective disempowerment that underly differential vulnerabilities and the incapacity of the food systems to deliver food and nutrition security. ETR should be conceived as "changing the world, its structure and conditions of possibility." (Evans and Reid 2013). This requires engaging with 'path dependence' and the role that social and ecological histories have in defining the present of individuals, communities and the planet. Socio-cultural relations are thus not only operating within ecological processes, but within a historical trajectory that matters.

The need for structural shift is not new to resilient conversations nor to the UN system and UN agencies. On the contrary, such a deep engagement with resilience aligns with the recent call coming from the HLPE-FSN and the CFS to address inequalities for food security and nutrition by means of transformative and bold policies. Likewise, the 2020 UN Guidance on Helping Build Resilient Societies discusses risk drivers that:

> can include poverty and inequality, weak risk governance, gender inequality, marginalization and socio-economic exclusion, climate change and variability, unplanned and rapid urbanization, poor land and ocean management, overexploitation of renewable natural resources (i.e., biodiversity, forests, water aquifer, soil) and erosion of fragile ecosystems, as well as compounding factors such as demographic change, and interactions between animals and humans that increase the risks of zoonotic diseases leading to epidemics and pandemics.

Scholars suggest that systems may become less resilient where issues of justice and equity are not taken into account, and that equitable distribution of wealth and assets is essential to building community resilience (Nelson et al., 2007; Twigg, 2007). Similarly, Matin, Forrester and Ensor (2018, p. 198) state that equitable resilience is the one that "takes into accounts issues of

social vulnerability and differentiated access to power, knowledge, and resources. It starts from people's own perception of their position within their human-environmental system, and accounts for their realities, and of their need for a change of circumstance to avoid imbalances of power in the future."

Redistributive policies 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 HLPE (2023). Access to land, water, seeds and local markets, as identified in the United Nations Declaration on the Rights of Peasants and Other People Working in The Rural Areas (UNDROP), is crucial to these structurally transformative and equitable shifts.

Another example is provided by the food sovereignty movement, which illustrates how marginalized groups (including peasants, women and Indigenous Peoples from around the world) have sought to drive structural change in ways that put many powerless people who grow and consume food in the driver seat when it comes to decisions about food system governance, challenging the power concentration and market institutions. Food sovereignty, defined 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 Via Campesina, 2007), emerges out of a struggle for redistributive justice.

Food sovereignty is increasingly also a movement for recognitional justice (Fraser 2007). Women and feminist movements have influenced the movements' agenda by shedding light on the role of women in food systems and bringing gender to the forefront of the food sovereignty debate. In Latin America, where women have a long history of social mobilisation, feminist food sovereignty has questioned traditional gender roles and patriarchy at the core of food system practices (Conway 2018; Caro 2013). 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 to drive justice and equity from their own positions of disadvantage.

As context specific undertaking, the construction of ETR is a journey that must be informed by the acknowledgment of the history of the empire, colonialism, slavery, enclosure, racism, patriarchy and the operation of an uneven system of extraction, circulation and distribution of resources as the underlying structural conditions that underpin contemporary forms of economic, social and ecological non-resilience.

Whereas mainstream approaches to resilience overlook individual and collective histories that have been caused in the past and the depth and degree of pain that they entail, ETR is premised on the recognition of decolonization as an unfinished project.[7] This is the same for ecological damage that has been done for several generations and that should not be ignored when thinking about the future capacity of food systems to be resilient.

[7] Bhambra, G. K. (2022) A Decolonial Project for Europe. *JCMS: Journal of Common Market Studies*, 60: 229–244. https://doi.org/10.1111/jcms.13310.

Therefore, ETR requires the enactment of a process of meaningful reparations[8] (Táíwò, Olúfhemi 2022)[9]. Likewise, decolonization should be a guiding principle for ETR processes at the level of individuals, public administrations, education, communities and international organizations, to align the immaterial of ideas and paradigms with the material of power, participation and access to resources.

3.3.4. Putting human rights at the centre ETR and FSN

Human rights are key for the construction of ETR food systems. They are legal tools that individuals and communities can leverage to claim and obtain entitlements and call upon the state to fulfill its duty to protect, respect and fulfil these rights. The lack of capacity of a system to prevent or rapidly address stresses, shocks and uncertainties, in a way that shields the most affected and marginalized, has impacts on fundamental human rights along with other rights that have been recognized in the recently approved United Nations Declarations on the Rights of Indigenous People (UNDRIP) and on the Rights of Peasants and Other People Working on Rural Areas (UNDROP).

The interdependence between ETR and the fulfilment of all human rights must be recognized. ETR requires, however, more than guaranteeing that rights are protected, respected and fulfilled. This report proposes that ETR must be built around human rights and duties in a way that addresses the root causes of uncertainties, differential vulnerabilities and the socio-ecological breakdown (Marks 2011; Brinks, Dehm and Engle (2019); Moyn (2018)).

The right to food has been widely promoted globally and nationally. The *Voluntary Guidelines* on the right to food emerging out of the 2002 World Food Summit (FAO 2005) establishes the right to food and the achievement of food security and requires States to fulfil their obligations under international law. Several countries, including Brazil, India and South Africa, have established a 'right to food' in their Constitution. These rights allow citizens and civil society to hold governments accountable for fulfilling them. Yet, food rights are often treated “as mere rhetoric, nothing more than an empty promise” (Elver 2023, 20).

However, fundamental rights that are key to ETR are undermined by food systems that empower large corporations and disempower many peasants, small producers and workers, and other marginalised but numerous food system participants. Food rights are also sometimes separated from other human rights (civil, political, economic and social and cultural) and the rights of nature. Our relational perspective on interdependencies emphasises the false dichotomy between people and nature.

By the same token, the right to food cannot be dissociated from the right to freedom, food sovereignty, development and self-determination or from the recognition of the rights of nature as a key component of the interdependency between the people and the ecosystems in which we live and that we continuously shape and that shape us (Elver 2023). The rights of nature, in particular, recognize that ecosystems, species, and natural entities are legal rights-holders

[8] Táíwò, Olúfhemi O. (2022). Reconsidering Reparations. Oxford University Press.

[9] Alex A. Moulton and Mario R. Machado, Bouncing Forward After Irma and Maria: Acknowledging Colonialism, Problematizing Resilience and Thinking Climate Justice, J Extreme Events, Vol. 6, No. 1 (2019) 1940003.

entitled to exist, thrive, and regenerate without the need of human intermediation or interest. By redefining the role of nature in international law according to non-Western understanding of its role (Natarajan and Dehm, 2022), this approach may challenge the traditional view of nature as mere property and open new opportunities of transformative and equitable resilience by requiring considering and interacting with nature as a community entitled with rights that must be respected, protected and fulfilled (Gilbert et al, 2023).

This call for a human-rights centered ETR is well grounded. Human rights offer – on a daily basis – support and hope to the oppressed and marginalized, because they give legal legitimacy to their actions, aspirations and resistance. The content and practices of human rights make them a key element in the construction of resilient societies that are also equitable and constantly readapting to the changing conditions and to the increasing uncertainty. As an example, we stress the importance of the recognition of the right to a clean, healthy and sustainable environment by the UN General Assembly in 2022 and acknowledge the contribution that it could provide in the construction of an equitably resilient society that is fully aware of the fact that human beings and societies are immersed in and interdependent from complex ecosystems and ecological processes.

Finally, a human rights-based approach to transformation underlines the need to combine substantive and procedural components and thus bring together many of the elements that have been discussed in this chapter. Usually known as PANTHER, such understanding highlights the importance of Participation, Accountability, Non-discrimination, Transparency, Human Dignity, Empowerment, and the Rule of Law as a constellation of conditions the satisfaction of which can facilitate transformations that are conscious of differential vulnerabilities, historically informed and that take place at the level of structures, systems and agency. For example, Participation requires that indigenous communities be involved in the planning of infrastructure projects on their lands, ensuring their voices are heard and respected in alignment with free, prior, and informed consent (FPIC), whereas Accountability should be implemented so that affected communities should have accessible legal avenues to seek justice and restitution against those who pollute water ways, the air or soil.

Recent international legal instruments like the Escazu Agreement and the Aarhus Convention 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 example from best practices and achievements in other jurisdictions. However, the adoption of a holistic PANTHER approach requires more than courts and legislators, because it is rooted on human dignity as the recognition of the inherent worth of every individual that cannot just be on paper nor simply an aspiration. The transformative potential of the right to food (De Schutter, 2014), and an approach to human rights that is rooted in the desires and aspirations of thriving people and nature rather than sufficiency, provide, “a common framework that enable international cooperation and cohesion" (Fakhri, 2024), identify shared values and enhance people’s dignity, and must be central to ETR.

