

# The current food crisis: Building resilience at the nexus of food insecurity, climate change and conflict

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The last three years have been marked by global turbulence and the simultaneous occurrence of catastrophic events such as the COVID-19 pandemic, extreme weather, disrupted trade and food supply chains, and an increase in the number of violent conflicts in different regions of the world. While the consequences are being felt across the globe, they are particularly considerable in the Global South<sup>1</sup>. More countries and populations are now experiencing acute food insecurity or famine<sup>2</sup>, progress toward the UN Zero Hunger goal has been derailed, and the world is facing the largest food crisis in modern history<sup>3,4,5</sup>.

This brief aims to provide an understanding of the current food crisis and provide insights for solutions. It explores the following key questions:

- What are the main impacts of the crisis and who is most affected?
- Why are we experiencing a food crisis now?
- What are its major drivers?
- Why is today's crisis different from previous food crises?
- What solutions have been suggested and can these contribute to increased resilience and the prevention of future crises?

## Box 1. Concepts and definitions

**Food insecurity:** A person is considered food insecure when they do not have regular access to enough safe and healthy food to sustain normal growth and development or an active and healthy life. This can be defined on a scale ranging from mild to severe, where mild entails an uncertainty in a person's ability to acquire food, and severe when a person does not have food for the day or for several days<sup>1-7</sup>.

**Food crisis:** A food crisis occurs when rates of acute food insecurity and malnutrition rise sharply at local or national levels, raising the need for emergency food assistance. It is usually caused by a shock or combination of shocks that impact one or more of the pillars of food security: food availability, food access, food utilization or food stability<sup>2</sup>.

**Emergency:** Food emergency happens when: a) individuals or households experience large gaps in food consumption, reflected by very high acute malnutrition and excess mortality; or b) individuals or households are able to mitigate those gaps but only through emergency livelihood strategies and asset liquidation<sup>2</sup>.

**Famine:** Famine is an extreme deprivation of food, even when individuals or households have employed all coping strategies. Starvation, extremely critical acute malnutrition, and high levels of mortality are often present<sup>2</sup>.

**Driver:** Any natural or human-induced factor that directly or indirectly causes a change in a society, an ecosystem, a biophysical process, or other aspect of a system, such as the food system<sup>9</sup>.

**Resilience:** The capacity to live and develop with change and uncertainty. It includes the capacity to cope, adapt, and transform in the face of disturbance<sup>10</sup>.

## Impacts of the current food crisis at a glance

- Currently, 2,4 billion people suffer from food insecurity (ranging from mild to severe), which is an increase of 391 million people compared to before the COVID-19 pandemic<sup>1</sup>.
- In 2022, 258 million people were estimated to experience food crisis conditions or worse (emergency or famine) across 58 countries. This is the highest number recorded since measures began in 2017 and marks the fourth consecutive year with continued increases<sup>2</sup>.
- More than 40% of people living in food crisis conditions or worse are located in five countries: the Democratic Republic of the Congo, Afghanistan, Ethiopia, Nigeria, and Yemen<sup>2</sup>.
- Fourteen out of the 25 countries most vulnerable to climate change are also experiencing violent conflicts<sup>7</sup>.

A growing body of evidence describes the widespread and severe impacts of the current food crisis across several regions and societal groups (see Box 3 and 4 for examples). Although almost all citizens of the world are experiencing the impacts of the crisis through a substantial increase in the cost of food, the magnitude of these impacts varies across different groups, with people living in already vulnerable geographies and socioeconomic conditions being the most affected.

Western Asia, the Caribbean, and all subregions of Africa are seeing the biggest increases in food insecurity and food crisis conditions, with the highest prevalence in Africa<sup>1</sup>. Women, children, and people living in rural settings are the ones more strongly affected<sup>1,2</sup>. Women are more likely to be the first to start eating less, in order to buffer the impacts on other family members<sup>8</sup>. Children, breastfeeding, and

pregnant women are more nutritionally vulnerable and thereby at increased risk of becoming food insecure<sup>1</sup>. These impacts will span generations given that pregnant women suffering from hunger or food insecurity are at higher risk of pre-term delivery, stillbirths, and birthing children with critically low birth-weights and slower growth<sup>2,8</sup>. Apart from these direct impacts on food insecurity and nutrition, evidence also shows that since the beginning of the food crisis, there has been an increase in physical and sexual violence against girls and women, and children (foremost girls) are being taken out of schools<sup>8</sup>. All of this has lasting consequences for women's and children's development, learning, and future prospects.

