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Abstract

This paper contributes to the Food and Agriculture Organization of the United Nations (FAO)'s Programme Priority Area: Better Life 4 on resilient agrifood systems under the FAO Strategic Framework 2022–31. It aims to develop an operational definition of resilience that can support measurement, policy design, implementation and evaluation across FAO's agrifood systems interventions. The paper combines a review of resilience literature with a participatory stocktaking exercise involving FAO divisions, technical units and decentralized offices through document analysis, an online stakeholders' survey, and selected stakeholders' interviews.

The analysis highlights that resilience remains conceptually diverse and operationally fragmented, both in the literature and within FAO. Resilience is generally understood as the capacity of individuals, communities and systems to anticipate, prevent, absorb, adapt to, and recover from shocks and stressors while maintaining food security and livelihoods. However, important differences exist across organizational units, reflecting FAO's decentralized structure and leading to fragmented operational approaches. Stakeholders emphasized the need for an operational definition that accounts for multiple scales of analysis, interacting risks, time horizons, and enabling institutional conditions, while integrating social, economic and environmental dimensions. Although there is broad convergence around key outcomes – including food security, nutrition, income stability and livelihood protection – tensions remain between viewing resilience as a capacity or as an outcome. Current resilience-building efforts mainly focus on *ex ante* interventions such as early warning systems, anticipatory action, climate-smart agriculture and risk management, while measurement practices continue to face challenges related to data availability, methodological capacity and lack of standardization. Overall, the findings highlight the need for a more coherent and operationally aligned resilience framework across FAO.

To address these challenges, the paper proposes an outcome-oriented framework for operationalizing resilience. Resilience is operationally defined in relation to welfare outcomes rather than capacities themselves and the paper introduces context-specific operational definitions linked to different phases of shocks and recovery. To support implementation, the framework identifies complementary indicators of outcomes and capacities across multiple scales – micro, meso, macro and programme level – capturing both welfare dynamics and the mechanisms through which resilience is built. Grounded in principles of flexibility, comprehensiveness, harmonization and knowledge production, the proposed approach seeks to strengthen coherence across FAO interventions and improve resilience measurement, learning, and policy effectiveness in increasingly risk-prone agrifood systems.

Keywords: resilience, operationalization, agrifood system, multiple risks.

JEL codes: Q18; Q54; Q01; D81; O13.

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1. Introduction

The *Reviewed Strategic Framework 2022–31* (FAO, 2025) of the Food and Agriculture Organization of the United Nations (FAO) is guided by three global goals: (i) the eradication of hunger, food insecurity and malnutrition; (ii) the elimination of poverty and socioeconomic progress for all; and (iii) the sustainable management and utilization of natural resources. The strategic framework is articulated around the organizing principle of the Four Betters – Better Production, Better Nutrition, Better Environment and Better Life – which together contribute to achieving the FAO's vision[1] and the 2030 Agenda for Sustainable Development. The Four Betters are further translated into a results framework comprising 20 programme priority areas (PPA), which are interdisciplinary, issue-based technical themes anchored in the Sustainable Development Goal (SDG) agenda.

The PPA Better Life 4 – Resilient Agrifood Systems (BL4) focuses on achieving "resilience of agrifood systems and livelihoods of the most vulnerable to socioeconomic and environmental shocks and stresses strengthened through improved multi-risk management capacities at the micro, meso and macroeconomic levels". To support efforts aimed at enhancing the actionability of the BL4, the BL4 leaders – the FAO's Agrifood Economics and Policy Division (ESA) and the Office of Emergencies and Resilience (OER) – in collaboration with the relevant technical units and FAO's decentralized offices, recently undertook a thorough review of PPA activities.

The key thematic components of BL4 are:

1. Measuring and understanding multiple risks and resilience within and across sectors and levels, spanning from the household and community to the value chain and broader systemic levels, by improving and mainstreaming methods and data to inform decision-making.
2. Assessing, designing and promoting risk and vulnerability reduction measures that contribute to enhancing resilience within and across sectors, through agrifood systems.
3. Enhancing the development and operationalization of multi-risk governance frameworks, policies, strategies, plans, budgets and coordination mechanisms.

In this framework, an internal assessment of stakeholders' views[2] on the concept and operationalization of the resilience definition has been carried out. The objective of the assessment is to lay out the foundation for an "operational" definition of resilient agrifood systems in the context of multiple risks, where the term "operational" refers to a definition providing guidance to translate concepts into concrete and practical actions by BL4.

The internal assessment aims to understand stakeholders' perceptions of the key elements and challenges involved in operationalizing and participatorily developing an operational definition of resilient agrifood systems in the face of multiple risks. This is achieved through a participatory stocktaking exercise involving FAO divisions, technical units and decentralized offices, whose representatives have participated in an online survey and face-to-face interviews. This exercise is coupled with a critical assessment of the existing academic literature as well as FAO's strategic, normative and programmatic documents. In particular, the assessment examines issues related to

[1] FAO's vision is "A world free from hunger and malnutrition where food and agriculture contribute to improving the living standards of all, especially the poorest, in an economically, socially and environmentally sustainable manner" (FAO, 2025, p.13).

[2] In this context, stakeholders are FAO's officers scattered across different offices – e.g. from the headquarters, to Regional and Country offices – spanning various levels of responsibilities – e.g. from divisions' Directors to BL4 group members and programme/project managers in decentralized offices – thus getting a comprehensive overview of views and understandings about resilience as applied to agrifood systems within the Organization.

scale of analysis and relevant outcomes; relationship with risks, stressors, shocks,[3] and vulnerabilities; measurement and assessment methods; and resilience-enhancing activities implemented. The assessment aims both to identify key challenges and to highlight gaps and overlaps in how different FAO divisions and offices operationalize resilience.

The paper begins with an overview of the literature dealing with resilience as applied to agrifood systems. Section 2 sets the scene for the critical assessment of the theoretical underpinnings of an operational definition of resilience as applied to agrifood systems in the face of multiple risks. Section 3 briefly introduces the methodology adopted in the assessment. Section 4 critically assesses FAO's strategic, normative and programmatic documents and provides an overview of the results of the online survey, which are complemented by findings from in-depth interviews and discussed in light of the reviewed FAO documents and relevant scientific literature. Building on this, Section 5 develops an approach to identify an FAO operational definition of resilience as applied to agrifood systems, proposing some examples and discussing the potential and limits of this approach. Section 6 concludes, summarizing the main findings of the assessment.

[3] It is worth noting from the very beginning that risks, stressors and shocks are all considered as possible "triggers" that can deviate the normal trajectory of a given unit of analysis – be it a household, the community or the whole agrifood system, affecting the unit's outcomes. Specifically, stressors are slow motion, long-term processes that gradually erode resilience and increase vulnerability; while shocks are realized disturbances, usually immediately perceived as affecting resilience; risks are not yet realized shocks and stressors that can determine *ex ante* behavioural changes that can potentially affect resilience. See Section 4.5 for more details.

2. Literature review

This section briefly reviews well-established works as well as recent advances,[4] with the objective of delineating the evolution of resilience thinking in terms of both conceptualization and empirical analysis.[5] The results of this review will be matched with the evidence emerging from the organization-level assessment (Section 4) and will inform the development of an FAO operational definition of resilience (Section 5).

2.1 Resilience concepts and policy implications

Significant ambiguity persists in the economic literature regarding what resilience is, where it is located, and how it should be measured.[6] Disagreements concern its ontological status (capacity, state, or outcome), its locus (households, communities, systems), its temporal focus (short-term recovery versus long-term transformation), and its normative grounding. These distinctions are not merely semantic: they shape measurement strategies, data requirements and policy priorities. The literature identifies five dominant conceptualizations: (i) resilience as capacity; (ii) resilience as return to equilibrium; (iii) resilience as transformability; (iv) resilience as a normative condition; and (v) resilience as minimized cumulative losses. All share a dynamic perspective linking a trigger – i.e. risks, stressors or shocks – to welfare trajectories under uncertainty, but they differ in analytical focus, normative clarity and operational implications.

2.1.1 Conceptualization

The first conceptualization appeared in the literature of resilience to food insecurity is resilience as capacity (see Annex 2, Resilience concepts), which defines resilience as the latent, *ex ante* ability of households or communities to absorb, cope with, and recover from shocks without lasting welfare loss (Alinovi *et al*., 2008; FAO, 2016; d'Errico *et al.*, 2018; Smith and Frankenberger, 2018). It offers clear programming entry points by identifying capacity deficits, but with the risk of conflating inputs with outcomes.

Resilience as return to equilibrium, rooted in ecological and engineering traditions, conceptualizes resilience as the speed with which a system returns to its pre-shock state following disturbance (Pimm, 1984; Knippenberg *et al.*, 2019). Both these approaches lack a normative anchoring, as improved capacity does not guarantee reaching sufficient welfare standards, and the pre-shock state is not always desirable if it was characterized by chronic poverty or structural inequality (Barrett and Constas, 2014; Barrett *et al.*, 2021; Upton *et al.*, 2022).

Resilience as transformability shifts attention from recovery to structural change. Here, resilience lies in the capacity to transition to a new configuration when existing arrangements become untenable, emphasizing thresholds, regime shifts, governance, and agency (Walker *et al.*, 2004; Folke *et al.*, 2010; Reyers *et al.*, 2018). This perspective is particularly relevant for understanding poverty traps and unsustainable development trajectories, but it is difficult to operationalize (Barrett *et al.*, 2021).

[4] Annex 1 lists all papers included in the literature review, classifying them according to their nature, i.e. conceptual and discussion papers, modelling approaches, empirical studies, and reviews and comparative analyses.

[5] A more detailed critical assessment of the literature is reported in Annex 2.

[6] See Annex 2.A for details of the conceptualizations provided by the scientific literature. The most important definitions adopted by international organizations are reported in Annex 2.D.

Resilience as a normative condition, grounded in welfare economics, defines resilience as the probability of remaining above a socially unacceptable welfare threshold over time in the face of shocks (Barrett and Constas, 2014; Cissé and Barrett, 2018). It is forward-looking and probabilistic, capturing stochastic well-being dynamics rather than realized outcomes alone. Its key advantage is normative clarity and alignment with poverty reduction goals. However, it may blur the distinction between resilience and poverty dynamics and is sensitive to threshold and outcome selection (Upton *et al.*, 2022).

Resilience as minimized cumulative losses, a recent contribution, conceptualizes resilience as the extent to which cumulative welfare losses from shocks are minimized relative to a counterfactual no-shock trajectory (Alloush and Carter, 2024). By explicitly modelling immediate impacts and longer-term scarring effects, it provides a rigorous welfare foundation and links resilience directly to impact evaluation. Yet its demanding data and identification requirements limit routine operational application.

The different resilience concepts imply different measurement strategies (see Annex 2, Measurement and data requirements), mainly varying in data requirements, causal interpretability and scalability. Capacity-based approaches (e.g. measures such as the Resilience Index Measurement and Analysis [RIMA]) are easiest to implement but less causally informative (Barrett *et al.*, 2021), while outcome-focused approaches (e.g. recovery paths, welfare thresholds, or minimized losses) provide stronger welfare and causal insight but require richer data and more complex empirical designs (Knippenberg *et al.*, 2019; Cissé and Barrett, 2018; Alloush and Carter, 2024).

The plurality of conceptualizations also contributes to persistent ambiguity in applied work. Although resilience has become a central concept in development and food security discourse (FAO *et al.*, 2018), it is frequently conflated with related but distinct notions such as vulnerability, sustainability, or stability.[7] Such conceptual overlap risks obscuring analytical boundaries and weakening the operational clarity of resilience-based frameworks.

2.1.2 Policy implications

Each different conceptualization of resilience implies distinct policy objectives and instruments (see Table A3). Capacity-based frameworks prioritize strengthening *ex ante* coping abilities through asset transfers, livelihood diversification, social protection and improved service access (FAO, 2016; Smith and Frankenberger, 2018). These interventions are actionable and scalable but risk weak accountability for realized welfare outcomes (Barrett *et al.*, 2021). Equilibrium-based approaches emphasize rapid recovery after shocks, aligning with humanitarian response and short-term safety nets (Knippenberg *et al.*, 2019). However, they may restore undesirable pre-shock conditions without addressing structural constraints (Barrett and Constas, 2014).

Transformability-oriented frameworks support institutional reform, governance innovation and systemic transitions (Walker *et al.*, 2004). They are suited to addressing systemic risks but are politically demanding and difficult to evaluate in the short run.

Normative condition approaches prioritize reducing the probability of falling below minimum welfare standards through targeted social protection, insurance and risk-reduction policies (Barrett and Constas, 2014). Their strength lies in a clear welfare benchmark, though results depend on threshold selection (Upton *et al.*, 2022). Cumulative-loss approaches aim to minimize total welfare losses over time through insurance schemes, shock-contingent transfers, scalable safety nets and risk-financing

[7] See Annex 2.B for a more detailed discussion.

mechanisms (Alloush and Carter, 2024). By linking interventions directly to welfare impacts, they support cost–benefit analysis but require robust evaluation systems.

2.2 Resilience use

The use of the concept of resilience is justified on both theoretical and practical grounds, as it captures dynamic features of risk, response and welfare that are only partially addressed by related concepts such as vulnerability, sustainability or stability. Vulnerability focuses primarily on the *ex ante* probability of being negatively affected by a shock, reflecting exposure, sensitivity and limited coping capacity (Alwang *et al.*, 2001; Ligon and Schechter, 2003). Sustainability emphasizes the long-term availability of resources and the continued functioning of systems for present and future generations without undermining environmental, economic, or social foundations (WCED, 1987; Perrings, 2006). Stability refers to the capacity of a system to resist shocks or return rapidly to a predefined equilibrium and is commonly associated with low volatility and predictable trajectories in both economic and ecological analysis (Holling, 1973).

Resilience, by contrast, centres on post-shock trajectories and the capacity to anticipate, absorb, adapt and recover without incurring persistent welfare losses (Barrett and Constas, 2014; FAO, 2016). As such, resilience is different from the above-mentioned concepts. For example, a given subject – be it a household, a community or the whole agrifood system – may be highly vulnerable and yet recover quickly through coping strategies or thanks to effective institutions (Montalbano and Romano, 2022). Similarly, systems may be resilient yet unsustainable if they stabilize low-productivity or resource-degrading equilibria. Finally, stability is neither necessary nor sufficient for resilience: systems may be stable yet persistently poor, or volatile yet resilient if well-being remains above critical thresholds (Barrett and Constas, 2014). The very concept of resilience – capturing dynamic features of risk, response and welfare – is particularly relevant in contexts characterized by recurrent climate shocks, market volatility and protracted crises.

From a practical standpoint, the added value of resilience lies in its integrative nature (Béné *et al.*, 2016). The concept of resilience can be mobilized across the entire policy cycle, providing a unifying analytical lens that links risk, welfare dynamics and intervention design under uncertainty. *Ex ante*, resilience shifts policy attention from static welfare levels to forward-looking trajectories of well-being under risk. This perspective enables the identification not only of who is currently poor or food insecure, but of who is most likely to experience persistent or future deprivation due to exposure to shocks, limited capacities and nonlinear dynamics such as thresholds and poverty traps (Barrett and Constas, 2014; Carter and Barrett, 2006; Dercon, 2005). In this sense, resilience-informed analysis strengthens targeting by prioritizing populations whose welfare trajectories are fragile even when contemporaneous indicators appear acceptable, thereby complementing conventional poverty- or food security-based targeting approaches.

During implementation, resilience provides a structured framework for identifying and monitoring the key determinants of resilience, including assets, access to services, social protection, livelihood diversification, social capital, and institutional and governance arrangements (Constas *et al.*, 2014b; Béné *et al.*, 2015). By explicitly distinguishing staged capacities such as anticipation, prevention, absorption, adaptation and transformation, resilience analysis supports differentiated intervention strategies tailored to heterogeneous risk profiles and shock intensities (Folke, 2006; Béné *et al.*, 2012). This capacity-based perspective facilitates adaptive management by tracking intermediate processes – such as recovery speed, outcome variability and coping responses – rather than focusing exclusively on outcomes (Knippenberg *et al.*, 2019; Upton *et al.*, 2016). In doing so, resilience also functions as a coordination device that helps align humanitarian assistance with

longer-term development programming, consistent with the humanitarian–development–peace nexus (FAO, 2021b).

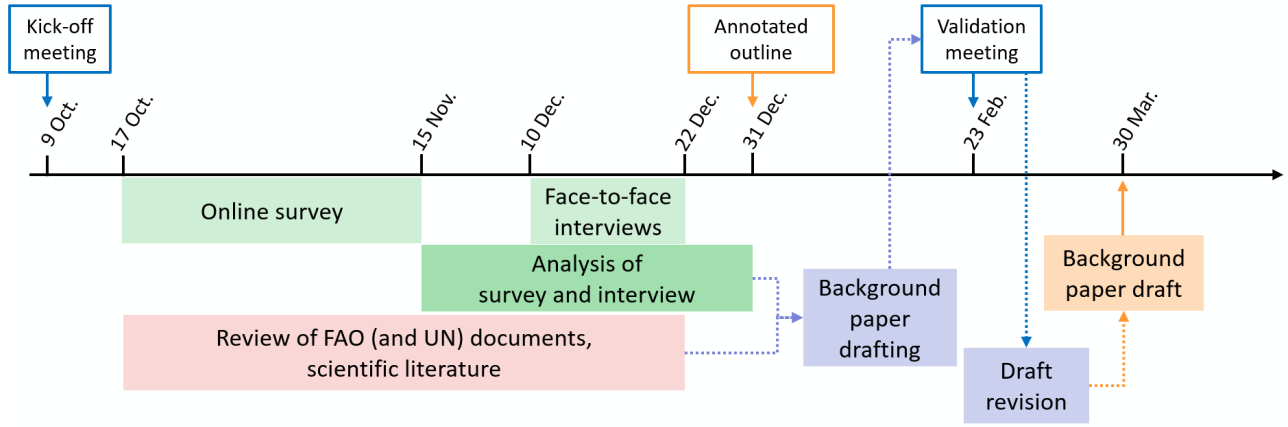
Ex post, resilience plays a central role in evaluation, learning and policy refinement by explicitly linking observed welfare dynamics to their underlying drivers. Identifying resilience determinants requires moving beyond descriptive correlations towards causal inference, assessing whether specific interventions causally alter welfare trajectories and reduce the probability of long-lasting deprivation (Phadera *et al.*, 2019; Barrett *et al.*, 2021). Approaches to resilience measurement – such as the conditional moments framework proposed by Cissé and Barrett (2018) and the counterfactual-based approach advanced by Alloush and Carter (2024) – are particularly well suited to this task, as they allow resilience itself to be treated as an outcome variable in impact evaluation. This enables rigorous testing of "resilience-building" claims, supports systematic learning about what works, for whom, and under which conditions, and improves future targeting by explicitly balancing errors of exclusion and inclusion in shock-prone environments.

These features explain why resilience has become a central organizing concept for addressing food insecurity and nutrition. It does not replace vulnerability or sustainability, but complements them by offering a dynamic, integrative and action-oriented framework that is particularly well suited to guiding policy and programming in increasingly shock-prone agrifood systems.

3. Methodology

The assessment of FAO stakeholders' views is conducted as a participatory stocktaking, comprising three components: (i) a review of key FAO documents identified by stakeholders; (ii) an online survey of PPA leaders and other FAO stakeholders to capture experience-based perspectives on how resilience is defined, operationalized and assessed; and (iii) follow-up face-to-face interviews with focal points or Directors of the divisions involved in the PPA BL4, as well as selected Country office respondents. The timeline of the assessment is presented in Figure 1.

Figure 1. Timeline of the assessment process



Notes: FAO = Food and Agriculture Organization of the United Nations; UN = United Nations. The timeline spans between October 2025 and March 2026.

Source: Authors' own elaboration.

An initial kick-off meeting was held with groups working on resilience-related initiatives, including the BL4 working group and the Global Transformative Resilience in Practice group. The meeting introduced the project and gathered feedback on the methodology and expected outputs. Participants highlighted both the relevance and challenges of the exercise, suggested additional documents for review, and identified key aspects of resilience operationalization. Based on the document review and inputs from the kick-off meeting, the online questionnaire was developed and subsequently revised by the directors and focal points of the divisions leading the PPA. During the survey, respondents could also suggest additional documents for inclusion. Preliminary results were then presented and discussed in a validation meeting, allowing participants to contribute to the interpretation of findings and support the development of an operational definition of resilience.

3.1 FAO and United Nations documents review

The review of FAO and other United Nations agencies' documents is based on a list of 44 reports and papers selected through a three-step approach.[8] First, a restricted list of 14 documents was agreed upon with the PPA BL4 leaders, namely OER, ESA and OCB. Second, an additional nine documents were suggested by participants during the kick-off meeting, at which the initiative was presented to

[8] The full list of the documents can be found in Annex 3.

FAO stakeholders, particularly members of the resilience working groups. Third, 21 further documents were identified by respondents to the online survey as relevant for the assessment.[9]

The selected documents have been classified in the following categories:

- Strategic/normative: documents that articulate overarching visions, principles, or normative frameworks, defining long-term goals and priorities.
- Programmatic/operational: documents that translate strategic objectives into concrete actions, programmes, or interventions, and describe implementation modalities.
- Methodological/empirical: documents that develop, apply, or assess analytical frameworks and methods.

Most documents fall within the programmatic/operational category, which is consistent with the primary objective of this work: to assess the extent to which the resilience definition can be operationalized into actionable projects and interventions.[10]

3.2 Online survey

To collect information about key stakeholders' views, an online survey was shared with participants of the BL4 working group (including the focal persons for OER, ESA and OCB, FAO divisions and participants from decentralized offices) and the Global Transformative Resilience in Practice Group. In addition, all divisions and decentralized offices were asked to indicate a person to be included in the survey and nominate Country offices (and respondents therefrom) to be added to the sample. In total, 43 people replied:[11] 13 from resilience working groups (hereafter, BL4 participants); 16 from FAO divisions, excluding those already participating in resilience working groups (hereafter, divisions); 14 from Country offices.

The questionnaire was organized in three sections: (A) The elements of resilience; (B) operationalizing resilience; and (C) FAO's corporate approach to resilience. The three sections use a zooming-in approach, moving from general issues such as what should be included in any meaningful operational definition of resilience (Section A), to the operationalization of resilience, such as activities and implementation modalities that contribute to enhancing resilience (Section B), and FAO's corporate approach to resilience (Section C).