Chapter 4: Strategies and actions: a roadmap to equitable, transformative resilient food systems

Key messages

- By providing current and historical examples from around the world, this chapter illustrates how individuals, communities, organizations, and governments are participating in new, equitable ways to transform food systems.
- A key question moving along this road is, how can equitable transformative resilience (ETR) help build food systems that respect planetary and social boundaries and are better able to respond to future shocks and stresses while also address the root causes of ongoing vulnerabilities and risk and the way in which they are differentially experienced by individuals, communities and ecosystems.
- Humanitarian aid is outlined as a key consideration in building ETR.
- Using the HLPE-FSN 2020 Sustainable Food System framework, we provide multiple examples as roadmaps to ETR. The sections and related examples include: supporting production systems; food supply chains; food environments including food security and nutrition; other conditions; policy and institutions. These examples highlight various facets of how to achieve ETR food systems by changing food system structures, building socioecological interdependencies, and enabling capacity, values and agency through policy and action across multiple scales and in different contexts over time.

As described in previous chapters, this report lays out why it is necessary to apply a systems approach to achieve ETR across food systems. The theory of change (Chapter 1), outlines the three approaches of transformation, including structural change, realizing socio-ecological systems interdependence, and the need to enable agency, capacity and values. By providing current and historical examples from around the world, this chapter illustrates how individuals, communities, organizations, and governments are participating in new, equitable ways to transform food systems. A key question moving along this road is, how can ETR help build food systems that: 1. respect planetary and social boundaries; 2. are better able to respond to future shocks and stresses, 3. while also addressing the root causes of ongoing vulnerabilities and risk and the way in which they are differentially experienced by individual, communities and ecosystems (Reyers et al 2020).

Part of the answer to this question lies in enabling the changes needed to shift paradigms, including the narratives and norms about development and sustainability. In particular, ETR necessitates a move away from a linear focus towards one centred on complexity, and from prescriptive templates to context-sensitive diversity. Through a collection of normative principles and approaches, the achievement of ETR food systems can be amplified, accelerated and reinforced (Figure 4 adapted from Reyers et al 2020 included in the text box below).

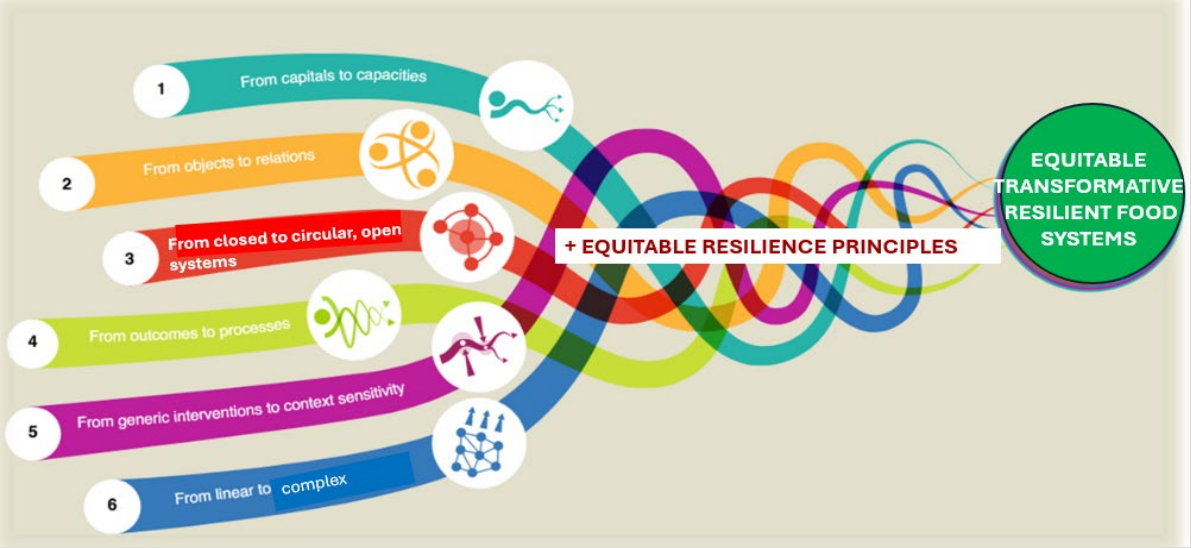
Socio-ecological systems perspectives on resilience emphasise that people and nature are inseparable and connected in networks of relations and interactions that are constantly evolving (Preiser et al. 2018). From this standpoint, resilience concerns “the ability of people, communities, societies or systems to live and develop with change—incremental and abrupt, expected and surprising—and with ever-changing environments.” (Reyers et al. 2022, 657). A

complex adaptive perspective on food system resilience requires a shift in mindsets that makes building resilience less about fixed goal posts and static logics of change (based on linear cause-effect relations) and more about the complexity of constantly changing capacities, relationships and connections between people, communities, and ecosystems. Sustainable development goals (SDGs) and processes related to FSN can be viewed through this complex adaptive lens, while combining it with the transformative and equitable principles of resilience established in the previous sections.

Shifts needed to build resilience in complex systems

Six organizing principles of complex adaptive systems can guide a shift in thinking about resilience: adaptive capacities, relationality, openness, dynamic processes, context-sensitivity, and complex causality. Adaptive capacities replace a focus on assets and capitals with a focus on dynamic abilities to respond to change – collective action may be more significant than assets in determining the ability to respond. Relationality focuses on interconnections between social and ecological components rather than looking at those components in isolation. The focus on openness emphasizes the linkages and overlaps between different systems with system boundaries as porous and dynamics (e.g. food, climate, energy, health, can all be placed in different systems that are integrated and interrelated). An emphasis on dynamic processes replaces a focus on short-term, static outcomes and feedback loops - rather than being fixed endpoints, sustainable development goals, for example, are constantly being shaped by the "dynamic and continuously unfolding nature of development" (Reyers et al. 2022, p.661). Context sensitivity recognizes that system behaviours result from dynamic interactions that are shaped by contexts—here context means not just a local scale, that may be regarded as static, but a "cross-scale that is dynamic and emergent". Context sensitivity is the opposite of generic interventions and blueprints that can be scaled up but emphasises the place-based nature of each case. Complexity emphasizes the non-linearity of change but acknowledges the multiple relationships affecting change and how the same starting conditions may lead to different outcomes.
Source: (Reyers et al. 2022; Preiser et al. 2018)

Figure 4: Form linear, extractive principles towards equitable, transformative resilient food systems.



Source: adapted from Reyes et al. 2020.

The move towards ETR food systems needs to consider transformation that moves beyond a collection of outcomes by building processes and capacities that: recognize dynamic changes; promote relationships that move from extractive economies to ones of care, redundancy and diversity; and foster circular, open systems. Identifying the specifics of these processes necessarily must acknowledge the context specific components that can contribute to ETR food systems over time. Some of the food system components that can act as levers for transformation are elaborated next.

4.1 The role of humanitarian aid amidst shocks and stresses

Environmental, economic, social and political induced shocks and stresses may result in the need for immediate humanitarian food aid to assist the public and alleviate suffering in a time of crisis. And this need is increasing. According to the 2024 Global Report on Foods Crises, "In 2023, 281.6 million people or 215 percent of the analysed population faced high levels of acute food insecurity in 59 food-crisis countries/territories." (FSIN and Global Network Against Food Crises2024: ix). Scholars have noted time and time again the right to food and the obligation of states which entails the need to respect, protect, and fulfil the right to food (Ziegler et al., 2011) and not push the responsibility onto charities and market forces. In an equitable and just society, reliance on food assistance due to conflicts, economic shocks, systemic inequalities, and discriminatory policies would be unnecessary. Achieving such a world aligns with the vision of the UN Sustainable Development Goal 16 (Peace Justice and Strong Institutions). But in fact, crises are becoming complex and lasting longer. On average, humanitarian response plans now span 10 years, with appeals in some countries running continuously for over 20 years (UNOCHA, 2025).

Protracted crises are contexts where 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 conflict, environmental degradation, natural and human-made disasters, climate change, inequality, and poor governance, which exacerbate the fragility of agrifood systems and drive widespread displacement (CFS, 2015; GRFC, 2024). They disrupt the six dimensions of food security leading to severe manifestations such as undernutrition, stunting, wasting, and micronutrient deficiencies, and death (HLPE 2020, HLPE 2024). In 2023, 36 countries were in protracted food crises, with 19 experiencing both protracted and major food crises (GRFC, 2024). Addressing protracted crises requires policies that not only alleviate immediate symptoms but also tackle root causes by integrating humanitarian, development, and peace-building efforts to strengthen resilience. Building resilience is critical to enabling communities, households, food systems, and ecosystems to adapt and transform, creating pathways out of crisis.

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 food security and nutrition needs and building resilient livelihoods, adapted to the specific challenges of these situations (i.e. protect those affected by or at risk from protracted crises, empower women and girls, support evidence-based action, strengthen country ownership and stakeholder buy-in and accountability, and promote effective financing), and contribute to resolving underlying causes of food insecurity and undernutrition (i.e. peacebuilding through FSN, managing natural resources sustainably and reducing disaster risks, and promote effective national and local governance).