### Box 2. Approach: Scoping literature review & qualitative analysis

We conducted a scoping literature review to understand the current food crisis, how it is described, and to identify drivers, solutions, impacted groups, and regions. We investigated how the crisis was described both in the academic literature and media articles (newspaper articles) published in English after January 1, 2020. We aimed for an even geographic distribution of selected newspapers across five continents in order to understand how the crisis was felt across regions. We used Web of Science to search scientific literature, while we used Newsbank, Factiva, and ProQuest for newspaper articles. In total, we reviewed 19 scientific articles and 90 newspaper articles. The review was further complemented with reports from organizations and databases offering statistics and raw data connected to the food crisis. The information from the literature was extracted, compiled, and analyzed, forming the basis of this brief. A separate qualitative mapping and analysis of the suggested solutions in the material was conducted, based on scientific articles only. Solutions were extracted, coded, and thematically grouped. Furthermore, solutions were assessed in relation to their potential contribution to increased food systems resilience by using the seven principles of resilience<sup>6</sup> to assess resilience's multiple dimensions.



## Why are we experiencing a food crisis? Drivers behind the crisis

Our scoping review shows that the current global food crisis is driven by multiple social, economic, and environmental drivers. While this can make it difficult to disentangle the root causes of the crisis, four main drivers were highlighted in the food crisis literature (Figure 1). They are as follows:

1. The COVID-19 pandemic<sup>5,11,12,13,14</sup>
2. Climate change and the increasing frequency and intensity of extreme weather events, natural hazards, and weather variabilities<sup>15,16,17,18,19</sup>
3. Violent conflict or war<sup>15,17,20,21,22,23</sup>
4. Economic shocks with the increasing cost of foods<sup>3,5,12,21</sup>

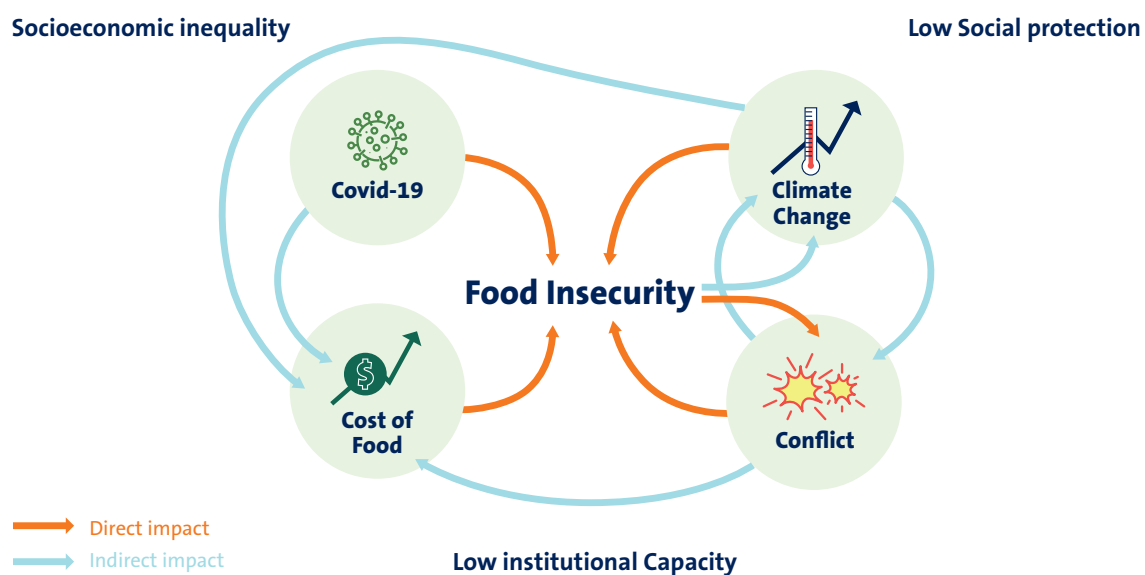
Described in the press as the four “C”s of the food crisis; COVID-19, Climate, Conflict, and Cost – these drivers are interlinked and interact in ways that can reinforce each other, thereby contributing to ever-worsening conditions<sup>15,22</sup>.

During the COVID-19 pandemic, lockdowns disrupted supply chains, restricted access to food and the mobility of farmworkers, and led to trade restrictions in food-producing and exporting countries. These impacts have not affected all people equally. Trade restrictions have mainly affected import-dependent countries where food insecurity is higher<sup>24</sup>. While lockdowns had a negative impact on the broader economy of several nations, the impacts have been disproportionately felt in urban areas of

the Global South where people are dependent on informal work and daily casual income in order to afford a meal. For example, 80% of the active African population is informally self-employed<sup>24,25</sup>. As social protection in most of these countries is low or non-existent, people started to die of hunger instead of COVID-19 during lockdowns.