3.3 Face-to-face interviews

The objective of the follow-up interviews was to gather deeper insights into the main challenges, gaps, and overlaps related to the operationalization of resilience interventions and assessments, particularly from the perspective of Country offices, which are the ones practically implementing the resilience strategies and interventions. In addition, the face-to-face interviews also aimed at consolidating and deepening the understanding of the point of view of the main divisions leading the PPA. Therefore, default respondents selected for the face-to-face interviews were the three focal persons of OER, ESA and OCB Divisions.

[9] Some respondents also indicated web pages or YouTube links; however, these were not included in the list of documents unless a report or any other document was explicitly associated with the link.

[10] Table A7 in Annex 4 presents the distribution of the selected documents across the strategic/normative, programmatic/operational, and methodological/empirical categories

[11] To be noted that in two cases the questionnaire was compiled in a collaborative way by: (i) OCB Division team, including the focal person; (ii) OER team, excluding the Deputy Director who sent a separate answer.

Country office interviewees were selected based on the following criteria: (i) completeness of survey responses or need for clarification; (ii) involvement in project implementation and analysis; (iii) number of nominations by divisions and Regional offices; (iv) regional representation; and (v) availability. Representatives from Afghanistan, Albania, South Sudan and Syrian Arab Republic were interviewed.

The main topics covered during the face-to-face interviews were:

- the distinction between resilience as a capacity and as an outcome;
- the balance between short- and long-term resilience, including the operationalization of the humanitarian–development–peace nexus principle;
- implications for measurement and operationalization related to the unit of analysis and scale of intervention;
- challenges in institutional strengthening and capacity building;
- the role of risks in resilience operationalization and assessment.

While these topics were identified based on the analysis of survey responses, interviewees also received tailored questions to clarify specific answers or explore inconsistencies and emerging issues.

4. Results from the document analysis and stakeholders' survey

This section summarizes the main results from the review of key documents, the online survey with relevant stakeholders and the face-to-face interviews.[12] The discussion highlights common patterns and differences, overlaps and gaps, found across and between official documents and individual/team responses and different groups of participants in the survey. The findings presented in this study reflect the perspectives of the stakeholders involved in the assessment and may therefore be influenced by their respective backgrounds and areas of expertise, potentially resulting in greater emphasis on certain topics, interventions, or methodological approaches.

4.1 Definition of resilience

The most widely reported definition of resilience in the selected documents is the one provided by the United Nations Common Guidance on Helping Build Resilient Societies (United Nations, 2020). *The State of Food and Agriculture 2021* (FAO, 2021b), as well as most of the FAO Regional Conferences on building resilience, build on the same definition.[13] However, several documents do not provide an explicit definition of resilience. This may reflect either an implicit assumption of a shared understanding within the community of practice and across the United Nations system – an assumption not fully supported by the findings of this internal review – or a deliberate choice to maintain conceptual flexibility and avoid overly prescriptive interpretations. We also document a recent trend towards the emphasis on agrifood transformation and equity-focused structural change, with "transformative resilience" emerging as a normative ambition and used as an umbrella term across multiple documents.[14] However, transformative resilience remains among the least operationalized capacities, as further work is required to translate its normative ambition into clearly defined pathways, implementation modalities and assessment frameworks.

From the online survey, it emerges that resilience is widely understood as a multi-level capacity of people, communities and (agrifood) systems to prevent, anticipate, withstand, adapt to, and recover from shocks and long-term stressors – while maintaining essential functions, protecting food security and livelihoods, and being supported by strong governance, inclusive capacities and sustainable natural resource management.[15] Because FAO is a highly decentralized organization, with several divisions and offices working on complementary and overlapping dimensions, the way resilience is defined by stakeholders offers different nuances depending on the specialization of the unit.[16]

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[12] The full set of results is reported in Annex 4.

[13] Based on this conceptualization, agrifood systems resilience is defined as "the capacity over time of agrifood systems, in the face of any disruption, to sustainably ensure availability of and access to sufficient, safe and nutritious food for all, and sustain the livelihoods of agrifood systems' actors" (FAO, 2021b, p. 11).

[14] A recent conceptualization defines equitably transformative resilience (ETR) as the "capacity of individuals, communities, nature and socioecological processes to prevent, absorb, adapt and transform in the context of multiple uncertainties compounded by structural and contingent shocks, stresses, and differential vulnerabilities. Equitably transformative resilience goes beyond short-term responses to enable bouncing forward in equitable ways that address the structural and systemic causes of differential vulnerabilities, redressing the unequal distribution of power, capabilities, resources, rights and duties; while harnessing socioecological synergies so that food systems are less prone to shocks and stresses in the future" (HLPE, 2025, p. 32).

[15] A summary of the definitions provided by stakeholders is available in Table A8.

[16] One of the respondents to the online survey emphasizes that, within the UN, definitions of resilience vary widely, reflecting "different (and sometimes opposing) perspectives" but also "different thematic and country contexts across the humanitarian–development–peace nexus". The respondent suggests that it is therefore important to "provide

Several patterns emerge from the textual analysis of the definitions of resilience provided by respondents (see Figure A8). First, resilience is strongly defined in relation to shocks, while stressors and risks appear much less frequently in the answers of respondents. Second, resilience is seen as a capacity (less commonly defined as an ability), in line with the official definitions, and in particular as the capacity to adapt and absorb shocks. Third, the subjects of resilience cited more often are communities and systems (especially agrifood systems), while micro-level subjects do not appear as often, even though the micro-level is considered as important as the meso-level when we specifically ask what the relevant subjects of resilience are.

4.2 Resilience capacities

Among the five resilience capacities, FAO stakeholders most frequently prioritize prevention and anticipation. Responses suggest that resilience interventions are often conceptualized along a temporal sequence relative to shocks (prevent → anticipate → absorb → adapt → transform), although BL4 participants and Country offices tend to prioritize prevention, whereas anticipation is most frequently ranked first by FAO divisions.[17]

Prevention is commonly framed as reducing exposure to risks before they materialize, and it is viewed as closely aligned with FAO's mandate, particularly in addressing root causes of food insecurity and malnutrition.[18] Anticipation is considered relevant for its cost-effectiveness and its role in improving risk recognition and preparedness, particularly when shocks cannot be avoided. In this sense, anticipation is often framed as enabling actors to identify emerging risks and prepare appropriate responses in advance.[19] Absorption reflects the immediate capacity to withstand shocks. While some consider it a central dimension of resilience – particularly due to its operational relevance in the short term – others view it as closely linked to prevention and anticipation.[20] Adaptation is often associated with the capacity to cope with long-term stressors and changing conditions. To be noted that BL4 respondents place greater emphasis on adaptation than other groups. Transformation is occasionally described as the ultimate goal of resilience, requiring structural changes when existing systems are unsustainable. However, although recent documents place increasing emphasis on

partners with a technical, nuanced, balanced understanding of resilience building, moving away from the politicization of terminology which is a constant challenge in New York." This topic also emerged during the interview with OCB focal point, who underlined the need for the division to go beyond a climate-centred definition of resilience to better acknowledge the many capacities resilience refers to. The interviewees stressed the need for a more structured and coordinated approach to resilience operationalization at the organizational level, overcoming fragmentation.

[17] See Table A9 in Annex 4 for the ranking distribution. The disaggregated rankings by groups, from the most to the least important, are as follows:

- BL4 participants: prevention – adaptation – absorption – anticipation – transformation.
- FAO's divisions: anticipation – prevention – absorption – adaptation – transformation.
- Country offices: prevention – anticipation – absorption – adaptation – transformation.

[18] The distinction between prevention and anticipation is often unclear or interpreted inconsistently by respondents, suggesting limited conceptual clarity between the two capacities. Some respondents emphasize the role of prevention in understanding and anticipating stressors and risks.

[19] One respondent emphasizes that anticipation has become a top priority after United Nations reform.

[20] In face-to-face interviews, absorption was also described as a cost-effective approach that can reduce the need for more expensive post-shock interventions.

transformative resilience,[21] stakeholders often perceive transformation – and sometimes prevention – as long-term priorities rather than immediate operational levers.

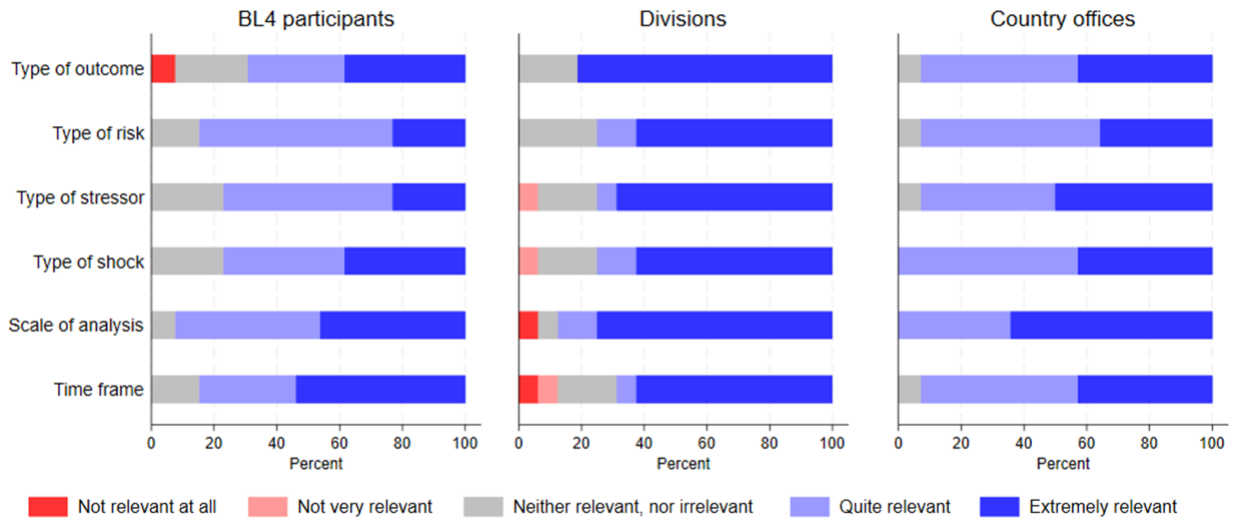
Finally, some respondents emphasize that all dimensions of resilience are equally important and interconnected. For example, in food-crisis settings, resilience efforts often start from anticipation and absorption, whereas in more stable contexts, prevention, anticipation and adaptation may serve as entry points.

4.3 Elements of an operational definition of resilience

According to respondents, an operational definition should specify the system/unit and the dimensions of resilience to be addressed (i.e. anticipation, prevention, absorption, adaptation, transformation), consider multi-risk interactions, include institutional and governance enablers, and focus on measurable outcomes, while remaining flexible and context sensitive. However, stakeholders diverge in their views on the relative importance of the elements upon which an operational definition of resilience should be grounded (Figure 2). Overall, respondents, especially those from Country offices, place the greatest emphasis on the scale of analysis, followed by outcomes (prioritized by FAO divisions) and the time frame (most salient for BL4 participants).

Several respondents highlighted differences in time horizons across FAO activities: development interventions typically adopt medium- to long-term perspectives, while humanitarian and emergency responses operate on shorter time frames. Bridging these perspectives remains a key challenge for operationalizing resilience across FAO's portfolio. The need for flexibility was particularly emphasized by Country office representatives during interviews, who highlighted the importance of adapting resilience concepts to local conditions and operational constraints. Very much in line with this, the ESA Director argued in favour of the adoption of multiple operational definitions tailored to specific contexts or fields of work.

Figure 2. Important elements of an operational definition of resilience



Note: BL4 = FAO Programme Priority Area: Better Life 4.

Source: Authors' own elaboration from the data collected through the online survey.

[21] This trend is particularly evident in the reviewed documents, where 76 percent of them were produced in 2024–2025 and frequently emphasize adaptive and transformative capacities (Figure A1).

4.4 Actors and scale of analysis

Resilience is understood as relevant across all levels (micro, meso and macro) but is more often associated with the micro and meso levels (see Figure A9 and Table A10 in Annex 4). Stakeholders, particularly from Country offices, emphasize the importance of considering marginalized social groups, which are often most affected by shocks. Interlinkages between targets also emerged as a key element of resilience interventions, notably in a face-to-face interview with a Country office representative. Projects frequently operate across levels, for example by addressing households while simultaneously engaging the groups and institutions to which they are connected.

The vast majority of participants state that social, economic and environmental dimensions – and their interactions – are extremely relevant to conceptualize and analyse resilience (Figure A10).

4.5 Shocks, stressors and risks

Shocks, stressors and risks are central to the concept of resilience, whose definition is often grounded in one or more of these elements. While shocks are consistently present across the reviewed documents, albeit to varying degrees, stressors and risks are more often neglected or overlooked (Figure A2). This pattern is confirmed by the text analysis in Figure A8, which highlights the prominence of shocks in stakeholders' definitions of resilience, while stressors and risks are mentioned far less frequently.

Shocks. Most stakeholders focus on climate, economic and conflict-related shocks, often cited together as the primary threats to agrifood systems and livelihoods, with climate shocks mentioned most frequently. Many responses acknowledge compound or cascading effects, indicating that resilience cannot be assessed against isolated shocks.

BL4 participants adopt a strong multi-hazard framing, including climate, biological, economic, conflict, geophysical, technological and mental or psychological shocks, and refer to types of shocks not mentioned by other groups (e.g. cyber shocks, mental health, anthropogenic degradation, sandstorms). FAO divisions tend to emphasize shocks affecting agrifood system functioning. Country offices more frequently highlight idiosyncratic shocks and social and political instability than other groups.

Stressors. Stakeholders define stressors as chronic, long-term processes that gradually erode resilience and increase vulnerability (e.g. change towards drier environmental conditions due to climate change, soil degradation, persistent poverty and/or food insecurity, institutional weakness). In FAO (2022), they are described as "risk multipliers" or aggravating trends.

Respondents identify environmental, social, institutional and economic stressors (Table A11), often emphasizing their context-specific nature across countries and socioecological systems. While shocks and risks are more frequently linked to climate and conflict events, stressors are typically framed in economic terms (Figures A3, A4, A5). Consistent with FAO's mandate to address the root causes of food insecurity, chronic hunger is frequently identified as a key stressor. Climate change is considered a long-term pressure on livelihoods, alongside protracted conflict and insecurity.

Risks. Stakeholders define risks as uncertain future events that can translate into a worsening of well-being status, such as droughts, floods, erratic weather, invasive species, price volatility, political instability, etc. Risks are generally seen as multi-dimensional, encompassing environmental, economic, social and health aspects (Table A12). As with shocks and stressors, respondents highlight compound and cascading dynamics.

Stakeholders stress the importance of risk assessment and mitigation, noting that risks can only be managed if identified. This emphasis is consistent with recent international adaptation frameworks,

including the Global Goal on Adaptation and the United Arab Emirates Framework for Global Climate Resilience, which increasingly position climate risk and vulnerability assessments as foundational elements of resilience planning, monitoring and evaluation (UNFCCC, 2025).[22] A Country office representative highlights the role of risk identification for preparedness, while the OCB focal point emphasizes the use of risk mapping tools to localize and measure exposure. In this sense, risk is understood as "an information-based factor" that can be managed, unlike uncertainty (FAO, 2022).

In the reviewed documents, risks are frequently referenced in generic terms, with frameworks emphasizing risk management or resilience in multi-risk environments without specifying particular risks. This lack of specificity reflects broader challenges in operationalizing resilience approaches that address risks, rather than responding to realized shocks, and in disentangling interacting risks. Diverging views on the role of risks are also evident: while some documents place risks at the centre of the narrative, others largely dismiss them. This divergence is echoed among stakeholders, although only four respondents consider risks irrelevant to resilience, the ESA Director described risks as "orthogonal to resilience," suggesting that outcome-based definitions should not depend on risk exposure.

4.6 Resilience outcomes

Across the selected documents, food security and nutrition emerge as the most frequently mentioned resilience outcome, followed by agricultural production (Figure A6). Outcomes related to empowerment, inclusivity and environmental sustainability receive attention in strategic and programmatic documents but are largely absent in empirical analyses. Similarly, self-reliance, which is linked to the graduation approach to transformative resilience, rarely appears as an explicit outcome.

Survey responses converge around three main outcome domains: food security and nutrition, income stability and poverty reduction and livelihood protection (Table A13). These largely align with two overarching domains identified in a recent mapping exercise on FAO's interventions and outcomes for agrifood system resilience by Rincón Barajas *et al.* (2025): safeguarding livelihoods and improving food access, and reducing risks and vulnerabilities.[23] However, matching survey responses with Rincón Barajas *et al.* (2025) analysis of over 1 700 FAO projects reveals some important gaps: outcomes such as risk-sensitive agriculture, market linkages and biodiversity-based assets, common in project portfolios, are less frequently mentioned by respondents, suggesting a certain degree of mismatch between conceptual framing and operational practice.

Some respondents extend resilience outcomes to the agrifood system level, including markets, value chains, infrastructure, institutions and governance, although these are less often linked to clear indicators. Environmental outcomes are also mentioned but receive comparatively limited emphasis. In some cases, respondents draw on existing frameworks, such as the 13 agroecosystem indicators used by the SHARP+ method[24] or RIMA pillars, to define outcomes.

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[22] In 2025, the 59 Belém Adaptation Indicators were adopted at the COP30 with the objective of supporting adaptation planning and reporting under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement (Lamhauge and Duluk, 2026).

[23] A third domain was identified by these authors, concerning the generation of food security and agriculture-related evidence for decision-making.

[24] These are the 13 indicators proposed by Cabell and Oelofse (2012) on which the FAO's SHARP+ assessment method is based (Hernández Lagana *et al.*, 2022).

Around 40 percent of respondents frame resilience outcomes in a dynamic or long-term perspective, emphasizing recovery, adaptation, and the sustained functioning of agrifood systems. When linked to resilience capacities (Table A14), absorption, often understood as recovery or "bounce back", is most frequently cited, followed by adaptation. In contrast, prevention and anticipation, despite being ranked as the most important capacities, are less often associated with outcomes, pointing to a gap between conceptual frameworks and practice.

Finally, responses reveal a tension between resilience as a capacity and as an outcome. Capacities such as absorption or adaptation are sometimes treated as outcomes, while in other cases resilience itself is defined as the outcome.[25] Interviewees suggested that this dual interpretation likely reflects the evolution of resilience from practical experience ("lived cultural routines") to formal conceptualization and may be useful in maintaining flexibility to support FAO's humanitarian, development and normative objectives.

4.7 Resilience-related activities

Selected documents highlight a wide range of resilience-building interventions (Figure A7). Nature-based solutions and climate-resilient practices are most frequently cited as tools to strengthen agrifood systems and protect livelihoods. Social protection plays a key role in reducing vulnerability and absorbing shocks, while policy design and strategic planning are essential to ensure timely, well-targeted interventions. These efforts are complemented by anticipatory actions and early warning systems, underscoring the importance of preventive and anticipatory capacities.

Surveyed stakeholders identify data and analysis, operations, programming, strategic planning and normative actions as central to resilience-building. Responses consistently emphasize preventive measures – such as climate-smart agriculture, water management, livelihood diversification, early warning systems and risk management – over post-shock responses, reflecting a shared view of resilience as primarily built *ex ante*. This aligns with Rincón Barajas *et al.* (2025), which finds that nearly 80 percent of interventions focus on reducing risk exposure and vulnerability, particularly through policies, strategies and plans.

Early warning systems, risk information and anticipatory actions are the most frequently mentioned activities, followed by climate-smart agriculture, nature-based practices, and water management. Although broadly shared, priorities vary across groups: BL4 participants emphasize evidence generation and knowledge; FAO divisions focus on policy and institutional strengthening; and Country offices highlight operational and coordination activities, including partnerships, community-based approaches, capacity building, and resource mobilization.[26]

[25] For example: "All outcomes must be resilient"; "The enhancement of the resilience capacities to prevent, anticipate, absorb (respond and recover), adapt and transform".

[26] Other areas of intervention mentioned across respondents include social protection; insurance and risk transfer mechanisms; livelihood diversification; market access and value chain interventions; governance and institutional strengthening for policymaking; infrastructure, assets and systems rehabilitation; financial access and credit. Stakeholders also frequently refer to specific FAO programmes and tools, including the Food Price Monitoring and Analysis (FPMA), the Global Information and Early Warning System (GIEWS), the Tool for Agroecology Performance Evaluation (TAPE), the Drylands Sustainable Landscapes Impact Program (DSL-IP), the Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP+), Farmer Field School (FFS), Cash+, and the Pastoralist Knowledge Hub (PKH).

4.8 Measurement and assessment: approaches, methods and data

Engagement in implementation and assessment of resilience interventions. Most stakeholders involved in this participatory assessment are directly engaged in the implementation of resilience-related interventions (Figure A11). While all surveyed Country offices report implementing resilience projects, only about half of the respondents belonging to this group indicate that their team or unit collects data that can be used to measure and evaluate resilience. Among BL4 participants and FAO divisions, a small share reports collecting resilience-related data but not conducting resilience analysis.

Methods for resilience assessment and evaluation. Respondents involved in implementing resilience interventions were asked which procedures their teams use to assess and learn from project impacts (Figure A12). Most rely on monitoring and evaluation (M&E) systems, typically involving pre–post comparisons of relevant outcomes using baseline (and sometimes midline) and endline surveys. Qualitative assessments are also widely used. Several FAO-specific tools for resilience analysis are mentioned, including RIMA, TAPE, SHARP+, and Data in Emergencies (DIEM), with RIMA by far the most frequently used. In contrast, causal inference approaches to impact evaluation are rare: only two Country offices report using quasi-experimental methods to assess intervention effects. Several respondents report lacking a systematic procedure for measuring and evaluating resilience. Many highlight that resilience measurement remains under development and is difficult to operationalize.[27]

At the same time, approximately 37 percent of respondents involved in resilience analysis report no awareness of alternative analytical approaches beyond those currently used, suggesting limited knowledge of existing tools or a strong reliance on familiar FAO instruments.