More generally, global hunger rose sharply during the COVID-19 pandemic (2019-2021) and has now remained around 9 percent (FAO et al. 2024). Conflict can contribute to - or exacerbate - hunger at the country, region, community, and household scale. Importantly, there is a key distinction between acute food insecurity, linked to shocks, and chronic food insecurity as connected to underlying structures, poverty and other stresses. Crises precipitate interconnected, overlapping and multiplicative food system impacts. Achieving equitably transformative resilience within food systems requires the elimination of both.

As one lever to help food systems to become more resilient it is important to consider the role of humanitarian aid, both its benefits and its limitations in alleviating food-related challenges as well as the role it can play in either hindering or supporting food systems resilience. Importantly, humanitarian operations are overstretched. Many have scaled down their support. As noted in the GRFC report, peace is an integral part of the longer-term food systems transformation (FSIN and Global Network Against Food Crises 2024). Crises precipitate interconnected, overlapping and multiplicative food system impacts including acute food insecurity (when individuals face severe food deprivation that threatens their lives or livelihoods) or chronic food insecurity (the persistent inability to access sufficient diets for a healthy and active life, due to underlying structures issues such as poverty and marginalization).

For example, conflict and competition over scarce natural resources mutually reinforce one another. A UN study on peacekeeping suggests that over 40 percent of intrastate conflicts over the past six decades have been linked to natural resources (UN Peacekeeping nd). Integrating humanitarian, development and peace (HDP) efforts is essential to addressing immediate needs while fostering long-term resilience. Resilience-building requires addressing not just crises or shocks, but also the root causes of vulnerability. 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.

In some cases, food aid can be harmful as it may come with strings attached from more powerful countries, and exacerbate the vulnerabilities, shocks and stresses for the aid recipients (Clapp, 2017). This type of aid can create disincentives for local farmers and further impoverish local markets (Moyo, 2009). For example, some donor countries insist on tying their food donations to their commodities. To some extent, this can be addressed by the localization agenda set out in part through the landmark Grand Bargain at the 2016 Istanbul World Humanitarian Summit which put forward a set of commitments for donors and aid providers to prioritize the localization of humanitarian efforts through increased local capacity and leadership.

However, even within food systems that are more resilient to human-induced shocks, there are circumstances such as natural disasters that are beyond human control and will require the mobilization of emergency food aid. Food sharing, mutual aid, and government efforts to stock state granaries, such as in China, to protect their citizens against disasters and famines have had a long history and is done prior to an emergency (Shiue, 2004). An equitably transformative resilient food system will ensure the design of emergency preparedness programmes and include, for example, multi-risk early warning, early action systems, risk and crises governance, and finance in addition to humanitarian aid that would allow the distribution of food equitably, efficiently, and safely to communities impacted by a shock, regardless of race, creed or gender (e.g. Tozier de la Poterie 2022).

Equitably transformative resilient food systems can be made to be proactive rather than reactive and will also ensure that humanitarian aid is meant purely to benefit those who are in need rather than having strings attached, connected to political intentions or foreign interference, done primarily for tax purposes, or as a tool for dumping unwanted foods (Murphy & Hansen-Kuhn, 2020). Sahinyazan et al., (2021) have identified mathematical models that can support decision making for aid organizations that consider the benefits of different aid modalities, whether it be voucher, cash, and or prepared foods etc., while keeping in mind the need to prevent negative externalities. To deliver food aid in a manner that directly benefits the people, investment in infrastructure such as transportation systems, warehouses, and cold chains could centre on the public good ensuring food is stored, distributed, and transported safely.

Where possible, food aid can contribute to an equitably transformative resilient food system. This can be done through a transformative incrementalism approach (Buchan et al., 2019), where short term incremental solutions are designed to continually nudge towards transformation. For example, governance of aid mechanisms should be done in a transparent and accountable manner, where root causes are addressed in parallel, where procurement of food aid contributes to the local economy and agroecological food production, and where aid is done in a way that empowers communities to be self-sufficient rather than dependent.

Brazil, Curitiba to Sao Paolo regional supply chain

The O Circuito sells agro-ecological products for the same price or less than conventional products in supermarkets. Given the extent of their market network, they are able to offer 95 fresh and minimally processed products providing stable demand for farmers while consumers can access local, diverse, affordable food. The markets are linked through a distributed network of small, medium and long routes with small hubs enabling flexible distribution using trucks and vans owned by members of the circuit. Food is distributed across 73 municipalities and includes 5400 small-scale producers through 165 markets. O Circuito achieved annual average sales of 3000 MT in 2016. 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 7500 metric tons per year – a growth of 1800% over 11 years." (2024: 1868).
Source: Van der Ploeg et al. 2024.

4.2 Food systems and equitably transformative resilience

The equitable transformation of food systems based on ETR centres on bouncing forward to food systems that embody equitably transformative resilience with the end goal of ensuring food and nutrition security, access to healthy and culturally appropriate diets, and improving health outcomes for all population groups. Leaning on the work of earlier HLPE-FSN documents, (e.g. HLPE 2020) this report outlines food systems as being defined as having four main components: food production systems, food supply chains, food environments, consumer behaviours, diets and health outcomes and their interactions with other systems (e.g. health, labour). As part of the transition towards ETR, food system components can usefully be understood both separately and in concert with one another to foster equitable access to local, regional and other supply chains that support fair livelihoods, ecological integrity and FSN . For example, food production depends on - and is vulnerable to - supply chains (e.g. processing facilities). In turn, food environments can impact food supply chains and vice versa (e.g. what is processed; where food can be accessed) and produced, what is grown) co-influence each other (Blay-Palmer et al.

2021). As discussed throughout this report other systems such as health, labour, food safety standards, urbanization and many more factors impact the food system directly.

In the next sections we elaborate multiple components of food system categories supported by examples that describe initiatives moving towards an equitably transformative food systems by exploring actions from around the world that support integrated principles of ETR as well as actions that support ETR in production systems, supply chains, food environments, and other areas (as outlined in the beginning of this chapter). Examples in this chapter look at transformation through the lens of ETR principles and explore where and how change is occurring. While only a few examples achieve the complete vision of ETR, each example contributes to our understanding about how change happens even within these limiting factors. Many examples also highlight policies that are needed to support equitably transformative resilient food systems. The chapter also explores policy and Institutions as levers for change by highlighting several examples wherein governments are working with communities to affect the principles of ETR. Ending with integrated examples of change, the chapter highlights cases where ETR has spanned across food systems areas to create outcomes to benefit livelihoods, nature, and future generations.

4.2.1 ETR and food production

Having strong, diverse, and sustainable production helps reduce vulnerability to socio-ecological shocks and stresses and enables the realization of ETR principles. Research from five African countries found that reliance on markets was associated with lower dietary quality – with higher food prices and lower quality diets observed throughout the COVID-19 period (Ismail er 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 COVID-19 pandemic. In other cases, shocks, such as hurricanes, to food systems that were oriented towards food sovereignty rather than dependency were less effected in the aftermath of the storm (Moulton and Machado 2019: UN Press 2018). While there is more than enough food produced to feed the current and projected world population (FAO 2023), some regions will need to increase production to help achieve regional food security. In sub-Saharan Africa, the population will almost double by 2050 (to 2.1 billion) increasing the demand for food. However, the population facing hunger has already been increasing (from 15% in 2010 to 20.4% currently, the largest prevalence globally) (Ogega 2024) while food production systems have had lower growth than the global averages (Dzanku 2015). Additionally, Asia is still home to more than half of all those facing hunger (384.5 million; FAO et al. 2024). Finding ways to address inadequate support for equitable production, distribution including underdeveloped infrastructure and food access is needed while ensuring local food availability, the promotion of indigenous crops and diversified diets, enhanced livelihoods, and ecological health is essential to building better food systems for local communities.

New science and innovative production transitions, such as natural farming (a form of agroecology), help re-focus food systems toward local consumption and strengthened regional food security. For example, farmers adopting natural farming practices in Andhra Pradesh have shown that place-based production has improved livelihoods, enhanced diet diversity, reduced the dependency on off-farm inputs (e.g. fertilizer and pesticides) that often are subject to volatile international markets (Bharucha et al. 2020; Durga 2023; Duddigan et al. 2023; Durga 2023). These innovations leave farmers more resilient than their chemical input dependent neighbours (Hussain et al. 2023). In total, fourteen countries across sub-Saharan Africa have visited Andhra

Pradesh to create co-learning networks to support the uptake of natural farming practices in their home countries. Innovations in natural farming can be combined with other mechanisms that build positive food system synergies include supporting food access points where farmers can sell their product (e.g. regional markets) and leveraging public procurement (e.g. school food programs) to make healthy food more accessible can enable ETR.