The impacts of climate change are being increasingly felt around the world in the form of cold and heat waves, droughts and floods, wildfires, and storms<sup>26</sup>. Exposure of crops to unfavourable weather can lead to losses in production, mainly through harvested area loss and yield reduction<sup>27</sup>. In 2022, 23 million people were severely impacted by extreme weather events, an increase of 53% compared with 2021. Several of these events occurred simultaneously across different regions, in places already vulnerable, and with direct impacts on food security. Examples included heat waves in the pre-monsoon period in India, which led to substantial declines in crop yields<sup>28</sup>; prolonged droughts in the horn of Africa leading millions of people into severe food insecurity<sup>29</sup>; and floods in Pakistan that led to extensive destruction of cropland, displacement of people, and restricted access to food<sup>30</sup>.

Violent conflict has also emerged as a key driver of the current food crisis. Between 2010 and 2020, the number of state-based armed conflicts nearly doubled, as did the number of refugees and forcibly displaced people<sup>31</sup>. Conflicts impact food security by, for example, displacing people and reducing



**Figure 1.** The figure is an illustration of the four factors that were identified in the scoping review analysis as main drivers of the food crisis: COVID-19, climate change, violent conflict, and high cost of food. The four drivers contribute to increased food insecurity and interact with each other in different combinations (e.g. the nexus between food insecurity, conflict and climate change, illustrated in the right part of the figure). Impacts of these four drivers on food insecurity are amplified in contexts of high social inequality, low social protection and low institutional capacity.

access to fields, which can disrupt food production, both cultivation and harvest, and food access. Conflicts can also disrupt food trade, both domestic and international, through the blocking of roads and harbours. Protectionist trade measures and export bans of food items can have international repercussions, for example on import-dependent regions<sup>32</sup>.

The rising cost of food can be seen both as a driver of the food crisis and a consequence of other drivers, such as the ones aforementioned. For example, disruptions in food production and trade (including transport of fertilizers) during COVID-19 led to food supply shortages and, consequently, rising food prices in several countries<sup>33</sup>. In 2022, the trend of rising food prices was exacerbated by prolonged droughts in India<sup>34</sup> and eastern Africa<sup>35,36</sup>, and the war in Ukraine<sup>20,37</sup> (see Box 5). There is also evidence that the financialization of food markets and the widespread speculation on commodity markets are primary causes of rising food prices<sup>11-38</sup>. High food prices negatively affect the food purchasing power of individuals and households, leading to dietary shifts from more nutritious foods to cheaper, highly processed foods. In more vulnerable geographies and society groups, these shifts had a profound impact on nutrition, through declines in both the quantity and quality of food consumed.

Apart from these four main drivers of the crisis, other contributors identified by our scoping review include a) policies relating to food production, trade, and agriculture. Examples include policies that lead to an overdependence on imported foods<sup>39</sup> or the lack of policies that support agricultural infrastructure development<sup>40,41</sup> b) increasing land competition between biofuels and food, which reduces both available food resources for human consumption, and agricultural land available for food production<sup>21</sup> c) sudden events and surprises, such as the desert locust pest or plant disease outbreaks that have negatively affected food production and yields in eastern Africa<sup>42,43</sup>, and d) the increasing consolidation and hyper connectivity of the global food system<sup>44,45</sup>, which allows for shocks to spread more rapidly<sup>46</sup>.

Our scoping review also showed that each of the four “C”s exists to varying degrees in different regions. Nevertheless, the interconnections between these drivers are consistently observed regardless of location<sup>23</sup>, which can be understood in light of the existing nexus between food insecurity, climate change, and conflict.

For example, violence and climate change impact already vulnerable populations, creating vicious circles that exacerbate food insecurity<sup>17</sup>. As described above, conflicts often trigger displacement, disrupt trade, and can lead to destruction of agricultural land and production infrastructure. They can also

### **Box 3. Food crisis in Kenya**

In Kenya, approximately 4,35 million people were estimated to be in a food crisis or worse<sup>3,47</sup> in 2022 and the amount is estimated to have increased to 5,43 million during the first half of 2023<sup>47</sup>. Those most affected are already vulnerable groups, foremost women, children, and the elderly. During the COVID-19 pandemic, the number of food insecure in Kenya increased by an estimated 38%<sup>48</sup>. Farmers were one of the groups heavily affected by the loss of income influencing their food intake. In Kenya, the interlinked drivers are evident where the prolonged and record-breaking drought has had the most significant impact, reducing crop yields and livestock production<sup>3,47</sup>. The drought is coupled with local resource conflicts, linked to water scarcity and economic downturns driven by the war in Ukraine, the lingering effects of the Covid-pandemic, and lowered local food production<sup>3,47</sup>.