Resilience indicators. Given the predominance of RIMA among quantitative methods, the resilience capacity index (RCI) and the components underlying the RIMA pillars – such as assets, access to basic services, and livelihood diversification – are among the most commonly used indicators to assess resilience (Figure A13). However, many teams rely primarily on food and nutrition security indicators, including the food consumption score (FCS), the household dietary diversity score (HDDS), the Food Insecurity Experience Scale (FIES), the Household Hunger Scale (HHS), the Minimum Dietary Diversity for Children (MDD-C), the Minimum Dietary Diversity for Women (MDD-W), the dietary sourcing flexibility index (DSFI), the cost of food and food expenditure. Indicators related to livelihoods, income, and coping strategies are also widely used. In contrast, indicators related to agricultural productivity are mentioned relatively infrequently. One respondent noted that, despite the widespread use of RIMA, measurement frameworks are often shaped by donor-specific indicators such as income growth, food security, or productivity gains.

Country office respondents rarely refer to indicators of prevention and anticipation – such as insurance, savings, early warning systems, or climate-smart agriculture – despite emphasizing their importance for resilience. Some also report confusion between resilience and emergency response, highlighting the need to distinguish between resilience capacities (e.g. absorptive, adaptive,

[27] As one BL4 participant noted, despite the existence of conceptual frameworks, "in practice, fragmented institutional structures, cost implications and lack of capacity hinder the real-time delivery" of intervention evaluations. Another BL4 respondent emphasized the absence of systematic methods to identify, quantify, and document good resilience practices across decentralized offices. Similarly, a Country office representative expressed interest in establishing an evaluation system based on RIMA but reported constraints related to limited capacity, funding, and donor priorities, pointing to the need for stronger analytical and methodological support from FAO divisions.

transformative, etc.) and outcomes (e.g. food security, income stability, asset recovery time, crop yield variability).

Satisfaction with used methods and indicators. Overall, stakeholders report only moderate satisfaction with the methods and indicators currently used for resilience assessment (Figure A14). In a face-to-face interview, a Country office representative emphasized the need to move beyond household-level assessments and adapt existing tools, such as RIMA, to capture resilience at the sectoral level.[28]

Interviews also highlight limitations in knowledge generation and learning. The ESA Director noted a tendency to emphasize positive results, potentially limiting learning from implementation challenges and creating tension between demonstrating success and generating knowledge, both central to FAO's mandate. Many respondents stressed the need for stronger knowledge sharing across divisions and offices to support organizational learning and foster more innovative, context-responsive interventions.

Data constraints. Available data for resilience measurement and assessment are often considered inadequate, especially by BL4 members (Figure A15). Respondents frequently describe existing FAO data as fragmented, short-term, and limited in scope, highlighting the need for more longitudinal, standardized, and multi-level datasets to enable more comprehensive resilience analysis and better inform intervention prioritization and investment decisions.

4.9 Understanding and knowledge of resilience-related work within the organization

According to stakeholders, OER, the Rural Transformation and Gender Equality Division (ESP), OCB and ESA emerge as the divisions most actively engaged with resilience-related work.[29] Notably, not all Regional offices are considered equally involved in resilience operationalization, while Country offices are rarely perceived as being directly involved in resilience.[30] Overall, the findings point to a fragmented understanding of what resilience represents both at the organizational level and among specific divisions and offices, as shown in Table 1. Respondents tend to shift between a practical interpretation of resilience – intended as a set of means to achieve intended outcomes – when reflecting on their own team's work, and a more normative or strategic interpretation – viewed as a guiding principle – when considering FAO's institutional framing, though for Country Offices it seems that what they do in the field is what FAO should be doing overall.

[28] The stakeholder identifies as a key challenge related to sector-level resilience assessment the lack of a clear conceptual definition of resilience at the agrifood sector level, particularly in terms of relevant out-comes. Once such outcomes are clearly defined, the interviewee suggested, the development of appropriate measurement tools and indicators would be relatively straightforward.

[29] Figure A16 shows what are the divisions and offices that survey participants consider as those that use the concept of resilience in their daily work. We highlight the fact that results may suffer from a bias deriving from the distribution across divisions and offices of stakeholders participating in the survey.

[30] Insights from a face-to-face interview with a Country office representative suggest that Country offices themselves may tend to view the relevant Regional office as the primary locus of expertise on resilience, as well as the main interface with FAO divisions leading resilience-related interventions, particularly in contexts where local technical expertise on resilience is limited.

Table 1. What does resilience represent for FAO stakeholders

	BL4 groups	FAO divisions	Country offices	Total
Resilience for your unit				
A guiding principle	3	1	4	8
A goal in itself	4	3	5	12
A means to achieve intended outcomes	4	10	5	19
Other	2	2	0	4
Resilience for FAO				
A guiding principle	6	4	3	13
A goal in itself	3	7	2	12
A means to achieve intended outcomes	1	4	8	13
Other	3	1	1	5
Total	13	16	14	43

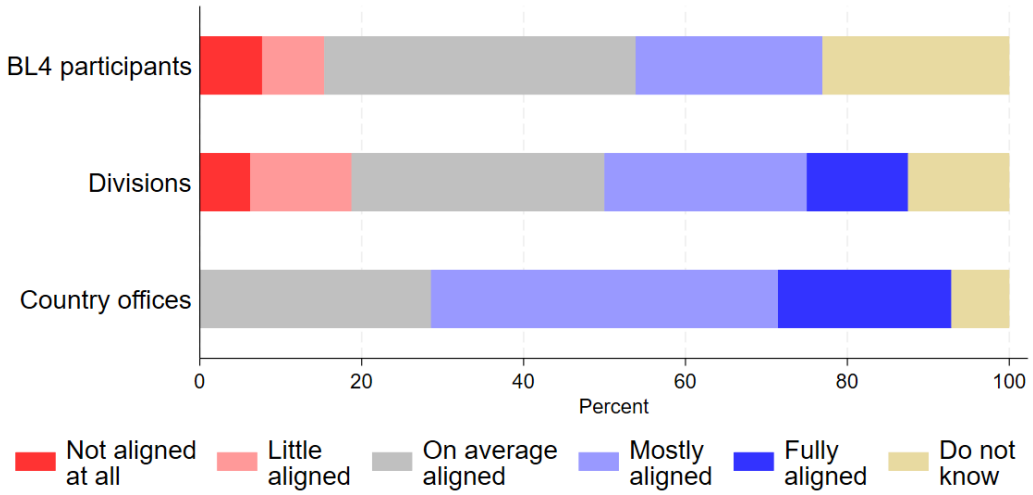
Note: BL4 = FAO Programme Priority Area: Better Life 4.

Source: Authors' own elaboration from the data collected through the online survey.

Furthermore, the analysis reveals a shared perception that, from an operational standpoint, the definition of resilience applied in practice is not fully aligned across units within the Organization (Figure 3). This perceived misalignment appears to be more pronounced among BL4 participants and representatives of FAO divisions than among respondents from decentralized offices.

Figure 3. Perceived alignment of the operational definition of resilience within the Organization

Question: "Think about the operational definition of resilience (i.e. resilience measurement and evaluation) adopted by your unit. How much do you think it aligns with the operational definition adopted by other FAO divisions/offices?"



Note: BL4 = FAO Programme Priority Area: Better Life 4.

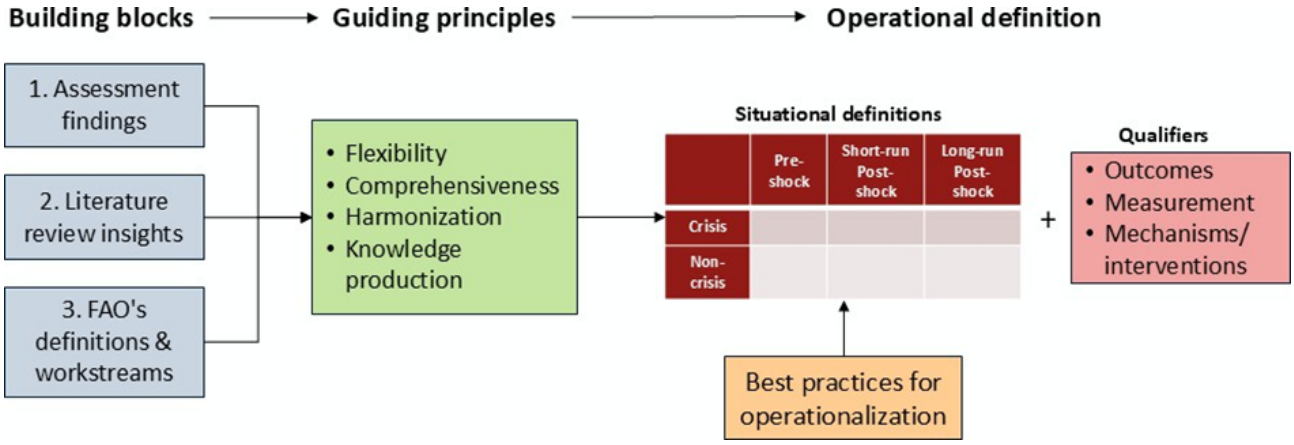
Source: Authors' own elaboration from the data collected through the online survey.

5. Towards FAO's operational definition of resilience

The various conceptualizations of resilience offered by the international and scientific community have contributed to a proliferation of approaches. Furthermore, the marked heterogeneity of operational contexts makes it difficult to identify a single operational definition of resilience applied to agrifood systems and calls for possibly tailored, context-specific definitions.

In this section, we propose an approach to the development of FAO's operational definition of resilience (Figure 4), drawing on the most relevant findings of the stakeholder assessment, key elements emerging from the scientific literature on resilience, and the conceptual framework adopted by FAO as a reference to define what resilience is as applied to agrifood systems. Leveraging these building blocks, we first identify a set of guiding principles to develop an operational definition of resilience that responds to both FAO's mandate and operations. Then, drawing on the established literature on how to formulate operational definitions, we integrate these elements into a framework that can be applied at the FAO corporate level.

Figure 4. Towards an operational definition of resilience



Source: Authors' own elaboration.

This represents a key step towards the identification of a FAO's operational approach to resilience and provides an opportunity to harmonize work in FAO divisions and offices and more effective corporate achievements. Furthermore, a clearer operational definition of resilience will hopefully support FAO units in identifying which programmes and interventions fall under the "resilience" umbrella and in assessing their contribution in terms of resilience outcomes.

5.1 Building blocks of an operational definition of resilience

5.1.1 Main findings from FAO's stakeholder assessment

All respondents to the FAO's internal assessment acknowledge that resilience is a central concept in FAO's work and recognize it as an intrinsically multidimensional concept. However, the assessment reveals substantial heterogeneity in the way different stakeholders conceptualize resilience, a partial misalignment between theory and practice, and several persistent operational challenges.

Different conceptual nature. A key conceptual challenge that translates directly into operational difficulties is the distinction between resilience capacities and resilience outcomes – often framed as the difference between mechanisms/pathways and ultimate results. Sometimes resilience is treated as an objective by some FAO stakeholders. As a result, measurable outcomes (e.g. food security,

income) are occasionally conflated with the capacities or support mechanisms that enable resilience, rather than being treated as the results that resilience is expected to support/generate.

Various scales. This issue is closely linked to the identification of relevant outcomes, which respondents highlighted as a key component of an operational definition. During the internal assessment, stakeholders emphasized that what resilience entails depends critically on the agrifood system component under consideration. While several instruments and approaches exist for measuring resilience outcomes at the micro level (e.g. individuals or households), there is currently no systematic approach for resilience identification and assessment at the system level. Respondents from Country offices identified the scale of analysis as a priority element of an operational definition, underscoring the need for clarification regarding the appropriate level at which resilience should be measured.

Context-dependency. FAO's resilience-related operations are implemented across a wide range of contexts, each characterized by specific conditions that shape resilience capacities, short- and longer-term needs, constraints on interventions, desirable outcomes, and relevant time horizons. In response to this diversity, FAO stakeholders develop tailored interventions that take into account, among other factors, the distinction between crisis and non-crisis contexts, varying levels of state fragility, specific risks, shocks, and stressors (and combinations thereof), and donors' priorities. Participants consistently emphasized the importance of such context-sensitive approaches and highlighted the need to preserve flexibility in both the conceptual and operational framing of resilience. In particular, stakeholders involved in the PPA BL4 generally agreed that an operational definition of resilience should specify the relevant time frame of interventions, relative to the shock occurrence.

Operational heterogeneity. FAO stakeholders broadly acknowledged the existence of segmented approaches within the Organization, driven both by the different entry points of technical divisions and by the contextual challenges faced by decentralized offices. At the same time, decentralized offices exhibit heterogeneous technical capacity in resilience measurement and assessment, as well as constrained resources for generating evidence on the impacts of resilience interventions. According to participants, this diversity of operational practices and evaluation approaches contributes to fragmented learning processes and weak knowledge sharing, which may limit the development of synergies and hinder the identification and scaling-up of effective resilience-building strategies. Respondents generally agreed that strengthened synergies would support the implementation of more effective and efficient interventions, while also reinforcing FAO's role as a knowledge hub.

5.1.2 Insights from the scientific literature

The scientific literature on resilience reflects a wide range of conceptualizations and measurement approaches, with significant ambiguity persisting regarding what resilience is, where it is located, and how it should be assessed. These differences concern resilience's ontological status (as a capacity, state, or outcome), its locus of analysis (households, communities, or systems), its temporal focus (short-term recovery versus long-term transformation), and its normative grounding. Importantly, these distinctions are not merely conceptual but directly shape the empirical strategies used to measure resilience, the type and frequency of data required, and the policy priorities associated with resilience-building interventions.

Ontological status. A first key insight emerging from the literature is the need to clearly distinguish the nature of resilience conceptualization, highlighting whether it is a capacity or an outcome. This distinction is relevant for the development of an operational definition as it makes it possible to highlight the causal pathways through which capacities translate into outcomes. Furthermore,

resilience measurement requires clarity on the welfare dimensions that resilience is expected to protect or improve, which defines what is the dimension the measurement is focusing upon, implying possible trade-offs with other dimensions.

Normative grounding. A second relevant contribution concerns the normative grounding of resilience. The literature increasingly emphasizes that resilience assessment requires the identification of explicit welfare-relevant benchmarks, such as the probability of remaining above a minimum welfare threshold, or the extent to which welfare losses from shocks are minimized relative to counterfactual trajectories. These perspectives provide a clearer welfare interpretation of resilience and facilitate accountability in the evaluation of resilience-building interventions, while also highlighting the sensitivity of results to the selection of outcome variables and time horizons.

Temporal dynamics. Temporal dynamics have a central role in resilience analysis. Resilience is inherently linked to welfare trajectories under uncertainty and/or multiple risks, and its assessment depends on the timing of measurement relative to shocks, the duration of analysis to evaluate the outcome dynamics, and the distinction between short-term and longer-term effects, which may entail inter-temporal trade-offs. Therefore, the literature points to the importance of specifying time horizons and of adopting approaches that can capture both short-term humanitarian impact and longer-term development effects.

Conceptual-operational trade-offs. Finally, the literature highlights a fundamental trade-off between conceptual rigour, empirical credibility, and operational feasibility. Approaches that provide stronger welfare grounding and enable causal inference often require higher-frequency panel data, longer time horizons, or robust counterfactual identification strategies, all features that do not apply to many operational settings. Conversely, more feasible approaches – often based on sparse panel data or even cross-sectional data – are widely used due to lower data requirements but may generate weaker or distorted evidence on the effectiveness of resilience-building interventions.

5.1.3 Institutional framing: FAO's conceptual definitions and the Organization's workstreams

On the process towards the identification of an operational definition of resilience, two inputs are crucial from the Organization's viewpoint, namely the definitions of the key concepts defining the constructs of interest – i.e. resilience, agrifood systems and resilient agrifood systems – and the Organization's mandate.

Conceptual definitions. Resilience is defined by the United Nations as the ability "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" (United Nations, 2020, p.11). This definition emphasizes the abilities of systems and actors, while leaving the specification of outcomes implicit. In practice, resilience outcomes are often understood as the preservation of key trajectories or states – such as system functioning, development, peace, security, human rights and well-being – while resilience capacities enable systems to face risks. This framework supports an interpretation of resilience as an end, with capacities viewed as ultimate outcomes.

However, as it emerges from the review of the literature, resilience is often conceptualized as a means to achieve intended outcomes (i.e. normatively chosen welfare thresholds or avoided cumulative losses). In the context of agrifood systems, the ultimate objective of resilience is "to sustainably ensure availability of and access to sufficient, safe, and nutritious food for all, and sustain

the livelihoods of agrifood systems' actors" (FAO, 2021b, p. 6).[31] In this case, the focus shifts on the outcome, while the unit(s) of analysis can be inferred by the official definition of agrifood systems, which "encompass the entire range of actors, and their interlinked value-adding activities, engaged in the primary production of food and non-food agricultural products, as well as in storage, aggregation, post-harvest handling, transportation, processing, distribution, marketing, disposal, and consumption of all food products, including those of non-agricultural origin" (FAO, 2021b, p. xii). While both definitions point towards a micro-level focus, they explicitly refer to the system that encompasses all agrifood components (actors as well as activities).

FAO's mandate. In addition to the official definitions of resilience, agrifood systems, and resilience of agrifood systems, another element must be considered in the formulation of an operational definition. The operational approach to resilience must reflect FAO's triple workstream of normative, development, and humanitarian action.

First, as a knowledge-based organization, FAO contributes to the generation of evidence to support technical guidance and policy advice. Accordingly, the normative work calls for an approach to resilience that enables the production of robust empirical evidence on the effectiveness and cost-effectiveness of resilience-enhancing interventions. Moreover, FAO is in a privileged position to address the critical issue of establishing a normative grounding for resilience analysis, as several conceptual approaches explicitly require normative choices regarding welfare benchmarks and thresholds against which resilience can be assessed.

Second, FAO's development work demands a long-term focus on the transformation of agrifood systems towards efficiency, inclusivity, sustainability, and resilience. In this regard, an operational definition of resilience should encompass capacity-building activities, institutional changes and structural transformations, whose outcomes in some cases may be more difficult to measure, especially at the system or institutional level.

Third, FAO's humanitarian work expresses the key role that the organization has in crisis and emergency contexts – mostly focusing on input provision and protection of agricultural production and livelihoods. While the humanitarian intervention usually requires a focus on addressing short-term, immediate needs primarily, it also embeds interventions aimed at longer-term recovery and future crisis prevention. This link between short- and long-term perspectives is explicated in the humanitarian–development–peace nexus, a systemic approach to "reducing people's needs, risks and vulnerabilities, supporting prevention efforts and thus, shifting from delivering humanitarian assistance to ending need" (OECD, 2019, p. 3; FAO, 2021a, p. 1).

5.2 Guiding principles for developing an operational definition of resilience

Building on the above results, a few guiding principles for the development of an operational definition of resilience can be envisioned.

Flexibility. The internal assessment underscores the critical importance of maintaining flexibility in both the conceptual and operational framing of resilience, so as to enable interventions to be adapted to different contexts, risk/shock exposure, and time horizons. Flexibility also facilitates alignment with donor priorities and supports FAO's triple workstream across normative, development, and humanitarian action. In this respect, the primary purpose of an operational definition of resilience is

[31] This definition resonates the well-known food security definition established on the occasion of the World Food Summit convened by FAO in 1996: "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." (FAO, 1996, par. 1 of the Plan of Action).

not to prescribe a one-size-fits-all definition, which would be unfeasible, but rather to provide a shared reference framework for identifying how different interventions contribute to resilience. Establishing common ground on what resilience entails and how it should be assessed, through the identification of relevant outcomes for relevant actors, would support FAO in consistently articulating and evaluating the resilience contributions of its programmes and interventions.

Comprehensiveness. The principle of flexibility implies that an operational definition of resilience should also be comprehensive. Given the multidimensional and intertemporal nature of resilience and the diversity of contexts in which it manifests, an operational definition should support its assessment across different scenarios, risk and shock profiles, temporal dimensions relative to shock events, and combinations of resilience capacities. In this respect, an outcome-oriented framing keeps open the range of capacities and mechanisms through which such outcomes may be achieved.

Harmonization. This principle refers to the need to strengthen coherence and coordination across FAO stakeholders, rather than to demarcate specific areas of activity among them. Given the diversity of entry points, technical approaches, and operational contexts within the Organization, an operational definition of resilience should provide a common reference framework that facilitates convergence in the interpretation, design, and assessment of resilience-related interventions. Harmonization is therefore essential to ensure consistency and alignment across activities, thus enhancing efficiency and promoting synergetic impact, as well as comparability in assessing those activities, thus promoting shared learning and supporting the accumulation of evidence on what works/does not work under specific conditions.

Knowledge production. Directly derived from FAO's normative work, a further guiding principle for an operational definition of resilience is its capacity to support knowledge production, both within and beyond the Organization. Internally, a shared operational definition should facilitate structured learning processes by enabling consistent documentation, assessment, and comparison of resilience interventions across contexts and programmes. This, in turn, can strengthen knowledge sharing between divisions and offices and contribute to the identification of effective mechanisms and pathways through which resilience capacities translate into outcomes. Externally, a clearer operational framing of resilience can reinforce FAO's role as a knowledge hub by supporting the generation of evidence-based policy advice and strengthening the Organization's contribution to normative and regulatory processes. In this sense, an operational definition should not only guide implementation and assessment but also enhance FAO's capacity to produce and disseminate actionable knowledge to inform decision-making at multiple levels.

5.3 Developing FAO's operational definition of resilience in agrifood systems

5.3.1 Best practices for building an operational definition

Operationalization means guiding how concepts can be translated into concrete and practical actions. Since the seminal work of Bridgman (1927), operationalization has been closely tied to measurement procedures. As noted by Slife *et al.* (2016), a central problem of operationalization lies in the fact that "constructs that require operationalization are not measurable in principle, so their relationship to the operationalization is not directly measurable" (p. 128). Therefore, because the translation validity of an abstract concept into a measurable variable cannot itself be empirically tested, the authors argue that operational definitions must perform three conceptual tasks (or best practices): clarification, specification, and justification. In particular, an operational definition must: (i) clarify the theoretical frameworks to which it refers, so that meaning is not inferred solely from the measurement; (ii) specify which aspects of the concept are represented in the operationalization –

an inevitable selection of meaning that leaves other aspects to separate operationalizations (Lundberg, 1942); and (iii) justify, through theoretical and methodological arguments, why the chosen instruments and procedures provide an acceptable representation of the concept.