Community managed natural farming in Andhra Pradesh, India

Community Managed Natural Farming (CMNF) in Andhra Pradesh is an example of a state partnership in ecological transitions. The initiative includes 6 million farmers producing on more than 6 million acres (GIST Impact 2023) with more than 50 million consumers. Funded by and initiated by the Andhra Pardesh state government in 2016, Rythu Sadhikara Samstha (RySS) is working to pair increased capacity and agency of individuals and communities with structural change at the government level. While many non-governmental organizations support initiatives in this space, governments have been reluctant to depart from industrial agriculture practices. The state government of Andhra Pradesh has been a key partner with RySS (an arm's length organization to government) since its inception. This partnership with the state means that the work of RySS is seen as a credible and important contribution to food systems policy in India. The collective work of natural farming has been recognized federally, with the federal government announcing support for the uptake of the practice in states across India.

RySS, supported by decades of work with women's empowerment groups, the CMNF model improves livelihoods and yields, enhances soil quality, creates more resilient environments, and shift dietary regimes towards more nutritious foods for families engaging in the practice (Bharucha et al. 2020; Durga 2023; Duddigan et al. 2023; Durga 2023). In addition, researchers have estimated that transitioning to CMNF could reduce the emission associated with food production by an average of 46 percent per acre (Rosenstock et al. 2024). CMNF practices can alter soil, root systems, and the physiology of the plants grown under the regime towards higher levels of resilience (Kumar 2024). In recent years, cyclones have devastated farm fields across AP. Comparison between CMNF and other farmers have shown that the practices deployed by CMNF farmers have significantly increased the ability of crops to withstand shocks such as flooding and drought (insert video links here) making the CMNF farms more resilient to climate pressures.

CMNF production practices rely on a set of principles that include pre-monsoon seeding, a large selection of Indigenous seeds (30 varieties), natural inputs that are 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 is an important source of both nutrition, income, and risk management (e.g. managing pests). For example, by widening the space between two rice plots (commonly known as a bund), a farmer can grow an increased variety of plants while also reducing run-off and pest load.

The governance and expansion of CMNF relies on women engagement groups across AP and farmer-to-farmer led learning with most adaptors focusing first on a small part of their overall field and eventually transitioning the entire farm. There is also a mixture of models deployed within one farm, including the any-time-money (ATM) model of market gardens that produce year-round for household and market consumption. The ATM model is often situated on the same farm as a CMNF market-based crop field (e.g. rice, cotton), allowing for the farmer to food access and income throughout the year rather than just at harvest.

To bridge the data gap and empower farmers behind the transition, the farmer-scientist and undergraduate degree program has created pathways for those leading in their communities to earn a degree through a combination of in-class and in-field examinations such as pest identification, crop planning, mentorship, and data collection. The farmer-scientists, together, are also harnessing the collective power of CMNF farmers to show aggregated results of the transition through consistent and high-quality data on yields, livelihoods, nutrition, pests, and soil quality. (Government of India 2024).

These innovations are happening side-by-side with farmers who are yet to transition. In these cases, chemical inputs are still available, and the adoption of natural farming is voluntary. Rather than a federal ban, farmers are learning how to transition away from costly inputs toward integrated, ecological farming practices that enhance yields and livelihoods. This transition happens through groundswell networks of trust, farmer-scientists, and demonstration farms. Simply put, the outcomes of natural farming transitions are driving national uptake.

4.2.2 Production support systems

Production support systems consider human, health, economic and energy systems as well as ecosystems. Taken together they can contribute to, or undermine, human and planetary well-being. For example, agroecology is at once the *science* of food system ecology, *practice* that captures natural synergies and interactions towards improved ecosystems, and a *social movement* that builds on and interconnects short-chain, equitable and economically fair local food systems (HLPE 2019, Gliessman 2007, Wezel at al 2014, Altieri and Toledo 2014). Production systems themselves depend on soil health, water quality and availability, biodiversity (e.g. plant, animal), livelihoods, community well-being, and many other aspects of socio-ecological interdependencies.

Mechanisms that build positive food system synergies include supporting food access points where farmers can sell their product (e.g. regional markets) and leveraging public procurement (e.g. school food programmes) to make healthy food more accessible can enable ETR. In Brazil, small-scale farmers are supported through public procurement (e.g. school food programs, Text Box) that enables job creation through local supply chain activities (e.g. transportation, distribution) and increases access to healthy food for 40 million students, as well as vulnerable populations including Indigenous and Quilombola communities. Complementary research in the Brazilian Cerrado makes it clear that giving smallholder farmers access to these stable markets increases the use of agroecological growing practices resulting in more field and household scale agrobiodiversity and improved soil nutrient profiles (Blesch and Witmann 2015) capturing socio-ecological interdependencies and building ETR food systems. Kenya provides another example of food procurement policy in action, where the Kenyan government has established school food programmes that aim to source food from local farmers directly or aggregate purchasing in areas where population density is low, and road networks are not adequate. 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 FSNS especially for children. A related project in Busia County used nutritionally rich indigenous plants to promote biodiversity and provide market access to smallholder farmers (Bhalla 2023). Together these examples paint a picture of food systems that are bouncing forward toward ETR food systems.

National school feeding programme (PNAE), Brazil

Change dimensions leading to Equitably Transformative Food System Resilience (ETR):

Laws to solidify equitable access to institutional markets for family farmers, traditional communities, and women help to bring about structural changes. For example, in Brazil Law No. 11.947/2009 establishes that at least 30% of the federal resources allocated to the PNAE must be used to directly purchase products from family farming and rural family entrepreneurs or their organizations. Institutionalized multilevel governance ensures consistent funding, operational support, and inclusivity. This supports the integration of public procurement with education, agriculture, and nutrition sectors promotes sustainable food systems. MIS platforms "PNAE Monitora" ensures transparency and accountability. Further, the emphasis on family farming strengthens rural livelihoods and women's participation. It also facilitates access to the programme by women and indigenous peoples. When food is purchased from an individual rural family, at least 50% of the value must be acquired in the woman's name (Law No. 14.660/2023).

Food security and nutrition dimensions: PNAE provides daily meals to 40 million students and helps ensure year-round access to nutritious food, emphasizing local, minimally processed foods. Subsidized meal programs prioritize vulnerable populations, including Indigenous and Quilombola communities, with differentiated funding per capita, secures access while nutritional guidelines promote diverse, culturally appropriate diets, and healthy eating habits. The PNAE legislation mandates the participation of Indigenous representatives in the School Feeding Council (CAE) in states and municipalities with students from Indigenous areas or Quilombola communities. Importantly, legislative frameworks protect the program against political changes, ensuring consistent support and stability. Socially and economically, it 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% procurement from family farmers, and inflation adjustments for meal costs have been inconsistent, impacting food diversity and equity. Documentation requirements for farmers need simplification to ensure wider participation.

While production and related aspects of food systems are complex and vulnerable to shocks and stresses – a reason they are often referred to as generating 'wicked problems' – they also offer the potential for multi-pronged solutions (Termeer et al. 2015; Nelson and Stroink 2014; Knezevic and Blay-Palmer 2015). However, through frameworks such as agroecology or natural farming we can shift towards more equitably transformative resilient food systems. Transformative applications of agroecology (AE), such as the case of Andhra Pradesh, embodies and deploys place-based science, practice and social movement so that all components of agroecology are essential to the success of one another. ETR food systems, such as agroecology, centre on the integrative relationship between Indigenous and traditional knowledges (e.g. locally adapted crop varieties) and sciences (e.g. soil testing, plant biology) as well as employing scale- and time-relevant technology (e.g. the development of natural inoculants) to support existing production and farmer-to-farmer transitions. All of this relies, 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.

Rather than banning fertilizer or synthetic inputs, transition in production can leverage the power of extension staff and farmer-to-farmer learning to support the adoption of new farming practices. The increased livelihoods and health of neighbouring families and fields are encouraging others to join the transformation to move change from the farm level to the

community landscape level. This is possible through the transformative potential of the system, commitment to equity and individuals working in concert with one another. Extension staff, the capacity to support technical co-learning opportunities, mentorship programs, and a network built on trust and local knowledges make these case studies successful. While chemical fertilizer is available in both regions, farmers are teaching each other how to thrive without it. Additional actions by the state and further investments through local, agroecological public procurement (e.g. school food) and robust public research and extension support, would underpin these successes by working in complement to - rather than as a substitute for - the current transition efforts.