### **Box 4. Food Insecurity in Watauga County, North Carolina, United States of America**

The current food crisis tracing back to the onset of the COVID-19 pandemic, had consequences across the globe. In 2021, 33,8 million people in the US were estimated to be food insecure<sup>49</sup>. Already in 2020, the county of Watauga in North Carolina had an estimated 14,3% of the population suffering from food insecurity<sup>50</sup>. Bagwell et al. (2022) looked at the effects of the pandemic in the county and how community-based organizations worked towards providing food to the population. The study's authors argued that the neo-liberal economic system, a lack of resilience towards shocks, and a frayed social safety net were the chief reasons for the pandemic hitting hard and why it led to increasing food insecurity<sup>11</sup>. In Watauga County, the collaborative efforts by different community-based organizations were vital in addressing the immediate food crisis. The study illustrated how systems of community-based organizations remained functioning during the pandemic when the global food system did not<sup>11</sup>.

### **Box 5 The war in Ukraine as an illustration of the interactions between food insecurity, climate change, and conflict**

The war in Ukraine has put substantial extra pressure on countries that were already experiencing food insecurity or crisis conditions, due to existing conflicts, COVID-19, or climate change<sup>49,54</sup>. Ukraine and Russia are some of the world's larger exporters of staple foods such as wheat, vegetable oil seeds, and agricultural inputs such as fertilizers<sup>20,24</sup>. Given the restricted exports accompanying the war, several countries already experiencing food crisis conditions and dependent on imports from Russia or Ukraine such as Yemen, Egypt, and Sudan were faced with even more challenging conditions<sup>24,50</sup>. On the top of this, extreme weather events during 2022 such as heat waves in Southeast Asia led to additional food trade disruptions from India, where the government imposed export bans on wheat to ensure domestic food security. The war also set off a spike in food prices, caused by disruptions in production and trade of wheat and sunflower oil seeds, which led to food shortages in importing countries. Furthermore, as Russia is the world's second-largest producer of natural gas, the conflict led to high energy prices with a consequent increase in the costs of food transport and synthetic fertilizers.<sup>20,49,55</sup> Even the World Food Program (WFP), which works towards the eradication of hunger, depends on Russia and Ukraine for their food aid supplies and has been severely restricted in their capacity to assist the most vulnerable<sup>56</sup>.

place the control of food resources in the hands of hostile groups, and create instances where hunger is used as a weapon of war<sup>47</sup>. In turn, food insecurity increases social tensions within a community and can lead to social unrest and political instability. Individuals in food insecure communities are also more prone to be recruited into larger-scale armed conflicts<sup>51</sup>.

While climate change may not be the direct cause of food insecurity or violent conflict, it is a risk multiplier and contributes to the erosion of resilience and local capacities to respond to social and environmental challenges. For example, droughts,

heat waves or other extreme weather events can lead to failed food production with significant impacts to food security. This happens particularly when these stresses exacerbate existing socioeconomic inequalities, and mechanisms for social protection are insufficient or inexistent<sup>47</sup>. Impacts of climate change in local food systems can also trigger tensions between longer-term management and the immediate use of natural resources, which potentially can develop into new conflicts<sup>52</sup>. Additionally, when an existing conflict is affected by climate change it tends to aggravate violence and increase the human costs of war, including food insecurity<sup>53</sup>.

## Food crises are not new. Is the current crisis different?

Food crises have occurred through history and have sometimes played a key role in triggering social unrest and revolts with long-lasting socio-political impacts. Examples include the French Revolution and the Russian Revolution, where food crises brought to light social injustices and inequalities, exacerbating the already existing social discontent and instigating winds of political change<sup>57,58</sup>. Each of these crises had their own particular causes and needs to be put into context. However, a common pattern for crises reaching a global scale, including the current food crisis, has been the simultaneous occurrence of socioeconomic and environmental shocks and stresses. The combined impact of several drivers places substantially higher pressure on the resilience of the global food system, as mobilizing resources and capacities to respond to one driver might limit the number of available options to respond to other co-occurring drivers.

Despite these commonalities, two main differences between the current situation and past food crises are the speed and scale through which the impacts of the crisis have quickly propagated across regions and sectors, reaching global proportions. At the origin of this is the configuration or 'anatomy' of the global food system, which can be described as hyperconnected, simplified and highly consolidated and concentrated (Box 6). These intrinsic properties shape food systems' capacity to deal with the challenges posed by the aforementioned drivers (e.g. COVID-19, climate change, conflict, and cost). In other words, it is this anatomy of the global food system that determines the system's resilience. Here we defined resilience as the capacity to cope, adapt and transform in the face of environmental, and socioeconomic change and uncertainty, while ensuring and further developing its vital functions. In the case of food systems, those functions include producing, delivering, and making available a sufficient amount of sustainable, nutritious, and healthy foods equally to all humans.