Clarification. The proposed operational definition of resilience is grounded in the official conceptual definition of resilience adopted by the United Nations (2020) and on the definition of resilient agrifood system as conceptualized by FAO (2021b) (see definitions reported in Section 5.1.3). It is framed within a theoretical approach that integrates risk analysis, humanitarian practice, and development thinking, with particular attention to how risks, shocks and stressors affect welfare trajectories over time. In this perspective, resilience is conceptualized as a dynamic property of agrifood systems and their components (e.g. households, farms, supply chains, etc.). Therefore, the operational definition should explicitly include three core elements of the construct: (i) the risks, stressors, and shocks affecting agrifood systems; (ii) the welfare outcomes that resilience is expected to protect or enhance (i.e. food security and livelihoods); and (iii) the temporal dimension through which out-comes are assessed, accounting for both immediate impacts and longer-term trajectories. This framing also clarifies the distinction between resilience and related constructs: while vulnerability describes the susceptibility to harm, resilience refers to the ability to avoid persistent adverse consequences by sustaining or restoring desirable trajectories without undermining long-term development prospects.

Specification. In line with the guiding principles outlined in Section 5.2, the operational definition specifies resilience in a way that is applicable across FAO's diverse workstreams and operational contexts. Following the best practices discussed above, we operationally define resilience starting from relevant and measurable outcomes, rather than from abstract capacities or intervention modalities. Moreover, consistent with this framework, we propose context-specific or situational operational definitions of resilience, in which the specification and justification of outcomes, instruments, and procedures are grounded in the characteristics of the context in which the definition is applied. The definition also explicitly distinguishes the temporal dimension of resilience by analysing it according to pre-shock, immediate post-shock, and medium- to long-term post-shock situations. Accordingly, it allows to accommodate interventions aimed at anticipation and prevention, shock absorption and response, and longer-term recovery, adaptation, and transformation. Resilience capacities and factors influencing those capacities are treated instrumentally as mechanisms contributing to the achievement of resilience outcomes, rather than as resilience outcomes in themselves.

Justification. The proposed operational definition provides a welfare-grounded interpretation of resilience that is consistent with the conceptual definitions adopted by the United Nations and FAO. By adopting an outcome-oriented framing, it preserves the welfare interpretation of resilience and avoids the common conflation between resilience capacities, intervention activities, and resilience outcomes. At the same time, the choice to develop situational operational definitions provides a practical solution to the heterogeneity of FAO's activities and operating environments, consistent with the Organization's multiple work-streams. Grounding the specification of outcomes, instruments, and procedures in contextual characteristics supports more targeted guidance, while maintaining consistency with a shared conceptual anchor. This approach also mitigates the trade-off highlighted in the literature between theoretical credibility and empirical feasibility, since it allows the level of methodological ambition to be adapted to available data, implementation constraints, and time horizons, without abandoning comparability across interventions. Finally, by enabling clearer assessment of resilience-enhancing interventions, the definition supports harmonization across divisions and offices, strengthens learning and knowledge production, and fosters synergies within the Organization.

5.3.2 Alternative approaches for an operational definition of resilience in agrifood systems

The definition of agrifood systems adopted by FAO encompasses the full range of actors and activities involved in the production, processing, distribution, and consumption of food and non-food agricultural products. This systemic framing implies that resilience is not attributable to a single component of the agrifood system, but rather emerges from the interaction of multiple actors, institutions, and processes. Therefore, resilience can in principle be operationalized through different, complementary approaches, depending on the unit of analysis and the intended use of measurement. Two broad approaches can be identified, both conceptually valid and consistent with FAO's work.

A first approach is a piecemeal or component-specific operationalization of resilience. In this perspective, agrifood system resilience is understood as the combined resilience of its different components, and the contribution of each part of the system can be assessed through a specific operational definition tailored to each component. This approach is coherent with the systemic nature of agrifood systems and supports a disaggregated understanding of how resilience is built through specific mechanisms, interventions, and institutional arrangements. However, it also raises important operational challenges, particularly regarding the identification of welfare-relevant outcomes that can be different across the various system components and their consistency among different components of the system. While household-level outcomes such as food security, income, or nutrition are relatively straightforward to observe, defining comparable outcomes for markets, supply chains, institutions, or the agrifood system may not be that straightforward.

A second approach is an objective-oriented operationalization of resilience. In this framework, resilience is defined primarily in relation to the overarching objectives of resilient agrifood systems, namely the sustainable achievement of food security and nutrition and the protection of livelihoods for all (FAO, 2021b). This approach shifts the focus from defining resilience separately for each system component to identifying measurable welfare outcomes that resilience is expected to protect or improve. In practice, these outcomes materialize most clearly at the level of individuals and households, where welfare dimensions such as food security, nutrition, and income can be directly measured. But it could also be identified with reference to the overarching objective (i.e. food security and nutrition and livelihood protection for all) at a higher level of aggregation – e.g. agrifood value added and employment, FIES and the Proportion of Undernourished (PoU), the affordability of a healthy diet, etc. This outcome-based focus provides a clear normative/policy-established grounding and facilitates the assessment of whether resilience-building interventions contribute to the ultimate goals of agrifood systems resilience.

We argue in favour of the second approach, as it provides a common framework that can be applied consistently across FAO's normative, development, and humanitarian work, and directly addresses the need – highlighted both by the literature and by FAO stakeholders – to distinguish resilience capacities from resilience outcomes. Importantly, this choice does not imply that resilience is more relevant at a specific level, such as the micro level (i.e. households or farms). Rather, it reflects the fact that, even when interventions operate at meso or macro scales, their resilience contribution should ultimately be assessed through outcomes that need to be consistent with the overarching objective of resilient agrifood systems – i.e. the sustainable achievement of food security and nutrition and the protection of livelihoods for all. From the empirical viewpoint, different resilience measurement approaches can be used: some of them are inherently micro-based, while others can be adapted across scales provided that the relevant outcomes are identified consistently with the overarching objective.

5.3.3 Situational operational definitions of resilience

A preliminary taxonomy. This section shows how situational operational definitions of resilience can be developed with reference to selected FAO operational contexts. This means that what is described here is not exhaustive of all possible operational contexts, but it is rather an exemplification of how those definitions can be developed. FAO's operational definitions can be articulated through a taxonomy that links resilience to the context in which FAO's intervention/assessment is implemented and to the timing of the intervention/assessment relative to shock occurrence. This taxonomy reflects the premise that resilience is not associated with a single measurable outcome, but rather with a set of welfare-relevant outcomes whose interpretation depends on whether shocks have materialized and on the structural characteristics of the operational environment. In particular, the taxonomy distinguishes between pre-shock situations, immediate post-shock phases, and medium-term recovery periods and applies this time breakdown, distinguishing between fragile and non-fragile contexts.

Boxes 1 to 3 propose the operational definitions of resilience according to the three main time periods relative to shock occurrence, qualifying also those definitions according to the specificities of fragile, conflict-affected, and major food crisis contexts.

Box 1. Resilience in pre-shock (no realized shock) situation

In the absence of realized shocks, resilience is the ability of households and agrifood system actors to maintain adequate welfare outcomes under plausible future shock scenarios, as reflected in the probability of remaining above normatively/policy-established thresholds in *ex ante* stress-testing and forecasting assessments.

Fragile and crisis contexts qualification: In such contexts, specific attention must be given to structural constraints, pervasive stressors, and anticipated shocks, prioritizing humanitarian preparedness, anticipatory actions, safety net scalability, and secure access to productive resources and basic services. Early warning systems and emergency response systems are key.

Box 2. Resilience in the period immediately after shock

In the short-term after shock, resilience is the ability of households and agrifood system actors to absorb the shock, thus limiting functionality and welfare losses (with respect to pre-shock levels) and avoiding the impairment of future recovery, maintaining welfare outcomes above normatively/policy-defined minimum thresholds.

Fragile and crisis contexts qualification: In such contexts, specific attention must be given to the role of structural vulnerabilities to prevent households and agrifood system actors from falling below critical minimum thresholds that may trap them into a negative (i.e. towards a low-level equilibrium) dynamics. Emergency safety nets and shock relief assistance, continuity of access to production assets and basic services, and prevention of negative coping strategies are key.

Box 3. Resilience in the medium- to long-term after shock

In the medium- to long-term after shock, resilience is the ability of households and agrifood system actors to adapt and recover after a shock, minimizing cumulative welfare losses and engaging in a transformative dynamic as needed.

Fragile and crisis contexts qualification: In such contexts, resilience requires not only recovery but also transformation away from structurally insufficient and/or unsustainable pre-shock conditions. Conflict prevention and peace building and keeping, institution and governance building, asset provision, and individuals capacity-building are key.

Capacities. Building on the definitions above, Table 2 summarizes how resilience can be operationalized, i.e. highlighting the types of capacities that should be enhanced by FAO's interventions, conditional on the timing of intervention/assessment relative to shock occurrence and on the context's structural features in terms of fragility and vulnerability.[32] In non-shock contexts, resilience is primarily reflected in preparedness and in the accumulation of capacities that reduce expected losses under plausible future shocks, whereas in post-shock contexts, resilience is revealed through realized welfare dynamics, including the magnitude of welfare losses and the shape of recovery trajectories. The fragility dimension affects the interpretation of resilience outcomes: in non-fragile contexts, resilience can be assessed mainly in terms of preserving functionality and avoiding long-term reversals, while in fragile and major food crisis contexts, resilience cannot be operationalized solely as a return to pre-shock conditions, since these may reflect chronic deprivation and structurally unsustainable equilibria. In such settings, resilience outcomes must therefore capture both protection and progressive improvement, including the strengthening and securing of livelihoods over time.

Table 2. Resilience capacities across different operational contexts

	Pre-shock situation	Immediately after shock	Medium- to longer-term after shock
FCA or MFC contexts	Anticipation and building adaptation capacity in a multi-risk and fragile environment with the objective of reducing vulnerability and potential harm.	Absorption of and response to shock in the context of chronic fragility and widespread vulnerability, with the objective of overcoming the emergency.	Post-shock adaptation and transformation, focusing on recovery trajectories, avoiding the return to insufficient or unsustainable living conditions.
Non-FCA and non-MFC contexts	Prevention and anticipation and investment in forward-looking transformation for long-term sustainability.	Absorption of and response to shock with the objective of preserving/restoring functionality.	Post-shock adaptation and recovery, avoiding maladaptation.

Notes: FCA = fragile and conflict-affected; MFC = major food crisis.

Source: Authors' own elaboration.

Outcomes indicators and methods. Building on the situational taxonomy and the related operational definitions, resilience interventions/assessment require the identification of welfare-relevant outcomes whose interpretation depends on the timing of measurement relative to shock occurrence. In line with the objective-oriented approach outlined in Section 5.3.2, the primary micro-level welfare outcomes for resilience operationalization are food security and nutrition. These outcomes provide a welfare-based benchmark that can be consistently linked to FAO's objectives, while allowing context-specific adaptation in terms of indicator choice and scale of analysis. Table 3 summarizes how resilience outcomes can be operationalized over the three time periods and across scales. In pre-shock contexts, resilience is assessed prospectively through the probability of

[32] It is worth noting that Table 2 contents emphasize only the most relevant capacities that resilience-enhancing interventions should aim at in each situation. However, this does not mean that other capacities cannot operate in that specific context, even if they are not mentioned. In other words, it is more a matter of emphasis given to each capacity within the portfolio of the five capacities – prevention, anticipation, absorption, adaptation, and transformation – rather than a crisp inclusion/exclusion duality for each capacity in each situation.

maintaining adequate welfare outcomes under plausible counterfactual shock scenarios, which can be approximated through forecasting approaches and testing hypothetical scenarios. Immediately after a shock, resilience is assessed through avoided welfare losses relative to pre-shock baselines and/or minimum welfare thresholds. In the medium- to long-term, resilience assessment shifts to welfare trajectories and avoided cumulative losses, requiring longitudinal observation of recovery and adaptation dynamics, particularly to distinguish between recovery pathways that restore or improve welfare outcomes and maladaptive responses that undermine future resilience.

Table 3. Outcome indicators, reference levels, and measurement approaches across time periods relative to shock occurrence and scales of analysis

	Pre-shock situation	Short- to medium-term after shock	Medium- to long-term after shock
Outcome indicators (individual / household level)	Adequate levels of food security and nutrition.	Avoided welfare losses and maintenance of minimum welfare conditions.	Avoided cumulative welfare losses and sustained recovery trajectories.
Outcome indicators (system level)	Share of food-insecure and malnourished population, cost of healthy diets.	Minimized the share of the population falling into food and nutrition insecurity, maintenance of sufficient food supply, etc.	Avoided cumulative losses in terms of shares of food- and nutrition-insecure population; sustained recovery trajectories for performance indicators at the country or regional level.
Reference point	Normative thresholds.	Normative thresholds and *ex ante* levels.	Normative threshold, *ex ante* levels, counterfactual levels, and growth rate (if the shock did not occur).
Measurement approaches	*Ex ante* prospective assessment under hypothetical shock scenarios (what-if analysis), including forecasts and stress-testing approaches.	Pre-post comparison where baseline data exist; probability of staying above welfare thresholds; assessment of coping strategies and immediate welfare deterioration.	Comparison of post-shock welfare trajectories with baseline trends and/or counterfactual welfare trajectories (where feasible).

Source: Authors' own elaboration.

Capacity indicators. Tables 4 and 5 complement the outcome-oriented framework by identifying capacity indicators as operational proxies of the mechanisms through which resilience outcomes are achieved across different scales. Table 4 cross-tabulates selected indicators across different operational contexts and timing with respect to shock occurrence. Table 5 organizes indicators along four levels – micro, meso, macro and FAO's programme – thereby reflecting the multi-level nature of agrifood systems and the need to capture interactions across them. At the micro level, indicators focus on household and livelihood capacities (e.g. assets, diversification, access to services). Meso-level indicators capture system-level functioning, such as value chain integration, connectivity, and market efficiency, as well as community-based mechanisms such as collective action. System-level functioning is also reflected at the macro level, where the emphasis shifts to institutional capacity,

governance, and systemic risk management, whereas programme-level indicators assess implementation performance (e.g. coverage, scalability, cost-effectiveness) of major FAO interventions. Overall, the table frames resilience capacities as measurable mechanisms linking interventions to welfare outcomes, facilitating a more structured assessment of causal pathways and policy effectiveness. It should be noted, however, that these indicators are not exhaustive and are provided as illustrative examples, intended to be adapted and refined according to specific contexts, data availability, and operational priorities.

Table 4. Resilience capacity (mechanisms) indicators across different operational contexts

	Pre-shock situation (no realized shock)	Short- to medium-term after shock	Medium- to long-term after shock
Proxy indicators	• Livelihood diversification • Market access • Social inclusion • Institutional capacity and governance • Social protection systems • Anticipatory actions • Early warning systems	• Protection of productive assets • Continuity of access to services and inputs • Shock-responsive social protection • Readiness of policy response • Supply chain functioning • Ecosystem integrity	• Asset restoration and productive reinvestment • Restored value chain and supply chain functioning; • Ecosystem restoration • Policy and institutional strengthening • Risk-informed reconstruction
Proxy indicators for fragile and major food-crisis contexts	• Early warning systems • Emergency response systems • Humanitarian preparedness • Access to basic services • Access to productive assets • Safety nets scalability • Anticipatory actions	• Emergency safety nets and shock relief assistance • Continuity of humanitarian access and service delivery • Prevention of negative coping and irreversible asset losses • Livelihoods of displaced people	• Conflict prevention and peace-building/keeping • Institutions/governance building • Asset provision • Individual's capacity building • Livelihood recovery (including displaced populations)

Notes: The table presents a non-exhaustive and illustrative set of resilience capacity indicators. The proposed categorization should be interpreted as a heuristic guide for distinguishing resilience capacities from resilience outcomes. Indicators identified for fragile and major food-crisis contexts should be understood as being particularly relevant to, but not exclusive to, these contexts.

Source: Authors' own elaboration.

Table 5. Capacity indicators (resilience mechanisms) across scales of analysis

Scale of analysis	Capacity indicators
Micro level	• Livelihood diversification. • Asset ownership and protection of individual assets. • Access to productive inputs. • Investment in climate-smart agriculture and sustainable practices. • Market access. • Integration in the value chain. • Adoption of early warning systems and anticipatory actions. • Social inclusion and equity. • Access to basic services. • Risk assessment. • Access to insurance mechanisms. • …
Meso level	• Value chain integration within the agrifood system. • Connectivity. • Market efficiency. • Systems-level input availability. • Supply-chain function indicators. • Social cohesion and community-based mechanisms. • System-level risk identification. • Risk assessment and risk monitoring. • Disaster risk reduction. • Availability and adequacy of insurance mechanisms. • …
Macro level	• Continuity and accessibility of basic services. • Shock-responsive social protection and emergency assistance (coverage, targeting and scalability). • Readiness and effectiveness of crisis response systems (including humanitarian coordination, access and service delivery). • Policy and institutional capacity for crisis response and agrifood system interventions. • Institutional cooperation, coordination and governance. • Ecosystem integrity, restoration and risk-informed adaptation investments. • Support for displaced populations and vulnerable groups. • Conflict prevention and socio-political stabilization. • Adequacy and efficacy of risk assessment and risk monitoring tools. • …
Programme level	• Readiness of shock-response interventions. • Population reached by the intervention. • Resources mobilized. • Programme cost-effectiveness. • Scalability of interventions. • Capacity building. • …

Notes: The table presents a non-exhaustive and illustrative set of resilience capacity indicators. The proposed categorization should be interpreted as a heuristic guide for distinguishing resilience capacities from resilience outcomes.

Source: Authors' own elaboration.

Trade-offs. A final word of caution concerns the trade-offs inherent in operationalizing resilience, which cannot be fully resolved but must be explicitly acknowledged and managed. Some of them arise from the multidimensional and intertemporal nature of resilience. For instance, resilience may involve trade-offs between economic, environmental, and social objectives, where gains in one dimension (e.g. agricultural productivity) may come at the expense of others (e.g. environmental sustainability). Similarly, tensions arise between short-term and long-term objectives, particularly across humanitarian and development interventions, where immediate response may compete with investments in future resilience, or when the achievement of a better welfare position in the short-run may impair future well-being outcome as it is the case with distressing sales of livestock that may favour consumption smoothing at the expense of production assets. Some other trade-offs are methodological, being related to how resilience is operationalized. First, there is a trade-off between conceptual rigour and operational feasibility: approaches that provide stronger causal and welfare grounding often require data, time, and analytical capacity that may not be available in many FAO operational contexts. Second, an outcome-oriented framework requires balancing standardization and flexibility: while harmonized indicators enhance comparability and learning, excessive rigidity may limit context-specific adaptation. Third, there are trade-offs across scales of analysis, as interventions targeting households may not fully capture system-level dynamics, and vice versa. Recognizing these trade-offs is essential to ensure that the operational definition remains both analytically sound and practically relevant.

6. Conclusions

This paper set out to develop an operational definition of resilience for agrifood systems, addressing the need to translate a widely used but often ambiguously defined concept into practical guidance for policy, programming, and measurement. Drawing on a participatory internal assessment, a review of the scientific literature, and FAO's institutional framework, the analysis highlights both the centrality of resilience in FAO's work and the challenges associated with its operationalization.

A first key finding is the persistent conceptual heterogeneity surrounding resilience. The literature offers multiple, coexisting conceptualizations – ranging from resilience as capacity to resilience as an outcome – each with distinct implications for measurement and policy design. This plurality is mirrored within FAO, where different divisions and offices adopt varying interpretations depending on their mandates, operational contexts, and areas of expertise. While this diversity reflects the multidimensional nature of resilience, it also contributes to fragmentation and limits the comparability and coherence of resilience-related interventions.

A second important insight concerns the distinction between resilience capacities and resilience outcomes, which emerges as a critical issue both in the literature and in FAO practice. Capacities such as prevention, anticipation, absorption, adaptation, and transformation are often treated as proxies for resilience itself, leading to a conflation between means and ends. This paper argues for a clearer separation between the two: resilience should be understood as a property reflected in welfare-relevant outcomes – such as food security, nutrition, and livelihoods – while capacities and interventions should be treated as mechanisms that contribute to achieving these outcomes. This distinction is essential to ensure analytical clarity and to support a more rigorous evaluation of resilience-building efforts.

Third, the analysis underscores the importance of adopting a dynamic and context-sensitive perspective. Resilience is inherently linked to the timing of shocks and the evolution of welfare trajectories over time. As such, its operationalization must explicitly account for different temporal phases – pre-shock, immediate post-shock, and medium- to long-term recovery – as well as for variations across contexts, including fragile and conflict-affected settings as opposed to non-crisis contexts. The proposed situational approach to operational definitions reflects this need, allowing resilience to be assessed in ways that are both flexible and aligned with FAO's diverse operational environments.

A fourth key contribution of the paper is the emphasis on outcome-oriented operationalization, supported by complementary indicators of capacities and mechanisms. By anchoring resilience in measurable welfare outcomes, the proposed framework provides a clear normative basis for assessing whether interventions effectively contribute to improving the resilience of agrifood systems. At the same time, the identification of capacity indicators across multiple scales – micro, meso, macro and programme – helps to trace the pathways through which resilience is built, facilitating a more comprehensive understanding of causal mechanisms and policy effectiveness.

The findings also highlight several operational challenges. Data limitations remain a major constraint, with existing information often fragmented, short-term, and insufficient to capture the dynamics of resilience processes. Methodological capacity is uneven across FAO offices, and the use of advanced evaluation approaches, such as causal inference methods, remains limited. In addition, knowledge sharing across divisions and offices is often constrained, reducing opportunities for learning and the scaling up of effective practices. Addressing these challenges will require sustained investment in data systems, analytical tools, and organizational learning mechanisms.

In this context, the proposed operational framework aims to strike a balance between conceptual rigour and practical applicability. Rather than prescribing a single, universal definition, it provides a structured yet flexible approach that can be adapted to different contexts, scales, and programmatic needs. This is consistent with the various FAO work-streams – normative, development, and humanitarian – which require the ability to operate across diverse environments and time horizons.