4.2.3 Supply chains

Supply chains begin with seeds and food production and move food through storage, processing, distribution, marketing and retail to the consumer and ultimately the waste stream. When supply chains aspire to circularity and equity, they reduce waste through, for example composting, and add to equitably transformative resilience of territorial food systems supporting more diversified, robust and localized market systems (IPES 2024). The transformation of current supply chains to ETR requires integration of those who are currently excluded from full participation in these systems. For example, removing middlemen as appropriate, enhancing access to resources for value addition through processing and preservation of nutrient rich crops, enabling access to cold chains to reduce food loss and waste, reducing distance to food and other markets for crops and livestock, will allow those currently excluded from development processes to benefit from food systems.

As demonstrated during the COVID-19 pandemic, agri-food supply chains are made vulnerable through concentration of infrastructure, knowledge, assets and inputs with few corporations controlling a majority of the market (Clapp 2019). Just-in-time delivery that depends on global trade networks reduces diversity and redundancy in supply chains and add to this precarity. Alternatively, building out regional markets to include scale-appropriate and regionally responsive infrastructure, trade regimes, and knowledge networks can support food security and nutrition as well as improve livelihoods for surrounding communities. Seed banks (e.g. inputs), inoculant centres (e.g. inputs), small- to medium-scale processing facilities, co-operatives, regional markets, and school food programs (e.g. procurement) are all examples of how ETR can be used to support transformation across supply chains. Appropriate and sufficient regional access points to healthy, affordable, ecologically produced food supported by multi-scale engagement and an existing food policymaker/actor network were key ingredients for ETR in Madagascar during COVID (e.g. regional markets, Text Box Antananarivo).

Increased resilience and food system capacity building through city-region food system networks, Antananarivo, Madagascar

In the late 2010s several initiatives were in place that allowed 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 put in place by the urban agriculture department, an existing central distribution point that eliminated middlemen, 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 work in the previous decade to protect land in Antananarivo as a strategy to mitigate flooding and landslides, as well as to address FNS (Dubbeling et al. 2019).

Despite shorter market hours as COVID-19 unfolded, the national government decision to process perishable food, in particular milk, poultry and eggs, meant that food loss was minimized and people could still get access to healthy food. A key pre-existing institutional innovation that supported this agile reaction was the existence of a multi-stakeholder engagement process that had resulted in a network of food systems actors that were brought together as COVID-19 emerged. 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 mitigate more catastrophic results. COVID-19 made it clear that the human networks, physical infrastructure, and supportive policies and programs are key to resilience. In Antananarivo, multiple stakeholders 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 Madagascar, 2022)

In Rio de Janeiro, Brazil, Urban Agriculture (RECAU) works to strengthen food security in the city in all its dimensions while paying particular attention to the circumstances of marginalized producers and consumers living in peripheral city areas. RECAU's work is consistent with ETR principles, focusing on transforming urban food systems by utilizing agroecology's integrated socio-ecological principles and promoting empowerment and solidarity among marginalized communities to create alternatives to prevailing food systems including supermarkets and low-quality food supply in peripheral city areas. Together these supply chain examples demonstrate the potential of ETR to realize rights, equity and building socio-ecological interdependencies towards human and ecosystem well-being.

The Carioca Network of Urban Agriculture (RECAU) 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). 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. RECAU, established in 2009, aims to support urban food growing and address inequities in access (to land and food) and distribution for food security. In 2022, 23.6 per cent of the population of the state of Rio de Janeiro faced severe or moderate levels of food insecurity. RECAU has promoted the right to land, inclusion in public policies, 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 a State Policy on Agroecology and Organic Production in 2019, with funding secured in 2022. RECAU has worked to connect agroecological production with the supply of healthy food to vulnerable populations, particularly during the COVID-19 pandemic. The network has supported territorial markets (including agroecology fairs), local producer participation in government procurement, and solidarity campaigns. It has also sought to address broader inequities in urban areas related to housing and basic services, recognition of *quilombola* territories, and institutionalized violence in marginalized areas, including in *favelas*. Despite many challenges, RECAU has increased visibility of these issues and empowered local actors and initiatives by forming alliances with other agroecology groups nationwide.

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 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 affordable access to food. As a result, Singaporean markets have become a staple across society and class. Communities from around the island state visit markets as a regular access point for fresh foods (wet markets) and prepared foods (hawker markets).

Fresh and accessible foods through Singaporean markets, Singapore

Part of a state-sponsored initiative, markets have been through several iterations over the past decades. Once part of a bustling informal economy, market culture in Singapore blossomed from the registration and integration of food sellers – both of fresh and prepared – into dedicated centres from the 1960s to the 1980s (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 hawker market. Recently, food markets have undergone renovations to ensure 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 an important food access point (Kumar 2019; Loh n.d.). The average meal - as of 2019 – was between 3 – 6 USD. 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). Across the decades and generations, Singapore has developed a culture of markets that supports the affordable access to fresh (wet) and prepared (hawker) foods (Chua et al. 2024). This has resulted in high levels of food security, independent vendors, and even Michelin-recognized food stalls (Yagoda 2022). To ensure the culture of hawkers continues for future generations and emerging vendors, programs like the Hawker Development Program (HDP) supports the skills development needed to ensure succession planning among vendors and attract youth back into the sector. However, despite this significant support for markets in Singapore, obesity continues to rise (although lower than regional averages) and there are challenges with malnutrition for elderly citizens (Chiam n.d.).

Diversity across the supply chain is essential. For crops and food production and supply sources, decentralization, the ability to adapt and innovate, the existence of collaborative trust-based, and sustainable livelihoods including fair prices and working conditions were found to increase food system resilience in the face of multiple shocks and stresses (Murphy et al 2023; Blay-Palmer et al. 2021). Including cultural values and knowledge along territorial supply chains also contributes to ETR (Lugo-Morin 2023). Finally, circulating value within territorial economies can also enhance ETR by increasing the viability of fair livelihoods and strengthening solidarity networks (Levidow et al. 2023).

4.2.4 Food environments

The complexity of food environments is directly linked to food and nutrition security including availability, access, utilization and consumer behaviour that is in turn linked to equity and the right to food. According to the HLPE (2020), policy that supports the right to food is more inclined to result in the realization of food security and nutrition. Food environment factors include food literacy, information availability, guidelines and advertising, among other considerations.

Building equitably transformative resilience for food environments as part of food systems is complex as it is impacted by policy from multiple scales and how the combination of these context-based policy and circumstances affects communities, households and individuals. 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.

Considering components of food systems is important. For example, value chains can promote and increase equitable access to and utilization of healthy foods. Studies show that shocks and disruptions to food system value chains for example during COVID-19 impacted those who are vulnerable e.g. informally employed people in urban areas (Ismail et al. 2023). Small scale farmers are also often disadvantaged with limited participation in the value chains, which often favour farmers with larger farms. Small scale farmers usually participate in food system value chains through the selling of crops, livestock, and other raw materials through middlemen or directly to local stores or markets. The participation of small-scale farmers and fishers in informal or formal agri-food value chains could enhance opportunities improved income, address equity challenges and make food value chains sustainable (Liverpool-Tasie et al. 2020).

Additionally, the cost of healthy diets is high for vulnerable communities including small-scale farmers and fishers, and those experiencing poverty and food insecurity in urban centres. Lack of electricity and cold chains reduces the availability of food processing and preservation services and technology is often expensive. Thus, the participation of marginalized communities, households and persons in food processing and their access to these minimally processed products is often low. For example, limited access to nutritious animal proteins and products as well as well as fresh fruits and vegetables, reduces dietary diversity and consumption of nutrient-dense foods. At the same time increasing availability of low-cost processed and ultra-processed foods also affects poor and low-income households who may be able to only afford these foods, contributing to the increasing burden of underweight as well as micronutrient deficiencies, overweight and obesity and related non-communicable diseases (the triple burden of malnutrition). Addressing inequity in access to healthy diets therefore requires addressing these challenges (Webb et al, 2021).

Achieving ETR within food environments requires actions that address drivers of poor nutrition and health outcomes. On the one hand, there is a need to address the lack of infrastructural investments and policies required to ensure the consistent availability of healthy diets (including sufficient access to fruits and vegetables and protein-rich foods, as well as mono and polyunsatured lipids). On the other hand, it is critical to limit excessive consumption of some foods (including ultra-processed foods, Monteiro 2019) while also making diverse, healthy, and nutrient-dense foods more affordable - especially for those individuals with limited resources – to ensure equitable access. Policies to regulate production and processing of unhealthy foods and stimulate or incentivize the production and distribution of healthy foods are critical. Increasing access to quality markets and decreasing food deserts is an important aspect of this effort (e.g. Ghana Laar et al. 2020). The example from Mexico is important as it indicates how consumers can eat a healthier diet as it explains how to identify and avoid unhealthy food. Clearly then, food environments elicit the need for diverse policy responses. This includes the promotion of healthy foods, the regulation of the sale of food connected to chronic diseases (e.g. ultra-processed foods and related policy, taxes and regulation Popkin et al 2021).