### Box. 6 Key properties of the global food system

**Hyperconnected:** International food trade has expanded massively in the last decades accounting for more than 25% of all the food produced in the planet. Production of globally traded food accounts for 24% of all farmland, 23% of freshwater resources used in food production, and more than 35% of seafood production<sup>45</sup>. In the last 20 years, the number of international trade agreements has tripled, and almost all countries have substantially increased their import dependency in one or several food groups<sup>45,59</sup>. This high connectivity and increased interdependence among countries for their food supply leads to a quicker propagation of food shocks across the entire food system.

**Simplified:** International trade has also become one of the main drivers of the increased specialization of agricultural landscapes towards the production of a handful of export crops to the global market<sup>45,59</sup>. With specialization often comes a loss of local diversity of crops and varieties, farming practices and cultures, leading to the simplification of local food landscapes. Simplified landscapes are poor in diversity, typically rely on artificial inputs (intensified), and have low resilience to environmental and socioeconomic disturbances<sup>45,52</sup>.

**Consolidated and concentrated:** In combination with the trends described above, the last decades have seen a progressive consolidation and concentration of land, actors, and power across the global food system. This concentration is happening at three levels: field, country, and global agricultural markets. At the field level, agricultural land has been aggregated in less but bigger farms, owned by fewer and fewer actors. Additionally, most farms are dependent on the same artificial and industrialized inputs. At the country level, the specialization of production focused on export commodities has led to a high concentration of national actors with regards the distribution of staple crop production and trade. For instance, only five countries account for more than 70% of the world's production of wheat, rice, maize, and soy crops<sup>44</sup>. At the global market level, a relatively small number of transnational companies dominate markets for crop seeds, farm inputs (such as fertilizers and agrochemicals), international trade, food processing, and retailing<sup>60</sup>. Currently, four top companies control around 60% of the global seed market and 70% of the global pesticides market, in what is a highly concentrated system<sup>61</sup>. These trends span across both international and domestic markets.

Resilience is complex and multi-dimensional but can be fostered through seven main principles (Box 7)<sup>6</sup>. Below, we provide short illustrations of how the anatomy of the current global food system negatively affects resilience. Without changes to the anatomy of global food systems, food crises of global proportions are more likely to happen than they have ever been before.

Managing connectivity, or avoiding being too isolated or too overconnected, is key for the resilience of any system. The global food system is no exception. Before global trade was widespread, a food shock could have direct impacts on local food security, as there were no other sources of food that could buffer for the local supply shortages. In this way, global trade has enhanced food systems resilience since deficiencies in food supply caused by local shocks can now be buffered from food imports from elsewhere. However, on the other hand, global food trade has substantially increased the interdependence between places and sectors leading to the quick spreading of food shocks across the globe, creating unexpected cascading impacts<sup>62,63</sup>. For example, droughts on land can affect seafood production, as most of the aquaculture production relies on crop-based feed<sup>62</sup>. Countries have also increased their import dependencies on each other (Box 6), such that making the impacts of one exporting nation's crisis are felt across several countries, as illustrated by the impact of the Russian-Ukraine conflict described above. This level of hyperconnectivity and high interdependence across the global food system is unprecedented, and was a determinant factor for the quick spreading of impacts of the food crisis across the globe.

Diversity is another key principle of resilience. Most agricultural landscapes today are highly simplified (Box 6), and diversity has been lost as a result of specialization and intensification<sup>45</sup>. With the loss of diversity also comes the loss of ecosystem redundancy (when several species contribute to the same ecosystem function), which ensures the maintenance of functions over time

in the agroecosystem. As a result, these simplified landscapes are more prone to the loss of crucial ecosystem functions that underpin food production, leading to considerable losses in the quantity and quality of food produced whenever disturbances hit. The increasing consolidation and concentration of the global food system (Box 5) also leads to a loss of diversity and redundancy of actors, practices, and traditional and context specific knowledge on how to produce, process, and prepare food<sup>63</sup>. This reduction in diversity also has negative consequences for resilience. For example, diversity of farmers ensures a diversity of agricultural practices, different sources of knowledge on how to handle local and regional disturbances built on past experiences, and consequently a diversity of potential strategies and options to handle shocks and surprises<sup>63</sup>. Similarly, a diversity of actors in the fertiliser market allows for alternative supply options in times of crisis and trade disruptions.