Finally, the paper emphasizes that operationalizing resilience necessarily involves managing trade-offs. These include trade-offs between short-term response and long-term trans-formation, between standardization and context-specificity, between different scales of analysis, and across economic, social, and environmental dimensions of resilience. Recognizing and making these trade-offs explicit is crucial for informed decision-making and for ensuring that resilience-building efforts are both effective and aligned with broader development objectives.

In conclusion, by structuring resilience operationalization around situational definitions, the proposed approach provides a coherent basis for harmonizing FAO's operations while preserving the flexibility required across diverse programmes and contexts. It supports the identification of appropriate outcomes, indicators, and evaluation strategies by clarifying what resilience is expected to achieve in each setting and by explicitly linking resilience to the protection or improvement of welfare trajectories. At the same time, it facilitates comparability across interventions by providing a common interpretative framework: different programmes may target different capacities and operate under different constraints, but their contribution to resilience can be assessed consistently through the lens of context-specific outcomes and their evolution over time.

Looking ahead, the development of shared operational definitions represents an important step towards strengthening FAO's role as a knowledge hub and coordinating actor in resilience-building, but its effectiveness will depend on its concrete integration into practice. This implies, first, the development of a corporate Theory of Change (ToC) for resilience in agrifood systems, complemented by nested ToCs tailored to specific divisions, offices, or thematic areas, in order to clarify causal pathways and align interventions across the organization (Virkkunen and Bruun, 2022; Vähämäki *et al.*, 2026). Second, there is a need to invest in learning mechanisms and knowledge sharing, which may include *ex ante* evidence generation as well as *ex post* evidence generation, for instance, by identifying flagship programmes suitable for rigorous impact evaluation or selecting the most relevant intervention types to be assessed. Third, strengthening knowledge-sharing systems – both internally, through structured stocktaking and cross-unit learning, and externally, through communication and dissemination – will be essential to enhance coherence and scalability. Finally, sustained investment in human capital and analytical capacities will be critical to support the implementation, measurement, and continuous refinement of resilience approaches. By advancing along these directions, FAO can enhance the consistency, effectiveness, and accountability of its interventions, ultimately contributing to more resilient agrifood systems in an increasingly complex and risk-prone global environment.

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Annexes

Annex 1. Classification of background papers included in the literature review

This annex lists the papers included in the literature review and classifies them according to study type, i.e. conceptual and discussion papers, modelling approaches, empirical studies, and reviews and comparative analyses. The classification is intended to facilitate navigation of the heterogeneous literature on resilience. These papers underpin the extended review presented in Annex 2, which provides an overview of resilience conceptualizations, measurement approaches, and policy implications.

Conceptual and discussion papers

Barrett, C. & Constas, M. 2014. Toward a theory of resilience for international development applications. *Proceedings of the National Academy of Sciences of the United States of America*, 111(40): 14625-14630. https://doi.org/10.1073/pnas.1320880111

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Hoddinott, J. 2023. Food systems, resilience, and their implications for public action. In C. Béné & S. Devereux, eds. *Resilience and food security in a food systems context*, pp. 1-24. Palgrave Macmillan. https://doi.org/10.1007/978-3-031-23535-1_6

Meuwissen, M., Feindt, P., Spiegel, A., Termeer, C.J.A.M., Mathijs, E., de Mey, Y., Finger, R., Wauters, E., Urquhart, J., Vigani, M., Zawalinska, K., Herrera, H., Nicholas, P., Hansson, H., Paas, W., Slijper, T., Coopmans, I., Vroege, W. & Reidsma, P. 2019. A framework to assess the resilience of farming systems. *Agricultural Systems*, 176: 102656. https://doi.org/10.1016/j.agsy.2019.102656

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Alinovi, L., Mane, E. & Romano, D. 2008. Towards the measurement of household resilience to food insecurity: An application to Palestinian households. In R. Sibrian, ed. *Deriving food security information from national household budget surveys. Experiences, achievement, challenges*, pp. 137-152. Rome, FAO. https://www.fao.org/4/i0430e/i0430e00.htm

Amparore, A., Constas, M.A., Fossi, F. *et al.* 2023. The Data in Emergencies (DIEM) Hub for evaluating multiple shock impacts on food security. *Nature Food*, 4: 628-629. https://doi.org/10.1038/s43016-023-00825-7

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Empirical studies

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d'Errico, M., Romano, D. & Pietrelli, R. 2018. Household resilience to food insecurity: Evidence from Tanzania and Uganda. *Food Security*, 10(4): 1033-1054. https://doi.org/10.1007/s12571-018-0820-5

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Maxwell, D., Tesfay, G. & Abadi, N. 2013. *Resilience, food security dynamics, and poverty traps in northern Ethiopia: Analysis of a biannual panel dataset, 2011-2013*. Feinstein International Center, Tufts University. https://fic.tufts.edu/wp-content/uploads/Resilience-Food-Security-Dynamics.pdf

Paz, B., Squarcina, M. & Wollni, M. 2025. *Building resilient households among coffee farmers in Rwanda: The role of voluntary sustainability standards*. Working Paper, University of Goettingen, Germany.

Phadera, L., Michelson, H., Winter-Nelson, A. & Goldsmith, P. 2019. Do asset transfers build household resilience? *Journal of Development Economics*, 138: 205-227. https://doi.org/10.1016/j.jdeveco.2019.01.003

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Slijper, T., de Mey, Y., Poortvliet, M. & Meuwissen, M. 2021. Quantifying the resilience of European farms using FADN. *European Review of Agricultural Economics*, 49: 1–18. https://doi.org/10.1093/erae/jbab042

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Upton, J., Tennant, E., Fiorella, K.J. & Barrett, C.B. 2021. COVID-19, household resilience, and rural food systems: Evidence from Southern and Eastern Africa. In C. Béné & S. Devereux, eds. *Resilience and food security in a food systems context*, pp. 281–320. Palgrave Macmillan. https://link.springer.com/chapter/10.1007/978-3-031-23535-1_9

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Reviews and comparative analyses

Barrett, C.B., Ghezzi-Kopel, K., Hoddinott, J., Homami, N., Tennant, E., Upton, J. & Wu, T. 2021. A scoping review of the development resilience literature: Theory, methods and evidence. *World Development*, 146: 105612. https://doi.org/10.1016/j.worlddev.2021.105612

Brooks, N., Faget, D. & Heijkoop, P. 2019. *Tools for measurement of resilience in Nepal: Literature review*. DAI Europe. https://assets.publishing.service.gov.uk/media/5cff7c18e5274a3cc494e7b1/Resilience_measurement_LitRev_FINAL-updated1_ML_June_2019.pdf

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Annex 2. Review of the economic literature on resilience

A. Resilience conceptualizations

The debate on resilience as applied to agrifood systems has evolved from skepticism to acknowledging that it has value added vis-à-vis existing concepts. Yet, the nature of resilience remains subject to considerable debate and ambiguity. Disagreement over whether resilience is a state, a capacity or a condition, shapes how it is measured, whether *ex ante* characteristics or *ex post* outcomes are emphasized, and how causal claims are interpreted. Similarly, the locus of resilience – whether situated in individuals, households, communities, institutions, or entire systems – determines the appropriate scale of analysis and the type of interventions considered legitimate, ranging from asset-based support to systemic governance reform. The temporal dimension remains contested: some approaches focus on short-term coping and recovery from shocks, while others emphasize longer-term adaptation, learning, and transformation in the presence of persistent stressors. Finally, different contexts frame the resilience concept differently, as it has been used across development economics, humanitarian studies, and social-ecological systems research.

Drawing on the selected corpus of literature, five dominant conceptualizations can be identified:

- Resilience as capacity (Alinovi *et al.*, 2008; FAO, 2016; d'Errico *et al.*, 2018; Smith and Frankenberger, 2018);
- Resilience as return to equilibrium (Pimm, 1984; Knippenberg *et al.*, 2019);
- Resilience as transformability (Walker *et al.*, 2004; Reyers *et al.*, 2018);
- Resilience as a normative condition (Barrett and Constas, 2014; Cissé and Barrett, 2018);
- Resilience as minimized cumulative losses (Alloush and Carter, 2024).

Resilience concepts: similarities and differences

The resilience literature encompasses a set of distinct yet partially overlapping conceptualizations that differ in how resilience is defined, what its key analytical features are, and what the limitations of each approach are (Table A1). Together, these approaches reflect different theoretical traditions and address distinct analytical and policy needs.

A widely adopted perspective conceptualizes resilience as capacity, defining it as the ability of individuals, households, or communities to absorb, cope with, and recover from shocks and stressors without long-lasting adverse consequences for well-being (Alinovi *et al.*, 2008; FAO, 2016). In this view, resilience is an *ex ante* and latent property, inferred from observable characteristics rather than directly measured. These characteristics are typically organized into multidimensional frameworks, such as absorptive, adaptive, and transformative capacities, or pillars including assets, access to basic services, social safety nets, and adaptive capacity (Smith and Frankenberger, 2018; FAO, 2016). The appeal of this approach lies in its action-oriented nature: by identifying capacities that are presumed to buffer shocks, it offers clear entry points for programming and investment. However, this approach has been criticized for its weak normative grounding and for conflating inputs with outcomes, as improvements in measured capacity do not necessarily translate into realized welfare gains when shocks occur (Barrett *et al.*, 2021; Upton *et al.*, 2022).

A second conceptualization defines resilience as return to equilibrium, drawing primarily on ecological and engineering traditions. Here, resilience is understood as the speed with which a system returns to its original state following a disturbance (Pimm, 1984). This approach is explicitly *ex post* and focuses on recovery trajectories and shock persistence (Knippenberg *et al.*, 2019). While this perspective provides a clear temporal link between shocks and outcomes, it rests on the assumption that the pre-shock state is both stable and desirable. In development contexts

characterized by chronic poverty or structural inequality, this assumption is problematic, as returning to the pre-shock equilibrium may simply reproduce deprivation rather than signal meaningful resilience (Barrett and Constas, 2014).

A more radical departure from equilibrium thinking is offered by the transformability perspective. Rather than equating resilience with persistence or recovery, this approach emphasizes the capacity of systems to shift into fundamentally new configurations when existing ecological, economic, or social structures become untenable (Walker *et al.*, 2004). Resilience is thus associated with nonlinearity, thresholds, regime shifts, and human agency, and is evaluated in relation to long-term sustainability rather than short-term stability (Reyers *et al.*, 2018). While this approach offers a powerful lens for understanding poverty traps and unsustainable development trajectories, it is difficult to operationalize at the household level and remains weakly anchored to short-run welfare outcomes (Barrett *et al.*, 2021).

A fourth strand conceptualizes resilience as a normative condition, explicitly grounding the concept in welfare economics and poverty analysis. In this framework, development resilience is defined as the capacity over time to avoid falling below a socially unacceptable minimum standard of living in the face of stressors and shocks (Barrett and Constas, 2014). Resilience is therefore forward-looking and probabilistic, capturing the stochastic dynamics of well-being rather than realized outcomes alone (Cissé and Barrett, 2018). This approach offers clear normative clarity and aligns closely with poverty reduction objectives. However, it may conflate resilience with poverty dynamics and overlook welfare improvements that occur below the threshold, and its results are sensitive to threshold choice and outcome selection (Upton *et al.*, 2022).

Finally, a recent contribution defines resilience as minimized cumulative losses, reframing the concept as the extent to which households minimize cumulative current and future welfare losses caused by shocks relative to a counterfactual no-shock trajectory (Alloush and Carter, 2024). This approach is firmly grounded in welfare economics and impact evaluation, explicitly modelling both immediate shock impacts and longer-term scarring effects. While conceptually rigorous and closely tied to welfare outcomes, this approach imposes demanding data and identification requirements and is less suited to routine monitoring in data-scarce environments.

Although the five resilience conceptualizations mentioned above originate in different disciplinary traditions, they share a common concern with how individuals, households, or systems respond to shocks and stressors over time. As summarized in Table A1, all approaches conceptualize resilience as inherently dynamic, linking current conditions to future outcomes under uncertainty. This temporal dimension distinguishes resilience from static measures of poverty or well-being and constitutes a unifying feature across otherwise diverse frameworks. Beyond this shared emphasis on dynamics, however, the conceptualizations diverge along several critical dimensions, such as their ontological status and normative foundations.

One fundamental difference concerns the ontological status of resilience – that is, whether resilience is treated as an input, an outcome, or a system property. Capacity-based approaches locate resilience in a set of latent, *ex ante* characteristics that are presumed to condition responses to shocks. In contrast, equilibrium-based, normative, and cumulative-loss approaches conceptualize resilience as an outcome or trajectory that can only be observed *ex post* or over a future horizon. Transformability perspectives depart further, situating resilience at the level of systems rather than individuals and defining it in terms of the ability to shift between development pathways, rather than to preserve or restore a given state.

The conceptualizations also differ in how they treat persistence versus change. Equilibrium-based approaches equate resilience with the ability to return to a pre-shock state, implicitly valuing stability.

Capacity-based approaches share a similar logic, emphasizing the maintenance of function in the face of shocks, even if recovery dynamics are not explicitly modelled. Transformability frameworks explicitly reject persistence as an inherent good, arguing instead that systems may be highly resilient in undesirable states, such as poverty traps or environmentally degrading regimes. Normative and cumulative-loss approaches occupy an intermediate position: while they recognize the importance of recovery and stability, they evaluate persistence through its implications for welfare rather than treating it as intrinsically desirable.

Finally, the five conceptualizations differ in their scope and level of analysis. Capacity, normative, and cumulative-loss approaches are primarily micro-oriented, focusing on individuals or households and their welfare trajectories. Equilibrium-based approaches can operate at both the micro and system levels but retain a strong focus on observable recovery paths. Transformability frameworks are inherently multi-scalar, emphasizing cross-level interactions, governance structures, and social–ecological feedback.

A second key axis of differentiation relates to the role of normativity. Capacity-based and return to equilibrium approaches typically embed normative judgments implicitly, treating resilience as desirable without specifying the welfare benchmark against which it should be evaluated. By contrast, resilience as a normative condition explicitly anchors resilience to socially defined minimum standards of well-being, such as poverty or food security thresholds. The cumulative-loss framework similarly embeds normativity but does so through welfare economics by quantifying avoided losses relative to a counterfactual. Transformability approaches introduce normativity at a broader level, emphasizing the desirability of development pathways and long-term sustainability rather than individual welfare thresholds.

Overall, Table A1 demonstrates that the resilience literature is characterized by divergent views on what resilience is and what objectives it should serve. These differences are consequential, shaping measurement strategies and data requirements, and policy implications.

Measurement and data requirements across resilience conceptualizations

The diversity of resilience conceptualizations reviewed above translates directly into substantial heterogeneity in measurement strategies and data requirements. As summarized in Table A2, each conceptualization of resilience implies distinct choices regarding the unit of analysis, the variable of interest, the temporal resolution of data, and the identification strategy used to infer resilience. These differences are not merely technical: they fundamentally shape what aspects of resilience can be observed, compared, and acted upon in empirical research and policy design.

Approaches that conceptualize resilience as capacity are the least demanding in terms of data requirements. Because resilience is treated as a latent, *ex ante* property inferred from observable characteristics, these approaches can be implemented using cross-sectional data or sparsely populated panels. Composite indices such as RIMA or TANGO rely primarily on household surveys that capture assets, access to services, and other structural features. As a result, they are highly operationally feasible and have been widely adopted in development practice. However, the associational nature of the underlying identification strategy – typically factor analysis or structural equation modelling – means that these measures provide limited insight into the dynamic effects of shocks or the realized welfare consequences of interventions.

Conceptualizations that define resilience as return to equilibrium impose more stringent data requirements. Because resilience is inferred from post-shock recovery trajectories, high-frequency panel data are often necessary to observe recovery dynamics, shock persistence, and repeated disturbances. Monthly or seasonal data substantially improve identification, particularly in shock-

prone contexts where welfare outcomes fluctuate rapidly. While this approach offers a clearer temporal link between shocks and outcomes than capacity-based indices, its data intensity limits scalability, and its focus on recovery paths constrains the time horizon over which resilience can be meaningfully assessed.

In contrast, the transformability perspective involves a fundamentally different measurement logic. Rather than focusing on household-level welfare indicators, it emphasizes system states, regime shifts, and structural change across social-ecological systems. This approach often relies on qualitative or mixed-method data, including case studies, participatory diagnostics, and process tracking. The relevant time horizon is long and the frequency of the data is variable, reflecting the slow-moving nature of institutional and systemic transformations. Although this allows for rich contextual understanding, it also limits comparability between cases and poses challenges for integration with quantitative welfare analysis.

Approaches that conceptualize resilience as a normative condition occupy an intermediate position in terms of data demands. Measuring the probability that households remain above a normatively defined welfare threshold requires panel or pseudo-panel data with sufficient temporal depth to estimate conditional moments of well-being. Data frequency need not be as high as in recovery-based approaches, but the time horizon must be long enough to capture stochastic dynamics and future risk. This probabilistic framework offers stronger normative clarity than capacity-based measures, but it remains sensitive to threshold choice and to the availability of repeated observations on the same units.

Finally, defining resilience as minimized cumulative losses imposes the most demanding data and identification requirements. Resilience is measured relative to a counterfactual no-shock trajectory. Therefore, panel data with sufficient pre- and post-shock observations are essential. Identification typically relies on impact evaluation techniques, including experimental or quasi-experimental designs, to construct credible counterfactuals. The relevant time horizon is necessarily long, as cumulative welfare losses and recovery paths unfold over multiple periods. Although this approach offers the strongest link between resilience and welfare economics – and supports cost–benefit analysis – it is less suited for routine monitoring in data-scarce environments. However, it is the only approach that can be used at any scale of analysis – i.e. households, population groups, or systems.

Taken together, Table A2 highlights that trade-offs between conceptual rigour, empirical credibility, and operational feasibility are unavoidable in resilience research. For instance, capacity-based approaches dominate applied work largely because of their relatively modest data requirements, whereas outcome-oriented conceptualizations offer stronger welfare interpretations at the cost of greater data and identification complexity. Recognizing these trade-offs is essential, particularly in development contexts where data constraints, policy timelines, and normative objectives must be carefully balanced.

Policy implications of alternative resilience conceptualizations

The conceptualization of resilience adopted by researchers and policymakers has direct and consequential implications for policy objectives, intervention design, and evaluation criteria. As summarized in Table A3, each resilience framework prioritizes different dimensions of welfare, operates on distinct time horizons, and implies specific policy instruments, while simultaneously introducing blind spots.

Conceptualizations that define resilience as capacity naturally lead to policies aimed at strengthening households' *ex ante* ability to cope with shocks. Typical interventions include asset transfers, livelihood diversification programmes, social protection schemes, and investments in access to basic

services. These policies are attractive to donors and implementing agencies because they are highly actionable, scalable, and compatible with existing programming and monitoring systems. However, the implicit assumption that enhanced capacities will translate into improved welfare outcomes is rarely tested directly. This creates a risk that policies may succeed in building measured capacity without delivering meaningful reductions in vulnerability or welfare losses when shocks occur.

Policies informed by resilience as return to equilibrium emphasize rapid recovery following adverse events. This perspective aligns closely with humanitarian and disaster-response objectives, prioritizing emergency assistance, short-term safety nets, and mechanisms that restore livelihoods quickly. Such interventions are particularly valuable in crisis contexts where speed is paramount. At the same time, this approach risks reproducing pre-shock conditions that may be undesirable, especially in settings characterized by chronic poverty or structural inequality. As a result, recovery-focused policies may stabilize welfare in the short run while doing little to alter long-term development trajectories.

The transformability perspective implies a fundamentally different policy agenda. Rather than reinforcing existing systems, it calls for interventions that enable shifts away from unsustainable or undesirable development pathways. Policy instruments associated with this framework include institutional reform, governance innovation, and system-level interventions that alter underlying feedback and power structures. While such policies are potentially transformative and well-suited to addressing systemic risks, they are also politically demanding, difficult to operationalize, and challenging to evaluate. Moreover, their welfare impacts often materialize only in the long run, complicating accountability and short-term policy assessment.

When resilience is conceptualized as a normative condition, policy objectives centre on reducing the probability that individuals or households fall below socially defined minimum standards of well-being. This framing supports policies such as poverty-targeted social protection, insurance schemes, and risk-reduction measures designed to stabilize welfare over time. Its principal strength lies in its clear normative benchmark, which facilitates alignment with poverty reduction goals. However, this approach may overlook welfare improvements that occur below the threshold. Furthermore, policy effectiveness becomes sensitive to the choice of the threshold itself, a decision that is inherently political.

Finally, conceptualizing resilience as minimized cumulative losses shifts policy attention toward minimizing the total welfare costs of shocks over time. This perspective strongly supports investments in insurance, shock-contingent transfers, scalable safety nets, and risk-financing mechanisms. Its key advantage is the explicit link it establishes between policy interventions and welfare outcomes, allowing for cost–benefit analysis and comparison across alternative policy options. However, the data and evaluation requirements associated with this approach limit its applicability for routine monitoring and may restrict its use to larger programmes and well-designed impact evaluation settings.

Table A1. Comparative conceptualizations of resilience

Conceptualization	Core definition	Ontological status	Key analytical features	Main limitations
Resilience as capacity	Capacity to absorb, cope with, and recover from shocks without long-term welfare loss	Latent; resilience as explanatory variable	Multidimensional (assets, services, social capital); action-oriented; implicitly normative	Weak normative anchoring; conflates inputs with outcomes; limited interpretability/ comparability
Resilience as return to equilibrium	Speed of recovery to pre-shock state following disturbance	*Ex post* system trajectory	Focus on recovery dynamics and shock persistence; assumes stable equilibrium	Assumes pre-shock state is desirable; equates stability with resilience; ill-suited to poverty traps
Resilience as transformability	Capacity to shift into a fundamentally new system when existing structures become untenable	System-level property; forward-looking	Emphasis on thresholds, regime shifts, agency, governance, and power	Difficult to operationalize at micro level; weak welfare anchoring; limited comparability
Resilience as a normative condition	Probability of avoiding falling below a socially unacceptable welfare threshold over time	Normative, probabilistic outcome; forward-looking	Explicitly welfare-based; rooted in poverty dynamics; thresholds; regime shifts	Conflates resilience with poverty avoidance; sensitive to threshold and outcome choice
Resilience as minimized cumulative losses	Extent to which cumulative welfare losses from shocks are minimized relative to a counterfactual	Realized (*ex post*) welfare outcome	Shock-centred; counterfactual-based; focus on recovery paths	High data and identification requirements; sensitive to outcome measure and time horizon length

Source: Authors' own elaboration.