Plato del bien comer - Mexico

The Icon of the Food Guide 2023 of the Ministry of Health of Mexico: The Healthy and Sustainable Good Eating Plate (Plato del bien comer) shown left, includes a dietary guide advising the usual food groups recommended for a healthy diet but contains two sentences that fit very well with building an equitably transformative food system resilience : "*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 warning about the excess calories, saturated fats, trans fats, sugar, or sodium, all of which cause health problems.

The icon, and in particular "avoid products with stamps," is the result of a long struggle (2010-2024) against ultra-processed foods and beverages that promote non-communicable diseases (NCDs) such as obesity, diabetes, and hypertension (Barquera & 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.

NCDs are a serious public health problem in Mexico and other low- and middle-income countries, affecting people of all income levels (Barquera & Rivera, 2020). This problem is fueled mostly by high-calorie beverages, ultra-processed foods, and fast foods (Rivera et al., 2016) produced and marketed by multinational corporations that have been and continue to be powerful opponents of all public health policies that discourage the consumption of their products (Barquera & Rivera, 2020; Rivera et al., 2024). A recent review on "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 food 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 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, to reduce portion sizes of beverages and snacks, and to adhere to good nutritional advice recommending "eat fruits and vegetables" in its advertising campaigns. By the time this review was published (January 19, 2024), nutrition policies were in place, including a ban on advertising high-calorie foods and beverages in television programs 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 getting the mandatory warning stamps on cereal packages removed, along with the reintroduction of previously banned cartoons of pets in advertising, starting in October 2024 (Barragán, 2024). As the incidence of NCDs continues to rise in children and adults, along with the success of the food industry, the question arises as to whether the 2023 Ministry of Health icon represents only an aspirational path to an equitably transformative resilient food system.

While there are myriad examples that demonstrate the goal to increase the healthfulness of food environments, all depend on the realities of their contexts. This means that developing generalizations as the basis for policy and programmes can be challenging. For example, CSAs can help stabilize farmer income to establish more equitable livelihoods. While these can be seen as cost-prohibitive when built for high-income markets (e.g. only for individuals with large levels of disposable income), they could be part of the solution in certain countries as we move towards ETR (Text Box CSAs).

Community supported agriculture (CSA), Germany

Often included in the range of alternative food networks (AFNs) (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 upfront to support production costs. In return, they receive regular shares of fresh, seasonal farm produce. The CSA has its origins in the 1970s and is closely linked with the rise of the organic movement and dissatisfaction with industrialized food. Various CSA arrangements exist in different countries, with variations on who drives the interventions (farmers or consumers) and levels of engagement. While there are diverse types of arrangements in place with slightly distinct motivations (Blättel-Mink et al. 2017), the model generally promotes a direct relationship between farmers and members with the potential to enhance trust and transparency in transactions, foster a sense of community, and encourage environmentally conscious food choices. CSA puts in place alternatives to prevailing market arrangements A study on the CSA structure in Germany indicates that, while not a complete solution as it might not increase farmers' income and could lead to farmer subsidizing through their own unpaid labour, CSA can contribute to resilience by providing reliable income, market independence, and increased satisfaction for farmers. The study also finds that CSA has 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 experiences in Brazil and Spain concludes that, while reliant on urban consumers, CSA is a model with resilient socio-economic 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 and low-income membership remains relatively limited – "The challenge in CSA is that social support actions assisting low-income households does not necessarily resonate with supporting smallholder farmers" (Parot et al. 2024:695). Committing to the CSA may be challenging for those without a stable income. Also, social support actions to involve low-income households may be accompanied by paternalistic view of healthy diets that disregard the issue of affordability.

It is also important to recognise the significant role of the informal economy. it. For example, street food traders play important roles in local food systems but are often misunderstood and undervalued by policy makers and planners, resulting in inadequate policies and lack of support. Street traders are informal businesses selling fresh produced, 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' agency is vital for future food security and crisis management. Policy changes are needed to provide more public trading spaces, including in wealthier areas (HLPE, 2024). A shift towards a participatory approach to urban planning and food systems, informed by street traders' needs and the specific context, is essential. This approach should be flexible, incremental, and responsive, valuing the contributions of those excluded from official processes. It also important to recognize and then develop supports for innovative and emergent initiatives such as the Nashipay Maasai Initiative in Tanzania that incorporates tourism, education, pastoralism and permaculture (Text Box Nashipay Maasai Initiative).

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 on these traders' resilience and their significant contribution to food security (Wegerif 2024).

The initial Covid-19 lockdown measures severely impacted their operations, leaving many struggling to recover due to a harsh economic environment and lack of government support and harassment. Despite reduced incomes for many, street traders continued operating, providing accessible fresh produce 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 2016; HLPE-FSN 2024) - something billions of people lack access to around the world (FAO et al. 2024). Wegerif (2024) adds to these findings by emphasizing the importance food traders played in maintaining that access during crisis in an affordable way, despite grocery retailers acting to maximize profits over food security. However, there are challenges (e.g. food safety) that are associated with informal food system actors. The HLPE-FSN report on Strengthening urban and peri-urban food systems (2024) notes the need for greater policy attention to street vendors, in particular support for increased food safety training and basic infrastructure (pg. 125).

Street trading showed resilience by creating stability in the food system, becoming a refuge for those who lost formal sector jobs. 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 that is standard practice for formal retailers. They are also conveniently located near where people live, work and travel, ensuring physical accessibility.

Nashipay Maasai Initiative (Eco Boma and Permaculture education), Makuyuni, Tanzania

Nashipay Maasai Initiatives (NMI) is a not-for-profit civil society organisation located in Makuyuni, Tanzania with a vision for a resilient, self-sustaining and informed local community that is able to adapt to and thrive in Tanzania. The organization empowers Maasai pastoralists in Makuyuni and beyond through culturally sensitive education and nature conservation that respect community rights and sustainable livelihoods. Agroecological, participatory, gender sensitive food sovereignty and food literacy work are critical elements of equitably transformative food system resilience supported by NMI. NMI developed an Eco Boma (Eco Village) supporting community-led, culturally empowering economic development and eco-tourism based on uplifting Maasai culture. NMI also produces honey, includes forest gardens, grazing spaces for livestock and an expansive permaculture garden. While 10 acres of the land is legally owned by the community with grazing areas granted by the government of Tanzania, there is always a chance the grazing area used by the community can be repossessed and the community displaced under the guise of conservation. NMI also developed the Nashipay Maasai School, an internationally certified eco-school with 428 students integrating Western and Maasai curriculum including permaculture education and three daily meals with most of the food sourced directly from the school farm. About 60% of the students are girls and Maasai oral traditional and literature are part of the students' extra curricula activities. Children are taught permaculture since kindergarten and receive training to grow organic food and manage the gardens. While the communities are pastoralists and predominantly rely on livestock (e.g cows and goats), integrating permaculture helps them adapt to climate change induced extreme droughts and shocks that impact livestock production and also increases vegetable availability and consumption. (Nashipay.org)

4.2.5 Other considerations

Food systems exist within broader contexts that can support or challenge a community or individuals' ability to achieve equitably transformative resilience. As discussed in Chapter 2, there are multiple structural forces at play that contribute to non-resilient pathways. In addition to these meta-systems, there are community level considerations such as access to health care, WASH and housing. Access to health care and the presence or lack of infrastructure such as water, sanitation and hygiene have a significant impact on household and community well-being including food security and nutrition. For example, the quality and quantity of available clean water contributes to peoples' capacity to grow, process and prepare food. Without water, there is no life. Yet, there is increasingly fierce competition for water usage (HLPE 2015). In addition, there are serious concerns about labour conditions including migrant workers and living conditions for small-holder farmers. While broader systems are impacted by food systems, examples of ETR can also support better living and working conditions.

Solidarity kitchens (*Cozinhas solidárias*), Brazil

At the start of the Covid-19 pandemic, the Brazilian Homeless Workers' Movement (MTST) started solidarity kitchens as an initiative to distribute food baskets to people in homelessness and other vulnerability circumstances in the city of São Paulo. Initially, MTST aimed to distribute food baskets but soon realised that many lacked cooking facilities or money for gas, leading some to sell the food for money. Consequently, MTST shifted towards distributing lunch boxes with hot food.

MTST is a sister organisation of the Landless Workers' Movement (MST). Similarly to MST's land occupations strategy as part of the struggle for land justice, MTST occupies empty public buildings to draw attention to the lack of decent housing as a violation of a basic human right. MTST set up solidarity kitchens in occupied buildings across the city, using cash donations to buy ingredients, as well as packing (styrofoam boxes and spoons) and cleaning materials. MTST also paid allowances to those who worked in the Kitchens and delivered the lunchboxes. This work was also supported by volunteers, including students with knowledge about food hygiene and nutrition. The inclusion of fruits and vegetables to offer nutritious meals has been a consideration from the beginning.