The consolidation and concentration across the global food system is compromising the resilience principles of diversity, broad participation across all scales, and polycentric governance. For example, a few dominant actors (nations or transnational corporations) can dominate all segments of production, control the whole supply chain, and have a disproportionate influence on decision-making, at the expense of broader and more inclusive decision-making processes. Therefore, there is a risk that dominant actors can privilege their own interests instead of maintaining a wider spectrum of responses to crisis<sup>44,61,63</sup>. These negative impacts on resilience were evident in the current crisis, where the overdependency on only a few staple crops and artificial fertilisers produced and exported by a handful of countries and transnational companies, quickly led to food supply shortages and high food prices in several parts of the world with profound impacts on global food security. Other risks of the increased concentration and consolidation of actors and power are for example “lock-ins” in the advance of knowledge and innovations, as dominant actors will privilege innovation that serves their own

### Box 7. Resilience Principles

There are seven principles of resilience to consider for socio-ecological systems<sup>6</sup>:



**1.**  
**Maintain  
Diversity &  
Redundancy**



**2.**  
**Manage  
Connectivity**



**3.**  
**Manage Slow  
Variables &  
Feedbacks**



**4.**  
**Adaptive  
System  
thinking**



**5.**  
**Encourage  
Learning**



**6.**  
**Broaden  
Participation**



**7.**  
**Polycentric  
Governance**

The principles are dependent on each other and some are preconditions of others, e.g. diversity is necessary for well-managed connectivity.

Resilience is intrinsically complex and multi-dimensional and therefore building resilience across the global food system requires the fostering several of these principles simultaneously<sup>6,63</sup>.

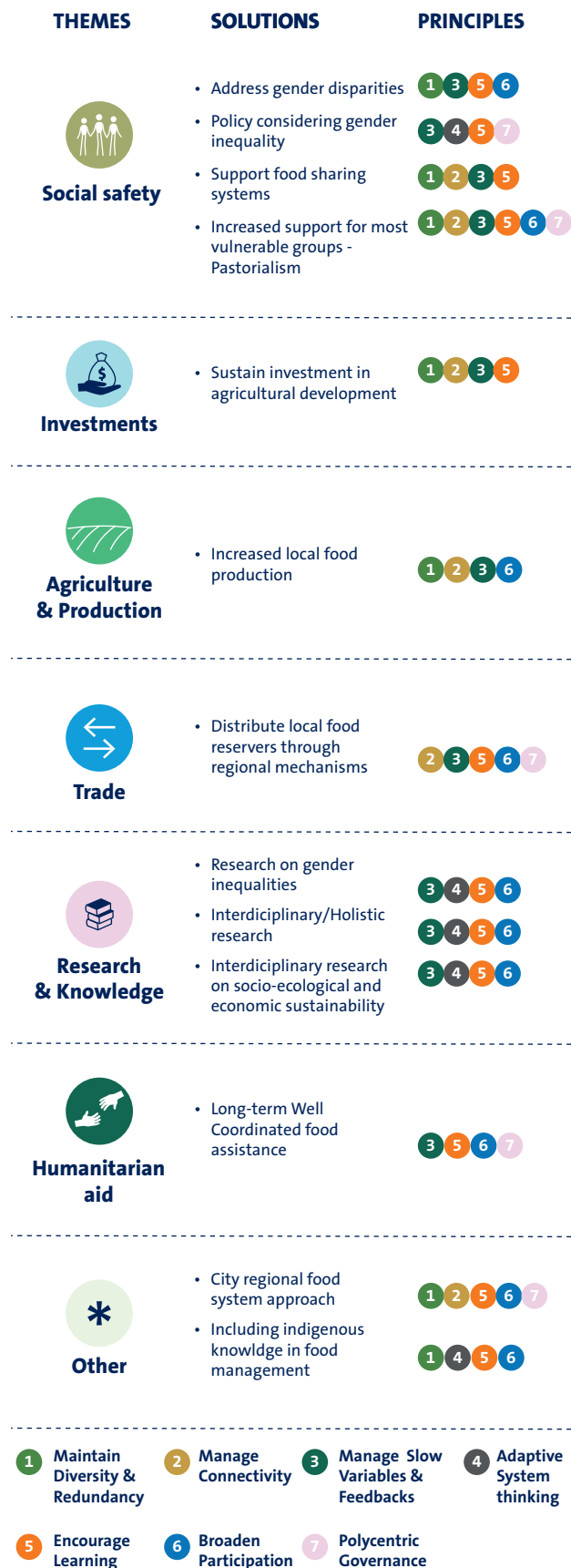
interests. This can prevent the capacity for broader learning and experimentation that is at the source of innovation and transformative resilience<sup>61</sup>.