Table A2. Measurement and data requirements across resilience conceptualizations

Conceptualization	Unit of analysis	Variable of interest	Data frequency required	Time horizon required	Identification strategy	Causal inference	Operational feasibility
Resilience as capacity	Households/ groups	Latent resilience capacity (index)	Low (cross-sectional or sparse panel)	Short to medium	Factor analysis/ Structural Equation Models (associational)	No	High
Resilience as return to equilibrium	Households/ groups	Recovery path of welfare indicator	High (monthly or seasonal)	Short to medium	Dynamic trajectory analysis	No	Low/ Medium
Resilience as transformability	Systems	System state and regime shifts	Variable	Long	Qualitative process tracing	No	Low
Resilience as a normative condition	Households/ groups	Probability of staying above welfare threshold	Medium (panel or pseudo-panel)	Medium to long	Conditional moments/ probabilistic modelling	Yes/No	Medium
Resilience as minimized cumulative losses	Households/ groups/ systems	Cumulative welfare losses relative to counterfactual	Medium to high (panel)	Long	Impact evaluation/ counterfactual estimation	Yes	Medium

Source: Authors' own elaboration.

Table A3. Policy implications across resilience conceptualizations

Conceptualization	Primary policy objective	Policy instruments	Strengths for policy design	Key policy risks/blind spots
Resilience as capacity	Strengthen households' ability to cope with shocks *ex ante*	Asset transfers, social protection, livelihood diversification, access to services	Highly actionable; attractive for donors (programming); easy to monitor	Assumes capacities translate into outcomes; weak accountability for actual welfare impacts
Resilience as return to equilibrium	Accelerate recovery after shocks	Emergency assistance, short-term safety nets, disaster response mechanisms	Well-suited for humanitarian response; focus on speed and effectiveness of recovery	Risks restoring undesirable pre-shock conditions; limited contribution to structural change
Resilience as transformability	Enable shifts away from unsustainable or undesirable development pathways	Institutional reform, governance innovation, system-level interventions	Addresses systemic risks; aligns with (weak) sustainability transitions	Difficult to operationalize; weak short-run welfare accountability; politically demanding
Resilience as a normative condition	Reduce the risk of falling below minimum welfare standards	Poverty-targeted social protection, insurance, risk-reduction policies	Clear welfare benchmark; integrates risk and poverty objectives	Insensitive to welfare improvements below threshold; threshold choice is contentious
Resilience as minimized cumulative losses	Minimize total welfare losses from shocks over time	Insurance, shock-contingent transfers, scalable safety nets, risk financing	Directly links policy to welfare impacts; supports cost-benefit analysis	High data and evaluation requirements; less suited for routine monitoring

Source: Authors' own elaboration.

B. Common misconceptions

Despite its growing prominence, the resilience concept is often affected by persistent misunderstandings that blur its analytical boundaries and weaken its operational use. These misconceptions frequently arise from its partial overlap with related concepts such as vulnerability, sustainability, and stability, which are sometimes treated as synonyms rather than distinct constructs. Clarifying these relationships is essential to avoid conceptual conflation and to ensure analytical precision. This section addresses the most common misconceptions surrounding resilience and delineates its specific contribution to development and food security analysis.

Vulnerability vs resilience

Vulnerability and resilience are central to Food and Nutrition Security (FNS) analysis in shock-prone contexts, yet they are often used interchangeably despite capturing distinct analytical dimensions. Vulnerability refers to the *ex ante* probability that individuals or households will experience food or nutrition insecurity following exposure to shocks, reflecting exposure, sensitivity and limited coping capacity (Alwang *et al.*, 2001; Chaudhuri, 2003; Ligon and Schechter, 2003). It is forward-looking and probabilistic, focusing on identifying who is at risk of falling below normatively defined food and nutrition standards, thereby addressing the stability dimension of FNS and the requirement that food security be ensured "at all times" (UNISDR, 2015; Montalbano and Romano, 2022).

Resilience, by contrast, refers to the capacity of individuals, households, or agrifood systems to absorb, adapt to, and recover from shocks while maintaining or regaining acceptable levels of food and nutrition security over time (Holling, 1973; Folke, 2016; UNISDR, 2015). In the FNS context, resilience focuses on post-shock dynamics, including the severity, duration, and persistence of food insecurity episodes. It is explicitly normative in development analysis, as it evaluates whether agents can avoid long-lasting deprivation or poverty traps rather than simply return to a pre-shock equilibrium that may itself reflect chronic food insecurity (Barrett and Constas, 2014; Montalbano and Romano, 2022).

Although closely related, vulnerability and resilience are not simple inverses. Households may face high vulnerability yet recover quickly through coping strategies or social networks, while others with low short-term vulnerability may lack resilience if shocks trigger persistent food and nutrition insecurity (Montalbano and Romano, 2022). This reflects the fact that vulnerability concerns the likelihood of adverse outcomes, whereas resilience concerns the trajectory of outcomes following a shock, including non-linear recovery dynamics (Lecina-Diaz *et al.*, 2024). The two concepts are therefore best understood as complementary analytical lenses: vulnerability informs prevention and targeting, while resilience captures recovery, persistence, and adaptation in FNS outcomes (Barrett and Constas, 2014).

Resilience vs sustainability

Resilience and sustainability are frequently conflated in policy discourse, yet they remain analytically distinct in terms of temporal orientation, analytical focus, and normative content. In the FNS literature, resilience is defined as the capacity of households, communities, or agrifood systems to absorb, adapt to, and transform in response to shocks while maintaining food and nutrition security outcomes (Alinovi *et al.*, 2008; Barrett and Constas, 2014; FAO, 2016). It is conceptualized as an *ex ante* capacity inferred from assets, livelihood diversity, market access, and institutional support.

Perrings (2006) refines this definition by emphasizing that resilience concerns the ability of a system to remain within a desirable stability domain, drawing attention to thresholds, irreversibility, and the risk of regime shifts that may lead to persistent declines in food and nutrition outcomes.

Sustainability, by contrast, refers to the ability of agrifood systems to deliver food and nutrition security for present and future generations without undermining environmental, economic, or social foundations (WCED, 1987; FAO *et al.*, 2018). From a development economics perspective, sustainability evaluates long-term trajectories and intergenerational equity and is formalized as maintaining the value of the asset base underpinning human well-being (Perrings, 2006).

The distinction between the two concepts is most evident in their temporal focus. Resilience emphasizes short- to medium-term dynamics, assessing whether food and nutrition outcomes can be stabilized following shocks and whether households avoid irreversible welfare losses (Barrett and Constas, 2014; FAO, 2016). Sustainability adopts a long-term perspective, addressing whether agrifood systems can continue to deliver adequate and nutritious food under cumulative pressures such as climate change and environmental degradation (FAO *et al.*, 2018; FAO, 2021b). Sustainability failures may therefore arise not only from gradual degradation but also from exposure to shocks in the absence of sufficient resilience (Perrings, 2006).

Misalignments between resilience and sustainability have important implications. Systems may be resilient yet unsustainable if they stabilize low-productivity or resource-degrading equilibria, or sustainable in principle but fragile if they lack adaptive capacity to shocks (Perrings, 2006; Tanner *et al.*, 2015). From a development perspective, resilience and sustainability are complementary but non-substitutable: resilience protects food and nutrition outcomes against shocks, while sustainability provides the normative framework ensuring that resilience-building supports long-term, equitable, and environmentally sound agrifood systems.

Resilience vs stability

Stability and resilience are closely related but analytically distinct concepts describing how systems respond to disturbances. Stability refers to the capacity of a system to resist shocks or return rapidly to a predefined equilibrium and is commonly associated with low volatility and predictable trajectories in both economic and ecological analysis (Holling, 1973). This perspective implicitly assumes that equilibria are desirable and that deviations are temporary.

Resilience, by contrast, is grounded in non-equilibrium perspectives and emphasizes the capacity of systems to absorb shocks, adapt, and reorganize while maintaining core functions, even if structures change (Folke *et al.*, 2004, 2010). Rather than resistance or rapid recovery, resilience focuses on the magnitude of disturbance a system can tolerate without shifting into an undesirable regime.

These differences imply distinct policy priorities. Stability-oriented approaches emphasize efficiency and control under known conditions, whereas resilience-oriented approaches prioritize diversity, redundancy, and flexibility under uncertainty. Systems optimized for stability may become fragile when exposed to large or systemic shocks, while resilient systems may exhibit short-term variability but stronger long-term viability (Arrow *et al.*, 1995; Daly, 1996).

The development resilience framework proposed by Barrett and Constas (2014) clarifies these distinctions by defining resilience as the capacity to avoid unacceptable standards of living over time in the face of shocks. In this framework, stability is neither necessary nor sufficient for resilience: systems may be stable yet persistently poor, or volatile yet resilient if well-being remains above critical thresholds. For FNS policy, this implies a shift away from narrow stabilization objectives toward strategies that enhance preventive, adaptive, and transformative capacity within ecological and institutional constraints.

C. Why resilience to food insecurity?

Resilience to food insecurity is justified on both theoretical and practical grounds, as it captures dynamic features of risk, response, and welfare that are only partially addressed by related concepts such as vulnerability and sustainability. From a theoretical perspective, resilience constitutes a distinct analytical construct. Vulnerability focuses primarily on the *ex ante* probability of experiencing food insecurity following exposure to shocks (Alwang *et al.*, 2001; Ligon and Schechter, 2003), while sustainability emphasizes the long-term viability of agrifood systems and their underlying asset base across generations (WCED, 1987; Perrings, 2006). Resilience, by contrast, centres on dynamic post-shock trajectories and the capacity of individuals, households, and agrifood systems to anticipate, prevent, absorb, adapt, and recover from shocks without incurring long-lasting food and nutrition insecurity (Barrett and Constas, 2014; FAO, 2016). This trajectory-based focus allows resilience analysis to explicitly address non-linear dynamics, thresholds, and persistence – key features of food insecurity in multi-risk contexts characterized by recurrent climate shocks, market volatility, conflict, and protracted crises

From a practical standpoint, the added value of resilience lies in its integrative nature. Resilience provides a common analytical and operational framework that facilitates collaboration across disciplines and communities of practice that have traditionally operated in silos, including humanitarian assistance, development programming, disaster risk reduction, climate change adaptation, and social protection (Béné *et al.*, 2015; United Nations, 2020). By framing food insecurity as the outcome of interacting shocks, stresses, risks, and response capacities across scales, resilience enables the design of interventions that explicitly link short-term relief with longer-term development objectives, consistent with the humanitarian–development–peace nexus (FAO, 2021b).

A further key contribution of resilience thinking is its emphasis on prevention and anticipation. Rather than prioritizing *ex post*, curative responses to food crises, resilience-oriented approaches foreground *ex ante* risk management, early warning systems, and anticipatory action (UNISDR, 2015; FAO, 2013). This shift is particularly relevant for food insecurity, where delayed responses often translate into irreversible losses in nutrition, productive assets, and human capital. By focusing on preventing food insecurity episodes or reducing their duration and severity, resilience aligns policy action with cost-effective strategies that preserve long-term welfare (Béné *et al.*, 2016).

Finally, resilience refocuses measurement and learning efforts. Conventional food security indicators often provide static snapshots that obscure volatility, recovery dynamics, and cumulative impacts. Resilience frameworks instead call for indicators and data systems capable of capturing multidimensional outcomes and temporal dynamics across scales – from households to value chains and agrifood systems (Constas *et al.*, 2014b; Knippenberg *et al.*, 2019). This measurement perspective strengthens evidence-based policymaking by enabling systematic learning about which interventions stabilize food access and diets under risk, for whom, and under what conditions.

These features explain why resilience has become a central organizing concept for addressing food insecurity. It does not replace vulnerability or sustainability, but complements them by offering a dynamic, integrative, and action-oriented framework that is particularly well suited to guiding policy and programming in increasingly shock-prone agrifood systems.

D. Policy definitions of resilience

The resilience definitions relevant for this assessment are drawn from both the scientific literature and official documents produced by international organizations. Among the former, the two definitions scholars refer to most widely are the ones from FAO's Resilience Index Measurement

Analysis - RIMA (FAO, 2016) and from the so-called "development resilience" proposed by Barrett and Constas (2014):

- "The capacity of a household to bounce back to a previous level of well-being (for instance, food security) after a shock" (FAO, 2016, p. 1).[33]
- "Development resilience is the capacity over time of a person, household or other aggregate unit to avoid poverty in the face of various stressors and in the wake of myriad shocks. If and only if that capacity is and remains high over time, then the unit is resilient" (Barrett and Constas, 2014, p. 14626).

Both definitions emphasize the ability of the agent under scrutiny to bounce back after experiencing a shock, but they also show significant differences – such as the level at which the agent should bounce back. Another common feature of these two sources – not reflected in the definition above but extensively discussed in the papers – is the focus they put on measurement issues.

In contrast, other definitions adopted by international organizations are more practitioner-oriented, being developed to serve the daily operation of those organizations. As such, they tend to cover all aspects of the organizations' mandates while reflecting the specificity of each organization:

- "The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management" (UNDRR, 2017).
- "The ability to prevent disasters and crises as well as to anticipate, absorb, accommodate or recover from them in a timely, efficient and sustainable manner. This includes protecting, restoring, and improving livelihood systems in the face of threats that impact agriculture, food and nutrition (and related public health)" (FAO, 2013, p. 91).
- "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" (United Nations, 2020, p. 11).
- "The capacity over time of agrifood systems, in the face of any disruption, to sustainably ensure availability of and access to sufficient, safe and nutritious food for all, and sustain the livelihoods of agrifood systems' actors" (FAO, 2021b, p. 6).
- "The capacity of social, economic, and ecosystems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity and structure as well as biodiversity in case of ecosystems while also maintaining the capacity for adaptation, learning and transformation." (IPCC, 2022, p. 7).

An important attempt promoted by FAO and other international organizations to standardize the definition took place in 2013-2014, with the so-called Resilience Measurement Technical Working Group (Constas *et al.*, 2014a, p. 11) that provided the following definition: "Resilience is the capacity of a household that ensures adverse stressors and shocks do not have long-lasting adverse development consequences." This is a very important definition because it emphasizes one of the

[33] This definition refers to the original definition that reflects initial efforts made at FAO to measure resilience to food insecurity (Alinovi *et al.*, 2008). Later FAO adopted the Resilience Measurement Technical Working Group definition (see Constas et al., 2014a, p. 11).

peculiar components of the resilience concept, that is the agent's capacity to withstand shocks and stressors, so that the agent – in this specific case a household, but easily scalable to lower- (e.g. individuals) or upper-level agents (e.g. the agrifood system) – would not have long-lasting adverse consequences, no matter which criterion is adopted to measure them.

Annex 3. List of reviewed documents

Table A4. Documents from the original selection

Reference	Type
Billi, M., Bórquez, R., Varela, J.C., Aldunce, P., Aspee, N., Beauchamp, E., Berríos, P., Cuevas, M., Loboguerrero, A. M., Mason Bustos, F., 2024. A pioneering approach to measure increased resilience to face climate change: Insights from the Race to Resilience Campaign. *Environmental Research Communications*, 6(9): 095006. https://doi.org/10.1088/2515-7620/ad6d37.	Methodological/ empirical evidence
FAO. 2021. *The State of Food and Agriculture 2021 – Making agrifood systems more resilient to shocks and stresses*. Rome. https://doi.org/10.4060/cb7351en	Strategic/ normative
FAO. 2024. *Emergencies and Resilience Programme Approach*. Rome, FAO.	Programmatic/ operational
FAO. 2025a. *BL4 Annex. Results Framework*. Rome.	Strategic/ normative
FAO. 2025b. Resilience Toolbox – Application to Sudan. Rome.	Programmatic/ operational
FAO. 2025c. *Transforming Food and Agriculture Through a Systems Approach.* Rome. https://doi.org/10.4060/cd6071en	Strategic/ normative
FAO. 2025d. *Entry points for enhancing the efficiency and effectiveness of emergencies and resilience operations for sustained impact at scale. Position paper + table that describes disbursement.* Rome.	Strategic/ normative
FAO. 2025e. *Indicator guidance and minimum monitoring and evaluation requirements. FAO Emergency and Resilience Plans 2026–2028 and Global Appeal.* Rome.	Programmatic/ operational
Rincón Barajas, J.A., Schuster, M., Skidan, V. & Porciello, J. 2025a. *Mapping FAO's agrifood system interventions and outcomes for resilience programming – An analysis using large language models.* Rome, FAO. https://doi.org/10.4060/cd7923en.	Programmatic/ operational
Rincón Barajas, J.A., Shabir, G., Schuster, M., Skidan, V., Porciello, J. 2025b. *Linking FAO agrifood system interventions to subnational spatial typologies for resilience building – Evidence from Afghanistan, Nigeria and South Sudan.* Rome, FAO. https://doi.org/10.4060/cd7606en	Programmatic/ operational
Ulimwengu, J.M. & Marivoet, W. 2025. *Multi-Shock Index (MSI) for Food Security. DIEM Data and the Dual Functionality of the Multi-Shock Index (MSI).* Working Paper. Washington, DC, IFPRI. February 2025. https://www.foodsecurityportal.org/sites/default/files/2025-04/DIEM%20Data%20and%20the%20Dual%20Functionality%20of%20the%20MSI_0.pdf	Methodological/ empirical evidence
United Nations. 2020. *United Nations Common Guidance on Helping Build Resilient Societies*. New York, USA, United Nations Sustainable Development Group. https://unsdg.un.org/sites/default/files/2021-09/UN-Resilience-Guidance-Final-Sept.pdf	Strategic/ normative
Wouterse, F. 2025. *Transformative Resilience*. Rome, FAO. Unpublished.	Strategic/ normative

Source: Authors' own elaboration.

Table A5. Documents suggested at the kick-off meeting

Reference	Type
FAO. 2024. *Building resilience in the region through agrifood systems transformation and the use of early-warning systems*. FAO Regional Conference for Latin America and the Caribbean. Report of the thirty-eighth session, Georgetown, Guyana, 11–13 March and 18–21 March 2024. https://openknowledge.fao.org/server/api/core/bitstreams/66d52f0c-2448-4082-8f5b-4f90383e9733/content	Programmatic/ operational
FAO. 2024. *Building resilience through agrifood systems transformation*. FAO Regional Conference for Africa. Report of the thirty-third session, Rabat, the Kingdom of Morocco, 26–28 March 2024 and 18–20 April 2024. https://openknowledge.fao.org/server/api/core/bitstreams/b66f9eb0-0ebb-40bc-bb68-d7720ae4a6a4/content	Programmatic/ operational
FAO. 2024. *Building resilience through agrifood systems transformation*. FAO Regional Conference for Europe. Report of the thirty-fourth session, Rome, Italy, 14–17 May 2024. https://openknowledge.fao.org/server/api/core/bitstreams/5aec210a-a80a-4e4e-91c0-cc7d42d7171f/content	Programmatic/ operational
FAO. 2024. *Building resilience through agrifood systems transformation*. FAO Regional Conference for Asia and the Pacific. Report of the thirty-seventh session, Colombo, Sri Lanka, 31 January–2 February 2024 and 19–22 February 2024. https://openknowledge.fao.org/server/api/core/bitstreams/45e14b7a-9b1b-4081-9bc5-50788c9730c0/content	Programmatic/ operational
FAO. 2024. *Building Resilience through Transforming Agrifood Systems*. FAO Regional Conference for the Near East. Report of the thirty-seventh session, Rome, Italy, 14–17 May 2024. https://openknowledge.fao.org/server/api/core/bitstreams/e2a08d81-2c66-4e37-9ebc-749a772d0f2d/content	Programmatic/ operational
FSIN (Food Security Information Network) & GNAFC (Global Network Against Food Crises). 2025. *Global Report on Food Crises 2025*. Rome. www.fsinplatform.org/grfc2025	Strategic/ normative
HLPE (High Level Panel of Expert on Food Security and Nutrition). 2025a. *Tackling climate change, biodiversity loss and land degradation through the right to food. Background note for the Committee on World Food Security's High-Level Forum held on 12 May 2025, in Rome, Italy*. Rome, FAO. https://www.fao.org/fileadmin/templates/cfs/Docs2324/HLF-RioConventions_RightToFood/HLFRioRtF-HLPE_Note.pdf	Strategic/ normative
HLPE. 2025b. *Building resilient food systems*. High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome, FAO. https://www.fao.org/cfs/cfs-hlpe/publications/hlpe-20	Strategic/ normative
HLPE. 2025c. *Strengthening responsible investments and finance for food security and nutrition. Background note for the Committee on World Food Security's High-Level* Forum in October 2025 in Rome, Italy. Rome, FAO. https://www.fao.org/docs/devhlpelibraries/default-document-library/hlpe-fsn-finance-background-note_layout_key-messages.pdf?sfvrsn=41223dcd_10	Programmatic/ operational

Source: Authors' own elaboration.