By 2022, MTST's solidarity kitchens had grown to 33 locations in São Paulo. This included the downtown area of São Paulo with high concentrations of homeless (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 costs of food and fuel. The lack of regular funding constituted a major challenge, but solidarity kitchens demonstrated how to build resilience from the bottom up. While addressing pressing food insecurity, they crucially advocated for healthy diets and food sovereignty for marginalized individuals, while drawing attention to the interrelated human rights to food and decent housing.

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

4.2.6 Policy and institutions

Outside of the food systems thematic areas, there is also the omnipresent influence of policy and institutions. From financing to regulating to governance processes, governments have an important role to play in moving towards ETR in food systems. For example, governments can help mitigate the intensity of food insecurity events through building systems that reduce the country's vulnerability to shocks and support producers in shifting toward agroecology. This can happen through public procurement, re-profiling of funding, allocation of staffing resources, and the identification of new funding. Policy can also change at the structural level to ensure that food security and nutrition is encouraged through legislative reform, beyond crisis or shocks. This can be seen in countries such as Japan and Bangladesh. For example, the National Food and Nutrition Security Policy (NFNSP), approved by the Government of Bangladesh in 2020, aims to ensure its food and nutrition security-related SDGs and fulfils relevant national and international commitments by 2030. It does this by supporting a range of low cost/no cost sustainable agricultural practices as well as community nutrition programmes transforming the food system, so it is more equitably resilient with improved adaptive capacity.

Focus on food utilization and marginalized populations in Bangladesh

Support for sustainable agricultural practices: Conservation agriculture through no-till farming, improving soil organic matter through applying balanced fertilizer, crop rotation, and cover cropping to improve soil health and water retention. Implement agroecological practices that enhance biodiversity and ecosystem services, such as using organic fertilizers, biopesticides, and natural pest control methods. To ensure crop production and ecosystem services, particularly during the dry period and in drought-prone areas, water availability must be secured. This can be achieved through improved management and a joint monitoring system of water availability in canals and river systems. This could be coordinated by the Department of Agricultural Extension and the Bangladesh Water Development Board. **Integrated pest management** (IPM) biological control methods, cultural practices, and targeted pesticide use to manage pests effectively while minimizing environmental impacts. IPM practices reduced pesticide use by 50-70% in rice cultivation, with cost savings for farmers and improved ecosystem health. **Traditional growing systems and crop diversification: floating gardening systems:** floating gardening flood-prone regions enhances food security, nutrition, and generates income for vulnerable people in addition to offering a way to grow vegetables during floods. **Gher (dyke) farming in the coastal area**: traditional shrimp farming (*gher* farming) has grown increasingly complex, allowing for the production of shrimp, fish, and prawns. Climbing vine type vegetables are grown on trellises over the pond.

Community-based nutrition programmes: Bangladesh has put in place community-based nutrition programs to combat malnutrition. These programs include encouraging the best nursing habits, strengthening complementary feeding for newborns and young children, and improving nutrition teaching and counselling. These initiatives, carried out by community health professionals, have helped to lower malnutrition rates, especially for young children under the age of five. **Solar-powered irrigation**: addresses the water shortage and lowers greenhouse gas emissions caused by diesel-powered pumps. Effective use of solar-powered irrigation systems led to lower fuel costs, greater access to water for irrigation, and higher crop yields. The head of the state declared converting diesel operated to solar irrigation as a priority.

ETR in food systems also require robust social protections. Evidence demonstrates that social protection promotes equitable food access.

Social protection programmes

A review by Bhalla et al (2024) finds that social protection programmes need to explicitly incorporate specific elements that address climate change to build adaptive capacity. However, there exist examples like India's National Rural Employment Guarantee Scheme and Ethiopia's Productive Safety Net Programme that support natural resource management and ecosystem restoration, despite challenges such as ensuring the sustainability of public works and mitigating unintended effects. Environmental cash transfers, where payments are linked to adopting sustainable practices or compensating for restricted ecosystem access, also demonstrate potential. For example, closed fishing season programs in the Philippines and Bangladesh have helped replenish fish stocks while providing financial relief to fisherfolk during restricted periods. However, challenges such as financial sustainability and community involvement remain, highlighting the need for participatory approaches and long-term funding mechanisms (Bhalla et al., 2024).

The entry points for social protection to help build transformative capacity, i.e. effecting structural change that reduces social inequalities lies in several critical elements. These include utilizing a right-based approach in extending coverage, participatory and accountability mechanisms, and incorporating gender sensitivity and gender transformative approaches which advance women's empowerment (Kundo et al., 2024). Transformative change requires a systems approach, aligning social protection programs with complementary initiatives in nutrition, climate action, livelihood programs, and employment policies. Such integration strengthens linkages across sectors, addressing root causes of vulnerability, reducing social inequalities and enhancing resilience over the long term.

Social protection programs that are grounded in universality and backed by legislation ensure non-discriminatory access. For example, India's Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) guarantees 100 days of wage employment annually to all rural households, regardless of funding availability, and includes provisions for preventing discrimination on the basis of gender and caste (Tenzing, 2020). Moreover, participatory and accountability mechanisms such as social audits empower marginalized groups to claim rights, hold service providers accountable, and influence decisions. In MGNREGA, decentralized planning has in certain cases enabled selection of projects that address local priorities and the involvement of marginalized groups in decision-making. Social protection programs can advance gender equality by challenging unequal gender norms and ensuring equal access to labor markets and productive resources. For example, life skills training in Rwanda engaged men in childcare and household tasks, fostering more equitable gender relations (Doyle et al., 2018 as cited in Kundo et al., 2024). Ulrichs et al. (2019) stress the importance of not losing sight of the basics – the first step toward transformative social protection is improving its delivery to ensure it is timely, reliable, consistent, and adequate. For social protection to effectively support resilience capacities, social protection systems at national and sub-national levels need to be strengthened and coverage needs to increase. At present, only 9.7% of the population in low-income countries is covered by at least one social protection benefit (ILO, 2024).

Another transformative aspect of social protection is its central role in enabling a Just Transition by ensuring fairness and equity in the shift to a green economy. Reforming fossil fuel subsidies is crucial for reducing emissions and advancing climate change mitigation goals. The fiscal space created by reversing these subsidies can be redirected towards expanding social protection coverage to cushion the adverse impacts of price hikes or job losses in carbon-intensive sectors. By facilitating retraining,

protecting incomes, and addressing social justice issues, social protection can enhance the political feasibility of climate actions. The Just Transition Work Programme explicitly highlights social protection's dual role in mitigating transition impacts and ensuring decent employment opportunities in the green economy.

There are also innovative ways that governments are working to address FSN and social protection that focus on social security programs in a new way by implementing public-citizen run financing programmes that include solidarity, universality and democracy (TEXT BOX SSA).

Social security for food and nutrition (Securité sociale de l'alimentation)

The idea of a social security for food and nutrition[10] (*Securité Sociale de l'Alimentation*, SSA) is inspired by national social security programs, and has already been implemented in France[11] and Belgium[12] with the aim to combine public policies and private contributions that strengthen food security and nutrition and realize a comprehensive understanding of the right to food. Different models have been conceived and proposed, also to best adapt to local context. Generally speaking, the SSA is based on three pillars that resonate with the principles behind equitably transformative food systems resilience: solidarity, universality and democracy.

1. Solidarity: the SSA is based on a system of funds replenished by contributions from affiliates and enterprises, in proportion to their income, supplemented by public authorities.

2. Universality: redistribution of the fund benefits all members.[13] The average monthly contributions to the fund are paid onto a meal voucher-type card. The ultimate goal is to provide a voucher that can cover at least 50% of the average person's food budget.

3. Democracy: this allowance only allows the purchase of food products that meet criteria defined by the members themselves, such as sustainability, fair price, short supply chain and exclusion of ultra-processed products. Thanks to the presence of a coordinator in each specific area, policies and value chains can be built and strengthen that meet these criteria.

Numerous pilot projects are being rolled out, involving thousands of people and enabling the proposal to be tested and its strengths and impacts measured before being scaled up. For example, the Caisse commune de Montpellier has been in existence for 2 years. It brings together almost 400 households, each contributing according to their income. Households contribute an average of 55 euros per month, but the *Caisse* redistributes 100e per household per month. Public subsidy makes up the remaining 45 euros. Affiliates manage an annual budget of around 400,000 euros, combining a democratic decision-making process with powerful financial leverage. They are organized into two categories: a 50-strong citizen's committee is made up of around 50% low-income and 50% middle-income or affluent members. It was formed over a period of 6 months through workshops and is highly cohesive despite the diversity of its members. It is responsible for 1) setting the rules, amounts and conditions governing

[10] https://www.bbc.com/future/article/20230321-cost-of-living-europes-trials-in-social-security

[11] https://securite-sociale-alimentation.org/

[12] http://collectif-ssa.be

[13] According to some proposals, the contribution should be the same to all members. For others, it should be a contribution that reflects the diversity of income and financial capacity of the recipient.

membership fees, and 2) selecting the sales outlets. With regards to procurement, a total of 50 providers have been selected that spread across the whole of France and that are subject to in-depth investigation of their social and environmental performances. Other similar projects exist in France. Belgium set up its first mutual caisse in 2024,[14] (*Caisse locale d'alimentation solidaire de Schaerbeek*) and its civil society is at the forefront of the reflection on costs, structures and feasibility. [15]

As a long-term policy innovation that links producers, public administrations and eaters, the rolling out of SSA schemes could make a significant contribution to resilient, healthy and fair food chains, while contributing to a better management of public money thanks to the savings in public health, environmental degradation, control of subsidies and tax revenues. Via the SSA, access to quality food for all would not simply be a matter of individual capacity or meeting individual needs, but of ensuring a sustainable future for society as a whole.