In summary, we are now facing a new risk landscape, where local and regional food shocks and crises spread and amplify at a pace never seen before<sup>45</sup>. The current anatomy of the global food system undermines its resilience capacity to respond to these shocks and crisis. As a result, the current global food system is vulnerable, not well-suited to address the difficult challenges and stresses posed by drivers such as climate change, violent conflict or increased risk of pandemics. Furthermore, the burden of the impacts caused by these increasing shocks and surprises is unequally shared across different geographies and society groups. As discussed in the following section, a broad and diverse set of solutions that actively foster resilience will be required.

## What are proposed solutions to address the food crisis? And can they contribute to increased resilience?

We identified 59 solutions that have been proposed in the literature as approaches to address the ongoing global food crisis. These were classified into nine themes (see figures 2 and 3). The solutions varied substantially in their specific goals and nature, e.g. some focused on coping strategies and mitigation of impacts while others proposed more transformative actions. The identified solutions ranged from general calls for building food systems resilience<sup>11,13,27</sup> to addressing gender inequalities<sup>14</sup>, and from closing yield gaps<sup>19,25</sup> to addressing climate change<sup>18,19,20,39</sup>. Our scoping review found that solutions are more often suggested to be implemented in the Global South, while still recognising the need for concerted action across regions and scales.

A key finding is that few of the proposed solutions contributed to more than four resilience principles (figures 2 and 3). This suggests a predominance of siloed approaches. Looking at the 13 solutions that could foster four or more principles of resilience (figure 3), we see that a number of those have a focus on gender equality and equity, indicating that gender-oriented approaches can potentially be a leverage point for fostering resilience across the food system. From the solutions supporting four or more principles, only one was targeted at food production landscapes and agriculture. Rather, 40% of the solutions contributing to a single resilience principle, and 26% of solutions focusing on two or three principles focused on agriculture. This indicates a predominance of rather narrow approaches to resilience in agricultural landscapes and points to



**Figure 2.** Solutions identified by the scientific literature review that contribute to four or more principles of resilience classified into their respective identified thematic areas (the nine identified themes were: agriculture & production; consumption; economic policy; humanitarian aid; investment; research and knowledge; social safety & inequality; technology; and trade).

the need for more holistic and innovative solutions. That is, solutions that ensure food landscapes' capacity to provide sustainable and healthy food in the face of turbulence and uncertain conditions<sup>52</sup>.

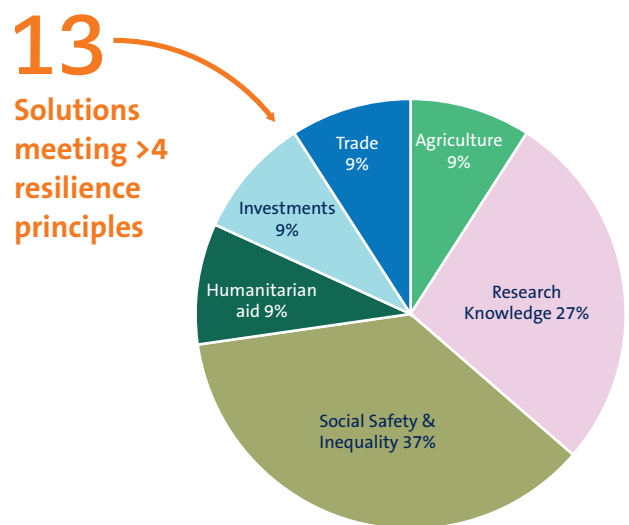
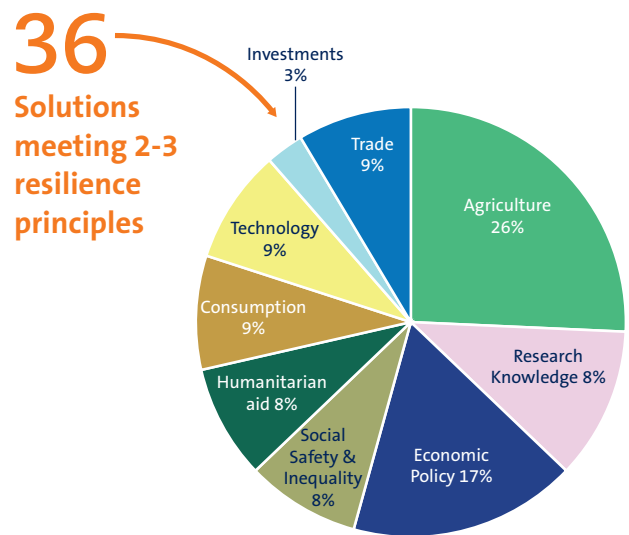
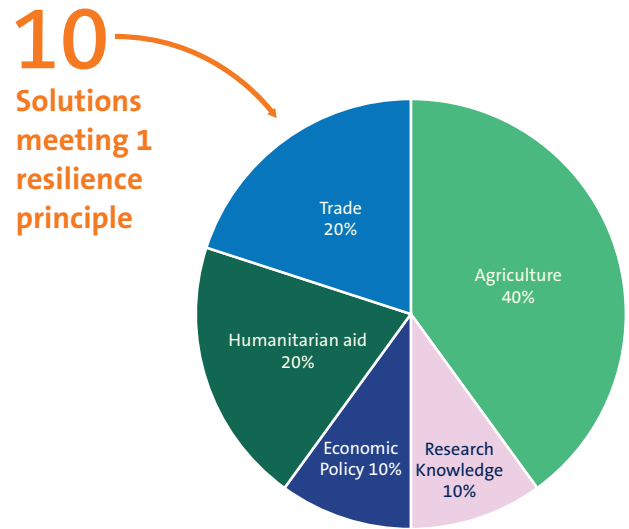
A rather similar pattern was identified for solutions targeting trade and humanitarian aid (figure 3), i.e. there were few multi-principles solutions identified. Agriculture, trade, and humanitarian aid are therefore three areas where the need for solutions with more multidimensional approaches to resilience are needed.