Table A6. Documents suggested during the online survey

Reference	Type
Boscolo, M., Lehtonen, P., Di Girolami, E. & Duong, G. 2025. *Enhancing the sustainability and financing of forest-based value chains*. Rome, FAO. https://doi.org/10.4060/cd5197en	Programmatic/ operational
Ciesla, W.M. & Donaubauer, E. 1994. *Decline and dieback of trees and forests*. FAO Forestry Paper No. 120. Rome, FAO. https://www.fao.org/4/ap429e/ap429e00.pdf	Strategic/ normative
FAO. 2015. *A guide to the formulation of the Country Programming Framework (CPF)*. Rome. https://openknowledge.fao.org/items/f32a74ec-28ff-44a1-babd-03d082d8762f	Programmatic/ operational
FAO. 2016. *Resilience Index Measurement and Analysis II - RIMA-II*. Rome. https://openknowledge.fao.org/server/api/core/bitstreams/c61a9a8c-feb4-4199-8cb1-7085c84908c8/content	Methodological/ empirical evidence
FAO. 2022a. *The future of food and agriculture - Drivers and triggers for transformation*. The Future of Food and Agriculture, no. 3. Rome. https://doi.org/10.4060/cc0959en	Strategic/ normative
FAO. 2022b. *Türkiye - Syrian refugee resilience plan 2022-2023*. Rome. https://doi.org/10.4060/cc2343en	Programmatic/ operational
FAO. 2023a. *Brazilian semiarid survey - Family farmers' resilience strategies during COVID-19*. Rome. https://openknowledge.fao.org/items/449d64a5-24de-4a60-9d55-c9f91ef08257	Methodological/ empirical evidence
FAO. 2023b. *Importance of investing in agriculture in emergency contexts*. Briefing note, March 2023. Rome. https://doi.org/10.4060/cc4892en	Programmatic/ operational
FAO. 2023c. *Improving human and planetary health through healthy diets from sustainable agrifood systems*. Rome. https://www.unnutrition.org/news/improving-human-and-planetary-health-through-healthy-diets-sustainable-agrifood-systems	Strategic/ normative
FAO. 2024a. *From Evidence to Response: Advancing Sustainable Land Management in Botswana. Insights from the SHARP+ and Behaviour Change Assessment*. FAO Drylands Sustainable Landscapes Impact Program (DSL-IP). Rome. https://openknowledge.fao.org/items/70acade8-707a-472c-b4a7-a5a7b2d62485	Programmatic/ operational
FAO. 2024b. *From Evidence to Response: Advancing Sustainable Land Management in Malawi. Insights from the SHARP+ and Behaviour Change Assessment*. FAO Drylands Sustainable Landscapes Impact Program (DSL-IP). Rome. https://openknowledge.fao.org/server/api/core/bitstreams/0bb8949d-2744-452c-b06a-620cf55a53c2/content	Programmatic/ operational
FAO. 2024c. *From Evidence to Response: Advancing Sustainable Land Management in Namibia. Insights from the SHARP+ and Behaviour Change Assessment*. FAO Drylands Sustainable Landscapes Impact Program (DSL-IP). Rome. https://openknowledge.fao.org/items/34c155f6-6e18-4d98-8e5c-3d73c30995d2	Programmatic/ operational

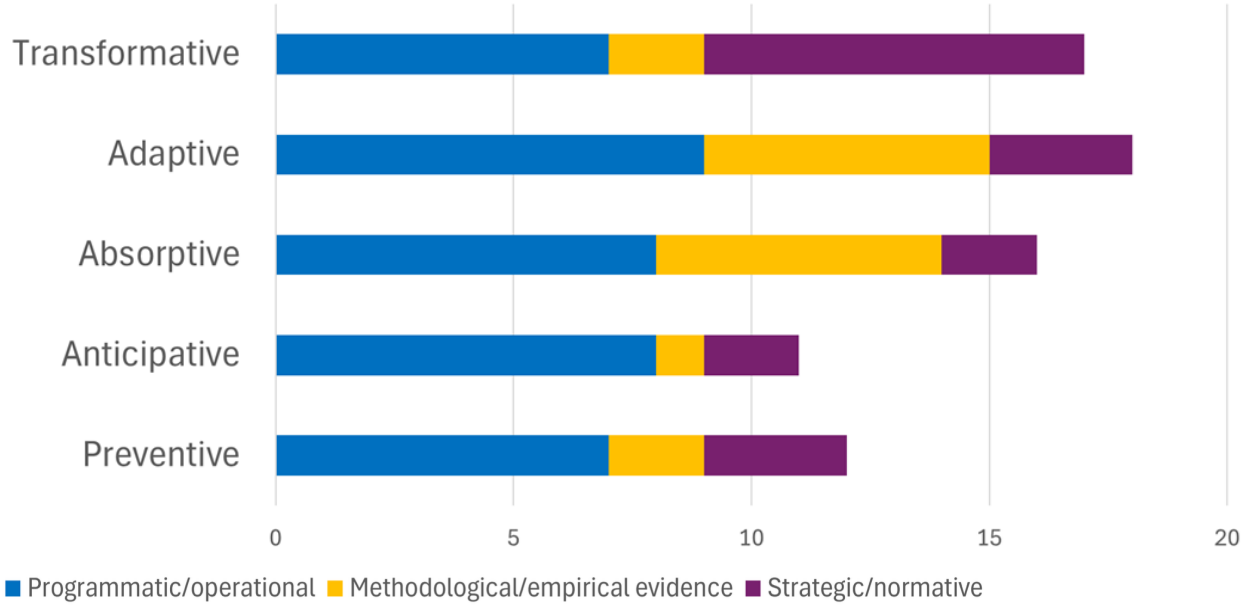
Reference	Type
FAO. 2024d. *From Evidence to Response: Advancing Sustainable Land Management in Tanzania. Insights from the SHARP+ and Behaviour Change Assessment*. FAO Drylands Sustainable Landscapes Impact Program (DSL-IP). Rome. https://openknowledge.fao.org/server/api/core/bitstreams/441e30c9-932a-407d-a5a8-feeaf616ae77/content	Programmatic/ operational
FAO. 2024e. *From Evidence to Response: Advancing Sustainable Land Management in Zimbabwe. Insights from the SHARP+ and Behaviour Change Assessment*. FAO Drylands Sustainable Landscapes Impact Program (DSL-IP). Rome. https://openknowledge.fao.org/server/api/core/bitstreams/1a93a846-8756-4c17-85e2-92b31e530c12/content	Programmatic/ operational
FAO. 2024f. *Record reporting as 34 African countries track resilience to food insecurity shocks*. FAO Agricultural Development Economics Policy Brief, No. 71. Rome. https://doi.org/10.4060/cd3223en	Methodological/ empirical evidence
FAO. 2024g. *The State of the World's Forests 2024 - Forest-sector innovations towards a more sustainable future*. Rome. https://doi.org/10.4060/cd1211en	Strategic/ normative
FAO. 2025a. *Ukraine: Emergency and Early Recovery Response Plan - 2025-2026*. Kyiv. https://openknowledge.fao.org/items/9616d132-b487-41ed-a778-9ec2eb0689d0	Programmatic/ operational
FAO. 2025b. *Self-evaluation and holistic assessment of climate resilience of farmers and pastoralist (SHARP+) in brief*. Rome. https://openknowledge.fao.org/items/1314660d-22c6-41e5-9bd4-03c8c5746e7e	Programmatic/ operational
FAO. 2025c. Vulnerability and resilience of youth in agrifood systems. In *The status of youth in agrifood systems* (Chapter 6). Rome. https://doi.org/10.4060/cd5886en	Methodological/ Empirical evidence
FAO. 2025d. *Two in three Afghan households show resilience gains in last year*. FAO Agricultural Development Economics Policy Brief, No. 72. Rome. https://doi.org/10.4060/cd7092en	Methodological/ empirical evidence
Wane, A., Cesaro, J.D., Duteurtre, G., Touré, I., Ndiaye, A., Alary, V., Juanès, X., Ickowicz, A., Ferrari, S. & Velasco, G. 2020. *The economics of pastoralism in Argentina, Chad and Mongolia. Market participation and multiple livelihood strategies in a shock-prone environment*. FAO Animal Production and Health Paper No. 182. Rome, FAO and CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement). https://doi.org/10.4060/cb1271en	Methodological/ empirical evidence

Source: Authors' own elaboration.

Annex 4. Additional figures and tables

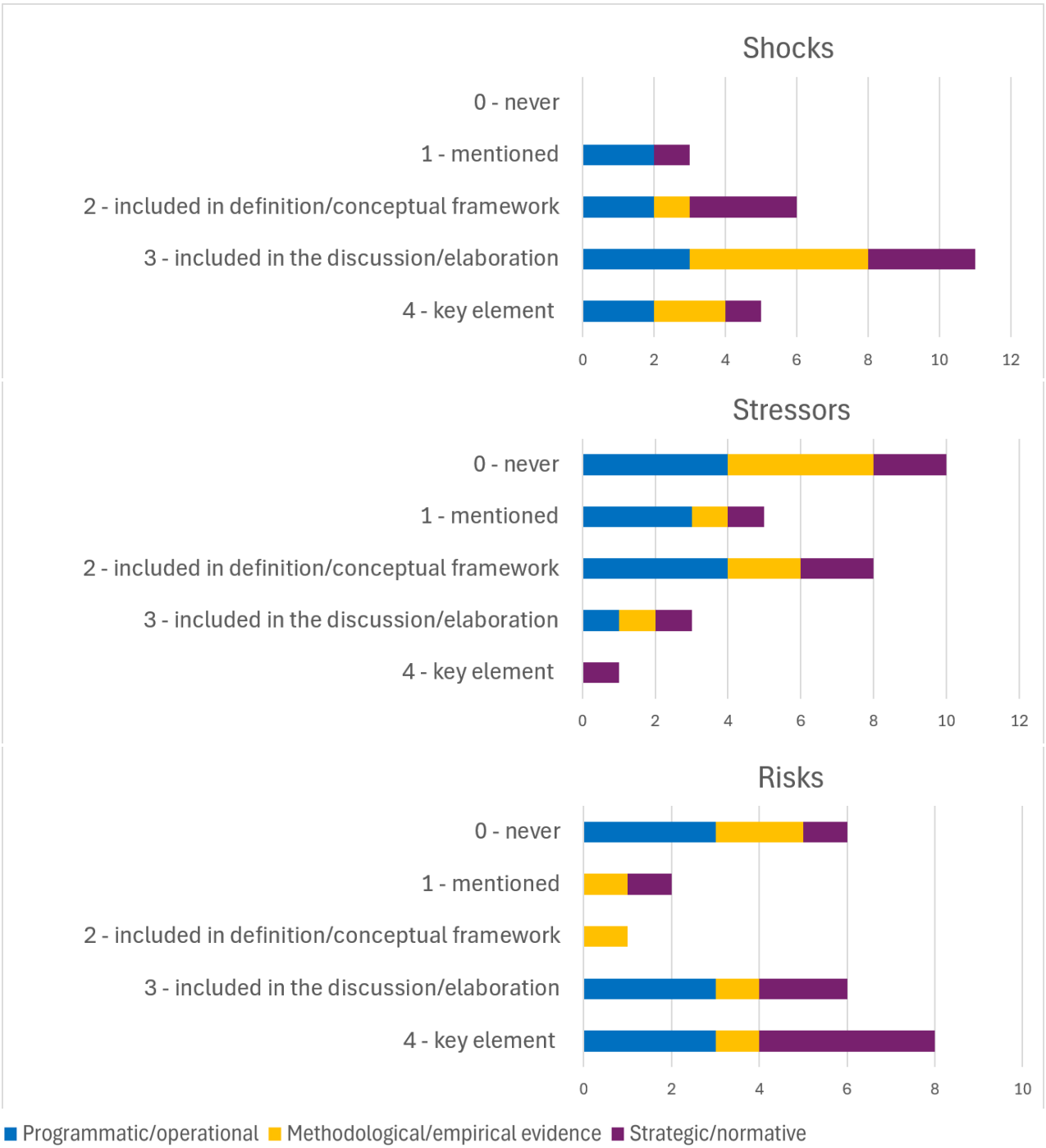
Results from the document analysis

Figure A1. Dimensions of resilience by document type



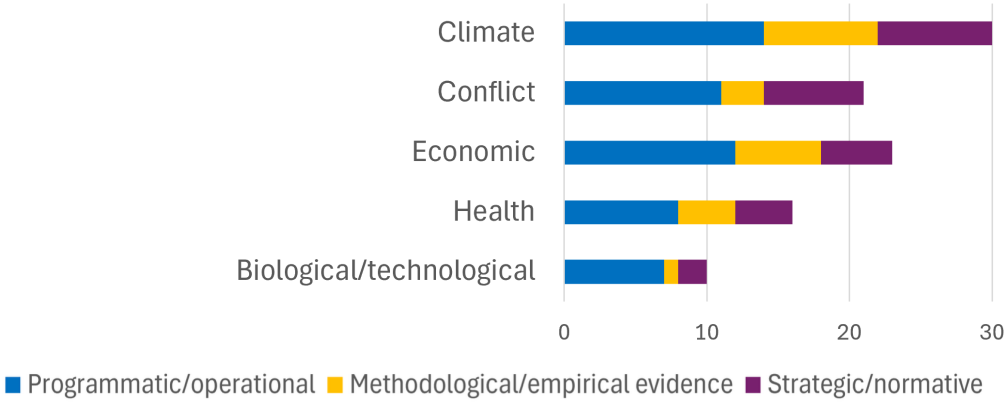
Source: Authors' own elaboration from the document analysis.

Figure A2. Mention of shocks, stressors and risks related to resilience by document type



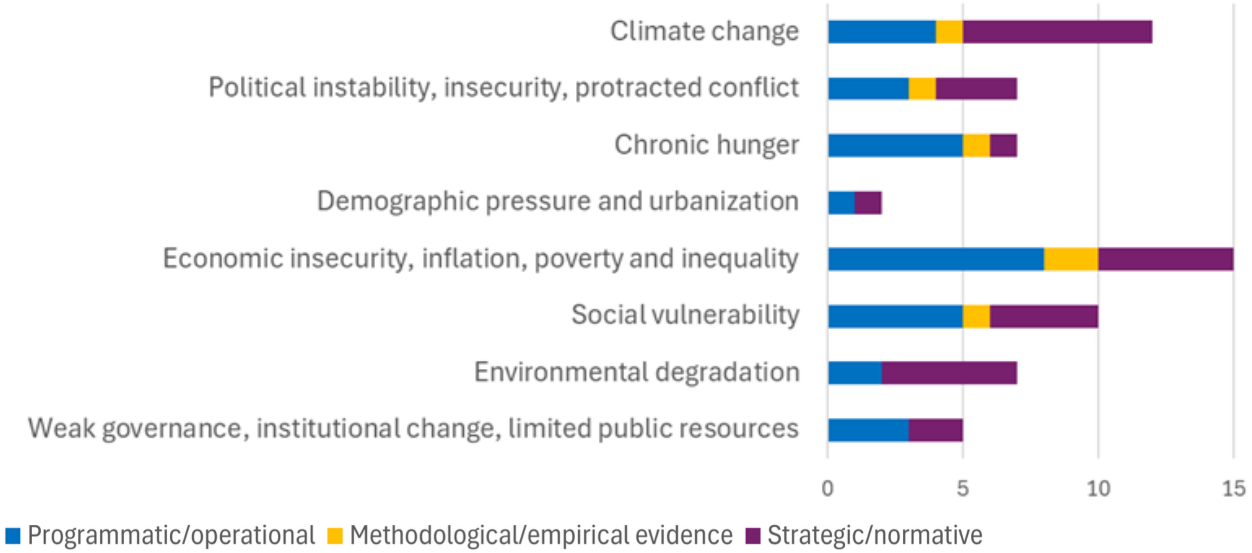
Source: Authors' own elaboration from the document analysis.

Figure A3. Main shocks mentioned in relation to resilience by document type



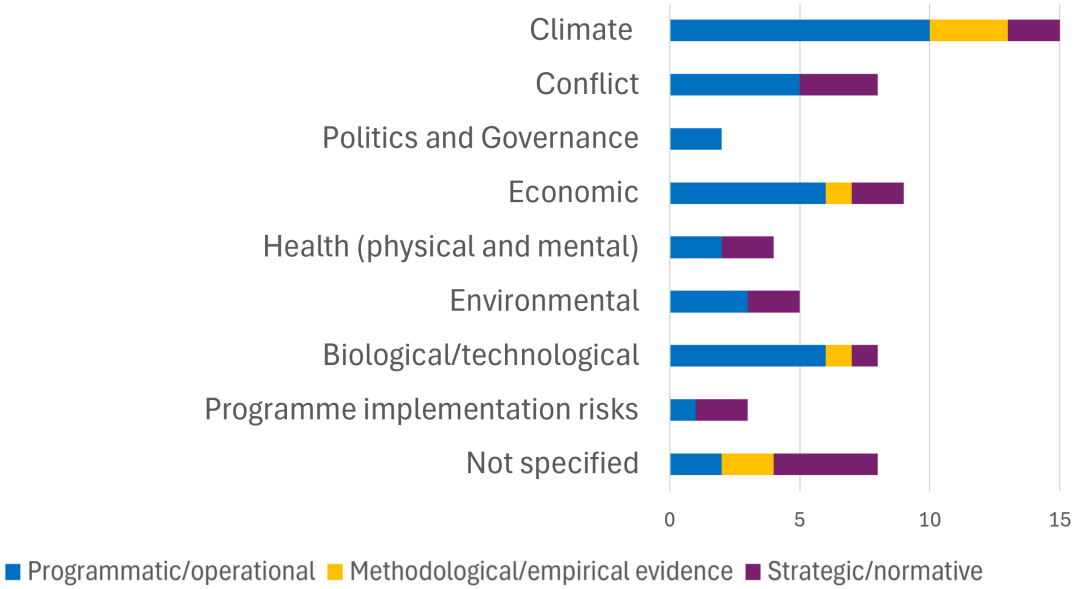
Source: Authors' own elaboration from the document analysis.

Figure A4. Different stressors mentioned in relation to resilience by document type



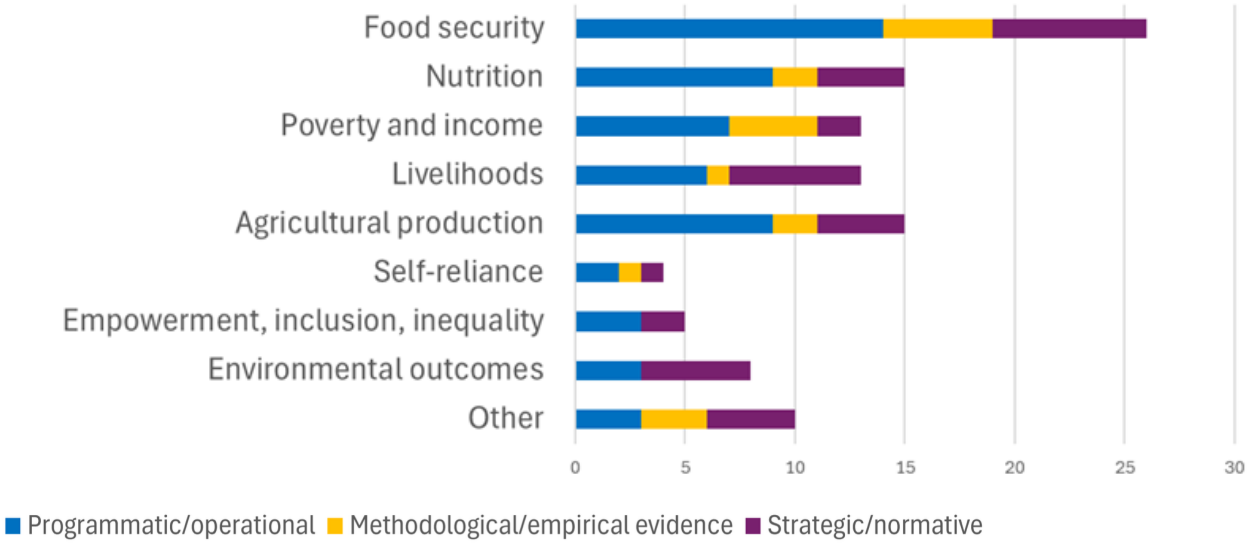
Source: Authors' own elaboration from the document analysis.

Figure A5. Different risks mentioned in relation to resilience by document type



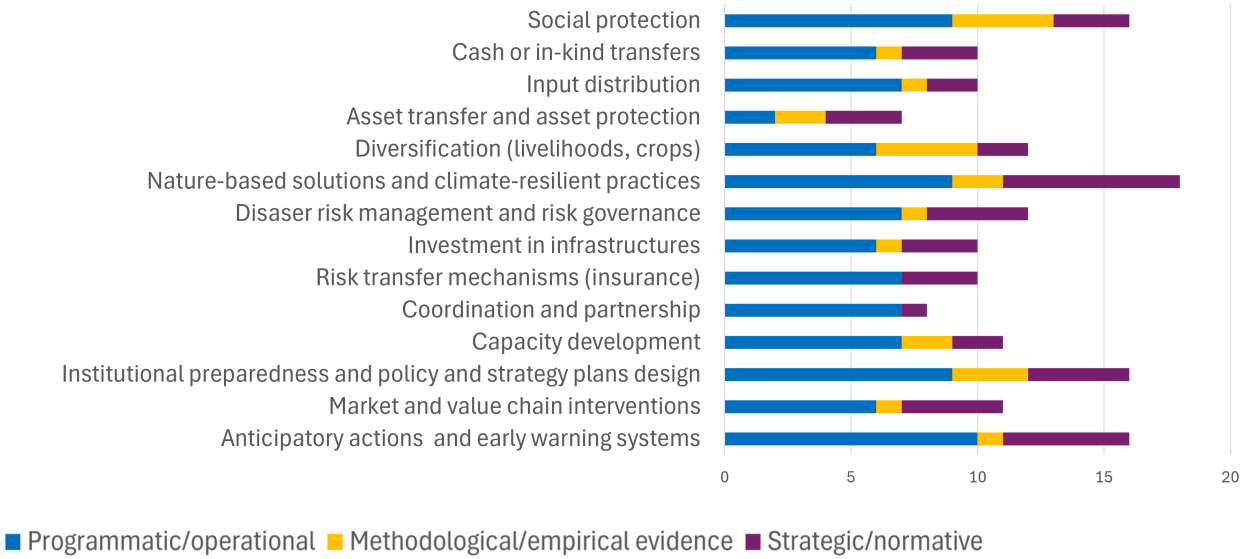
Source: Authors' own elaboration from the document analysis.

Figure A6. Resilience outcomes by document type



Source: Authors' own elaboration from the document analysis.

Figure A7. Activities mentioned in relation to resilience by document type



Source: Authors' own elaboration from the document analysis.

Table A7. Classification of selected documents

Type	Document selection			
	PPA leaders	Kick-off meeting	Online survey	Total
Programmatic/operational	6	6	11	23
Methodological/empirical evidence	2	0	6	8
Strategic/normative	6	3	4	13
Total	14	9	21	44

Note: PPA = programme priority areas.

Source: Authors' own elaboration from the document analysis.