Another significant area of discussion by governments and communities is the mechanisms to fund equitably transformative resilience. While other policy levers such as regulation and establishing norms are important, funding is a key point of discussion. In particular, the need to shift the emphasis of funding approaches from the favoured private-public partnership model (PPP) towards public-place based partnership models. While both models are necessary, public-place based partnerships allow for policy to focus on research innovation that delivers a social good without necessarily generating profits or privately-owned intellectual property.

Finally, policies and institutions rely on good governance to ensure a movement towards ETR. In particular, governance should be reflective of – and centre on – the rights of those most affected by the current globalized food system. While the United Nations has taken differing approaches across its network, the Committee on World Food Security (CFS) has stood as a beacon for inclusive governance.

The Committee on World Food Security (CFS)

Very closely related to the history of FAO and to the understanding of food security and the right to food, the CFS was established in 1974 after the food price inflation crisis (1973) as a technical intergovernmental FAO committee for policy convergence on FSN. In the 1980s and 1990s, however, the ability of the CFS to have an impact on food governance was weakened by the parallel implementation of neoliberal policies, the agrarian crisis and the emergence of the civil society movement on food sovereignty. The CFS was finally reformed in 2009 after the 2007/8 food price crisis with the vision of being "the foremost inclusive international and intergovernmental platform for all stakeholders to work together to ensure food security and nutrition for all." (CFS Reform document, 2009). With the 2009 reform, the CFS becomes an intergovernmental body (independent from FAO) and an inclusive and evidence-based platform for negotiation on FSN.

[14] (http://class.collectif-ssa.be)

[15] Chomé, F. et Vanloqueren, F. (2024) Vers une Sécurité sociale de l'alimentation en Belgique : Modélisation prospective économique et organisationnelle. Rapport à FIAN Belgique. Septembre 2024. 59p. https://www.collectif-ssa.be/wp-content/uploads/2024/11/20241115-ModelisationSSA-par-FactorX.pdf

The defining features of the CFS, which make it a unique example of inclusive governance, are the institutionalized participation of civil society and marginalized communities (represented by the Civil society and Indigenous Peoples mechanism – CSIPM); the private sector (with the participation of the umbrella organization Private Sector Mechanism – PSM); research organizations and philanthropic associations, which ensures that politically and sensitive issues can be put forward in the policy debate. In addition, the participation of different countries on an equal basis and the one-country one-vote system contribute to making the CFS a platform where diverse voices and experiences are heard. Another innovation introduced by the reform was the creation of the High Level Panel of Experts on Food Security and Nutrition (HLPE-FSN), to guarantee that the policy dialogue and recommendations in the CFS would be based on sound analysis of scientific evidence and research – without excluding diverse forms of knowledges that may be underrepresented in published literature.

In the 15 years since the reform, the CFS has created a substantial body of policy products including voluntary guidelines and recommendations, helping to shape national policies globally on diverse areas essential for food security and nutrition, such as the right to food, tenure and governance of land and other resources, responsible agricultural investments, gender and women's empowerment, among others. Very importantly, the CFS, through the HLPE-FSN contributions, has contributed to innovations in conceptual frameworks (e.g. the six dimensions of food security) or to consolidate and systematize knowledge and approaches and facilitating their uptake in global policy (e.g food systems, agroecology).

Ref. CFS Reform documents (FAO Basic texts, 2009); CFS and HLPE-FSN websites; Clapp J et al (2022).

4.2.7 Integrating ETR principles across areas of the food system

Inclusive, collaborative, and responsive governance underpins almost all ETR examples. The Haida Gwaii Local Food to School programme demonstrates how an Indigenous community has come together to support food literacy, responsible governance, and food sovereignty to build food systems with ETR to shocks and stresses (Text Box). The Landless Workers' Movement (*Movimento Sem Terras*, MST, Text Box XX) in Porto Alegre Brazil is another excellent example of how public policy, land reforms and social movement collaborations can lead to better food security, ecological food production and the promotion of social equity. Both examples underscore the need for a policy or governance framing that supports ETR.

Haida Gwaii local food to schools

Haida Gwaii, home to the Haida Nation, is a remote community and an archipelago located in the province of British Columbia Canada with a population of 4500 people. Haida Gwaii's Local Food to School program (established in 2010) provides an example of equitably transformative food systems resilience, incorporating food literacy, Indigenous food sovereignty, responsible governance, circularity, and healthy culturally appropriate foods for children. Using learning circles as a form of responsible governance, the community and Elders would discuss ideas and pathways to address food security (Farm to Cafeteria, nd). The schools integrate local game, seafood, and plants that are culturally significant for school meals, to avoid dependence on outside food shipments. Schools that are involved in the program teach children a range of food literacy skills including how to catch and process fish and seafood, how to harvest and process deer, how grow food in school gardens, and learn about Indigenous plant medicines. The food harvested is included in the school meals and food

scraps/organic waste are processed in the bokashi composting systems. The compost is then used in the school garden. The "Pantry" run by the Local Food to School initiative is a food hub where food processing equipments are 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 under the leadership of the Haida Gwaii Local Food to Schools came together to coordinate an emergency food plan. Moving beyond school meals, The Pantry distributed food to the community and especially Elders during the pandemic. This pivot was particularly important as the archipelago relies on ferry service for food distribution and has only a few grocery stores which had their shipments disrupted during the pandemic.

Source: https://www.farmtocafeteriacanada.ca/wp-content/uploads/Ch10-Haida_Gwaii_Case_Study.pdf

Expanding agro-ecological rice production: Landless Workers' Movement (*Movimento Sem Terras*, MST), Porto Alegre, Brazil

The Landless Workers' Movement (*Movimento Sem Terras*, MST) in Brazil demonstrates that land reforms, collaborations with academic partners and adequate public policies can foster the uptake of organic practices, deepen food security and promote social equity. Since more than a decade, tens of MST cooperatives manage the production of agroecological rice on the land of the agrarian reform settlements near Porto Alegre. In 2023, the Rio Grandense Rice Institute (Irga) declared that the MST's production was the largest of the whole of Latin America.[16]

These initiatives involve over a thousand families who collaborate on production, processing, and commercialization. Certified organic, this rice is cultivated using sustainable practices that respect biodiversity and reduce reliance on harmful chemicals. Beyond agriculture, MST integrates food sovereignty and social justice by donating rice to urban community kitchens and international aid efforts. The success of MST's projects underscores the need for integrated land, environmental, social and procurement practices that strengthen the potential for agroecology to challenge dominant agricultural paradigms while increasing the local availability of food, reducing the dependency on import and chemical inputs, and decreasing environmental degradation.

4.4. Metrics of resilience (placeholder)

Metrics – indicators of change

Will include various perspectives including:

Household nutrition measures and impactful interventions recommendations (Lee, Abbay, Barrett, Hoddinott forthcoming)

Food Systems Countdown Initiative: Governance and resilience as entry points for transforming food systems in the countdown to 2030

[16] https://www.fao.org/world-food-day/food-heroes/archive/bela-gil/en

Review of Food System resilience assessment. Ujjwal, K.C., Campbell-Ross, H., Godde, C., Friedman, R., Lim-Camacho, L. and Crimp, S., 2024. A systematic review of the evolution of food system resilience assessment. *Global Food Security*, *40*, p.100744.

4.5 Next steps

These ongoing and shared limitations and challenges are the basis for broader recommendations in Chapter 5. Success can be considered in adaptable and context-specific ways, including the need for the collection and assessment of long-term, systemic data which are often absent in short-term reporting processes. Roadmaps to ETR will improve livelihoods, social and ecological well-being, and build on local capacity and agency for multiple actors across time and space. ETR responses to food systems change are gender-responsive and work to build the sovereignty of food producers, peasants, and fisherfolk, consumers, workers across local and regional food systems.

Chapter 5 | Recommendations

This chapter will be completed after the e-Consultation in order to ensure the recommendations are informed by submissions made.

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