Looking at the seven resilience principles, those principles most often targeted by the solutions included maintaining diversity and redundancy, and encouraging learning and experimentation. On the other hand, the principles of complex systems understanding and polycentric governance were not as frequently targeted. This can potentially indicate areas of action that are being overlooked in current recommendations for policy and action.

Finally, while it is no surprise that single solutions cannot deliver on all dimensions of resilience, the results of our analysis point to the need for multiple and complementary solutions in a given context to ensure that all seven principles of resilience are being built. Additionally, recognizing the complex interactions between the four drivers identified by this work (conflict, climate change, COVID-19, and high food prices) is a pre-condition for designing solution spaces that address the various aspects of this multifaceted crisis.



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**Figure 3.** Number of solutions identified in the scientific literature review addressing one, two-to-four or more than four resilience principles. The figure also illustrates how the main themes targeted by the different solutions are distributed across the different number of principles.



## Considerations to policy and action

We present five critical aspects to be integrated into the design and implementation of policies and investments aiming to build up the resilience of the global food system.

1. Food needs to be considered as a fundamental human right, meaning that solutions and approaches for addressing the impacts and root causes of the food crisis need to build on principles of equity and inclusivity.
2. The global food system is a large, integrated social-ecological system. Thus, no true change towards increased resilience can be achieved by addressing single parts of the system. For example building food system resilience implies going beyond agricultural practices to also address consumption patterns and questions of food-related health and access.
3. The anatomy of current global food systems – i.e., hyperconnected, simplified, and concentrated – is contributing to food system vulnerability. Thus, no investments in resilience will be effective if they don't target the change of this configuration. For this it is necessary to:
  - Actively invest in the diversity of food landscapes, food cultures, and actors.
  - Foster a moderate level of connectivity, ensuring that local and regional food systems are neither isolated or overconnected. For that, we need among other things to support a diversification of markets at different scales, as an alternative to the overreliance on the global trade market.
  - Promote broad participation in decision making and the design and implementation of solutions. Polycentric forms of governance and increased collaboration between different actors across scales and regions need to be encouraged in order to ensure coordinated efforts and the design of solutions that are inclusive and pluralistic.
4. Drivers of the current crisis, including climate change, violent conflict, COVID-19, and increased food prices, are complex and interlinked. Only with this awareness in mind will be possible to abandon siloed-perceptions and become aware of potential synergies and feedbacks among solutions.
5. Transformative change addressing the root causes of a crisis always implies risks, such as unintended consequences. However, risk should not be a hindrance for change, but rather an incentive for fostering adaptive knowledge and the monitoring of solutions outcomes over time.



Photo credit: Practical Action

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## Authors' role and contribution

Cibele Queiroz is a Researcher in food systems resilience at the Stockholm Resilience Centre and the Head of Knowledge of the Global Resilience Partnership. She led the framing and conceptualization of the brief, and project-leading of the research beyond the review and solutions analysis. She wrote most of the final version of the brief.

Amanda Jonsson is a Research Assistant at the Stockholm Resilience Centre. She carried out the scoping literature review and the analysis of solutions that serve as basis for the brief. She contributed substantially to the writing of earlier versions of the brief and parts of the final version.

Amanda Wood is a Researcher in food systems transformations at the Stockholm Resilience Centre. She was engaged in the framing and conceptualization of the brief, and contributed to the writing of several parts of the brief.

Albert Norström is an Associate Professor at the Stockholm Resilience Centre and the Science Director of The Earth Commission, hosted by Future Earth. He was engaged in the framing and conceptualization of the brief, and contributed to the writing of parts of the brief.

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