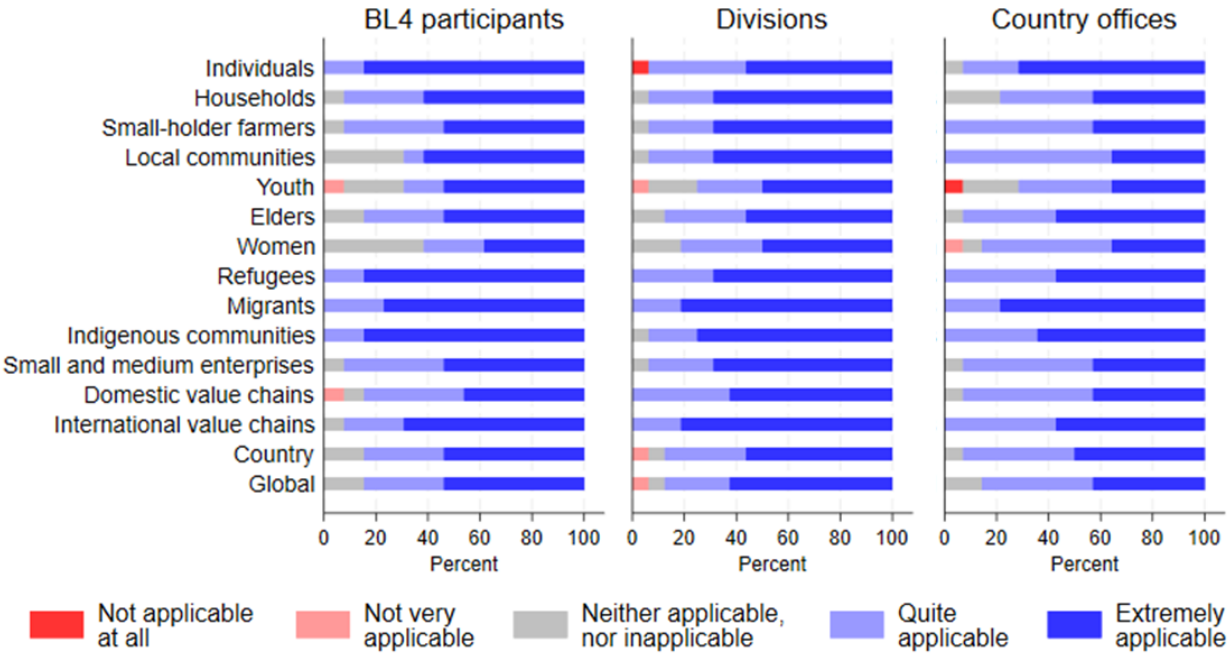
Results from the online survey

Figure A8. Frequent elements emerging from stakeholders' definitions of resilience

Note: Word cloud elaborated from the answers provided to the question "What does resilience mean to your unit, in 2 or 3 sentences?" The size of the word is proportional to its frequency across answers.

Source: Authors' own elaboration from data collected through the online survey.

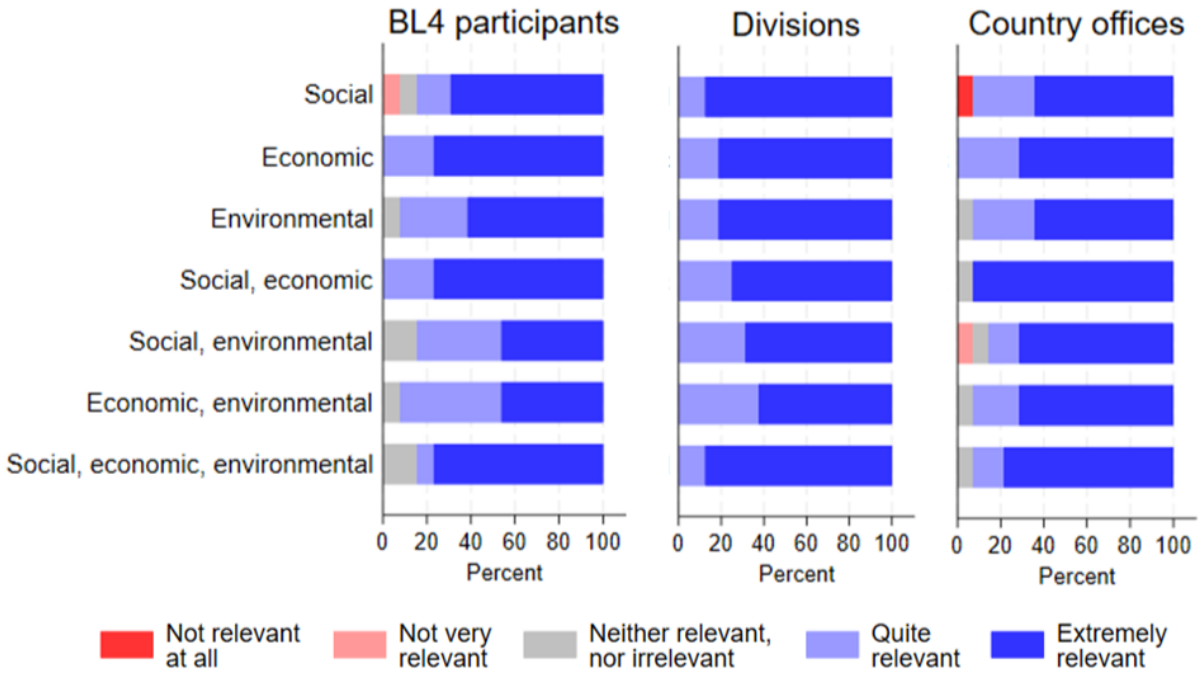
Figure A9. The subjects of resilience



Note: BL4 = FAO Programme Priority Area: Better Life 4.

Source: Authors' own elaboration from data collected through the online survey.

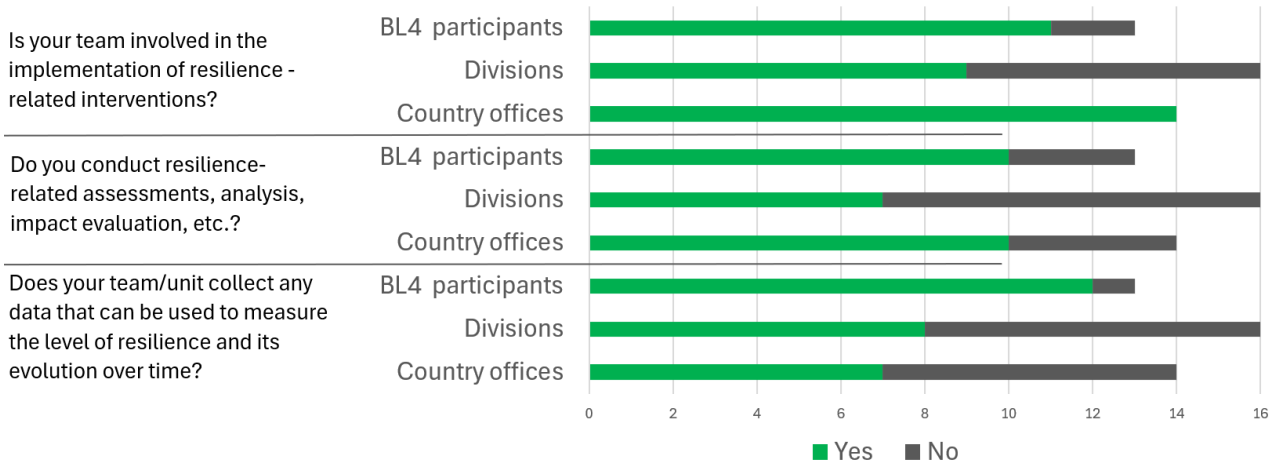
Figure A10. The relevant dimensions of resilience



Note: BL4 = FAO Programme Priority Area: Better Life 4.

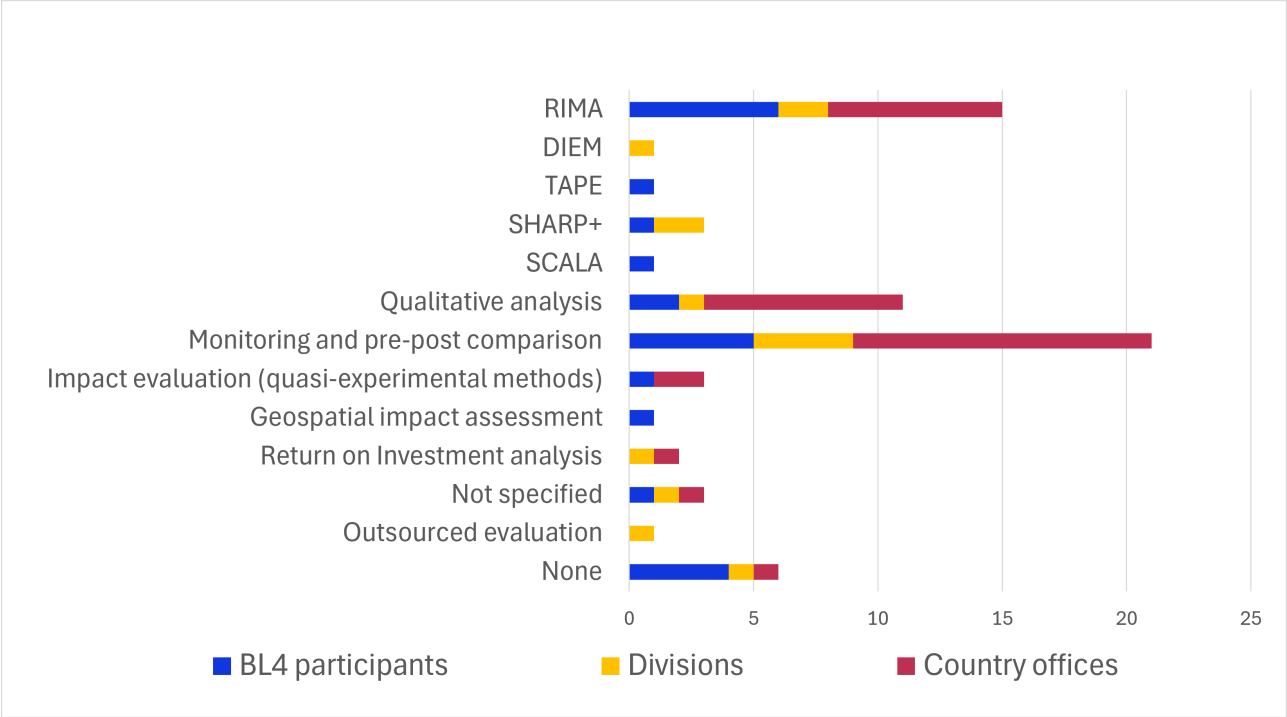
Source: Authors' own elaboration from data collected through the online survey.

Figure A11. Respondents' involvement in implementation, assessment and measurement of resilience interventions



Source: Authors' own elaboration from data collected through the online survey.

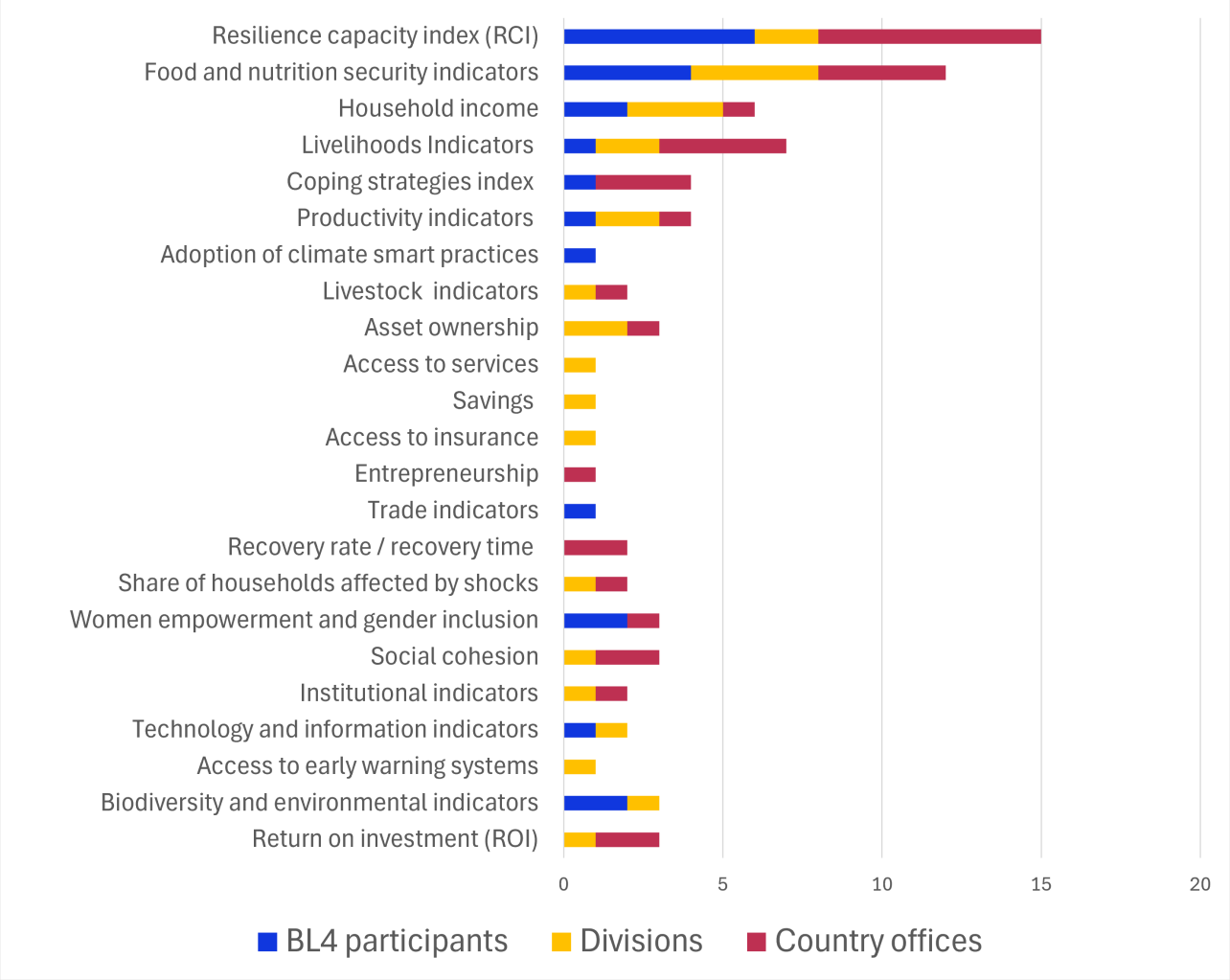
Figure A12. Methods applied to assess and evaluate resilience



Note: RIMA = resilience index measurement and analysis; DIEM = data in emergencies; TAPE = tool for agroecology performance evaluation; SHARP+ = self-evaluation and holistic assessment of climate resilience of farmers and pastoralists; SCALA = scaling up climate ambition on land use and agriculture; BL4 = FAO Programme Priority Area: Better Life 4.

Source: Authors' own elaboration from data collected through the online survey.

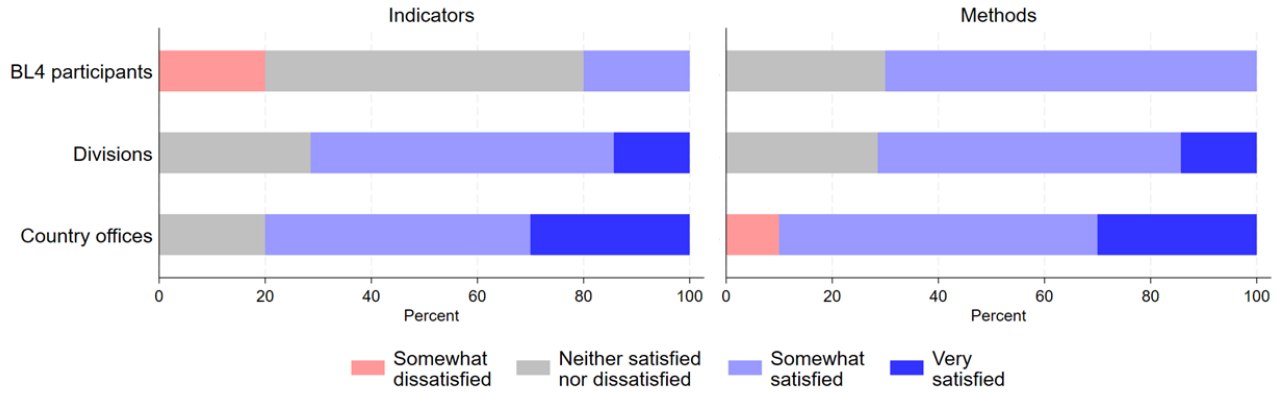
Figure A13. Indicators used to assess resilience



Notes: The indicators contributing to the Resilience index measurement and analysis (RIMA) pillars (for example, asset ownership and access to services) are not reported individually in the graph unless mentioned outside of the RIMA framework. The RIMA capacity indicators are counted along with the resilience capacity index.

Source: Authors' own elaboration from data collected through the online survey.

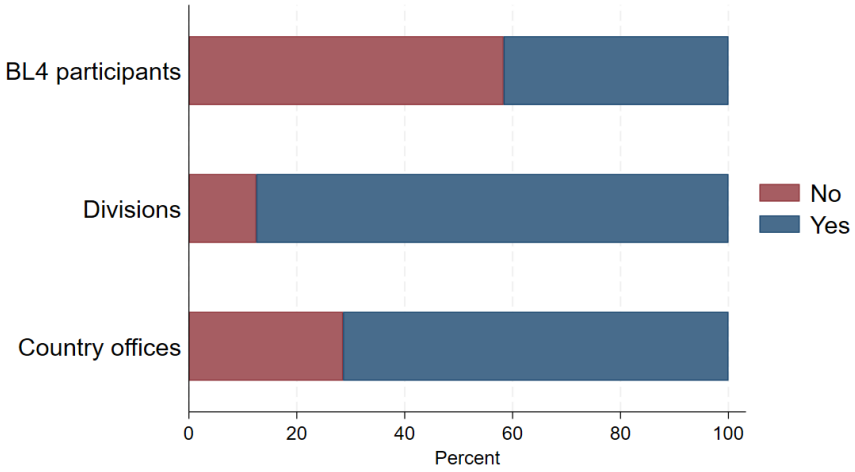
Figure A14. Satisfaction with methods and indicators used for measuring and evaluating resilience



Notes: BL4 = FAO Programme Priority Area: Better Life 4. The questions are answered only by respondents whose teams/units are involved in resilience assessment and analysis.

Source: Authors' own elaboration from data collected through the online survey.

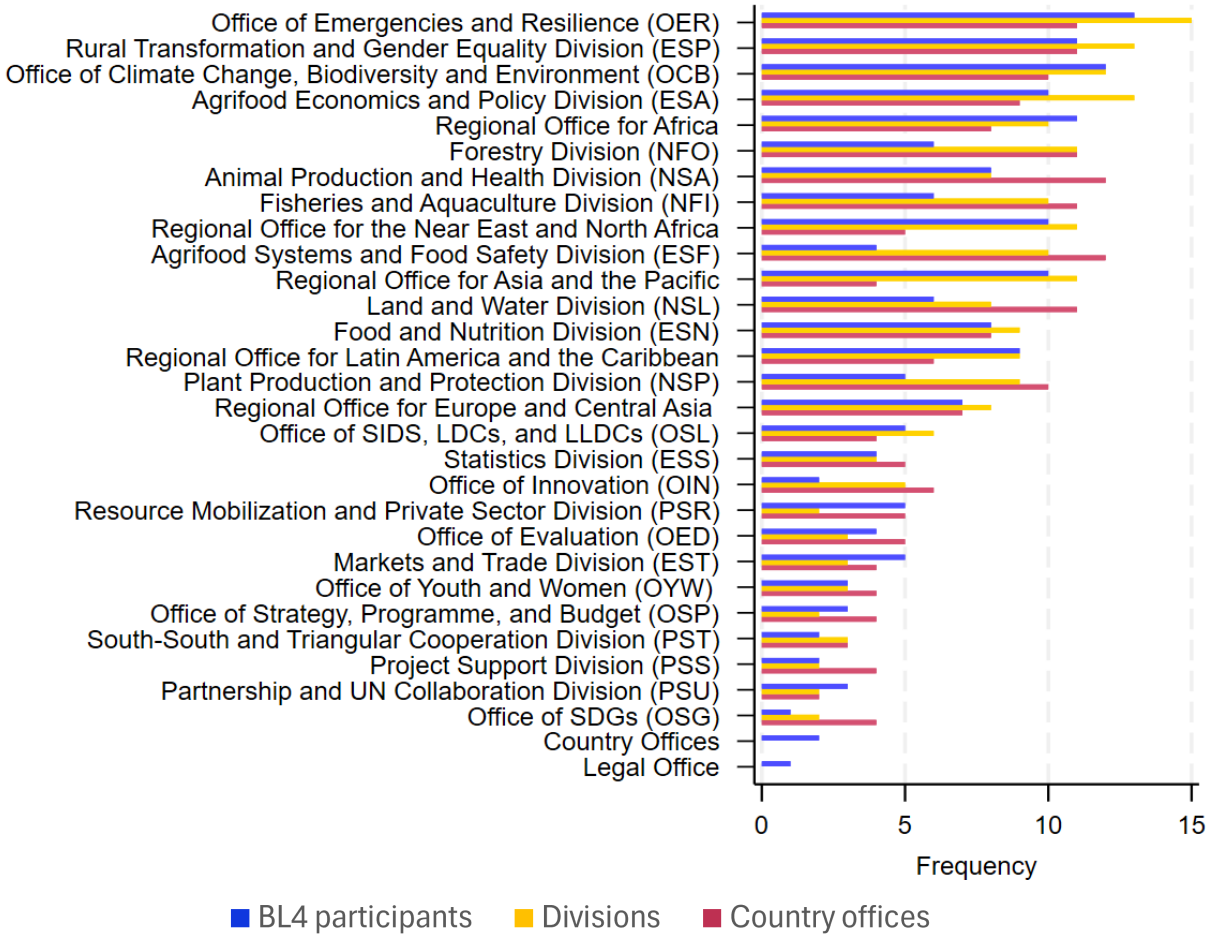
Figure A15. Adequacy of available data for measuring the level and evolution of resilience



Notes: BL4 = FAO Programme Priority Area: Better Life 4. The questions are answered only by respondents whose teams/units are involved in resilience assessment and analysis.

Source: Authors' own elaboration from data collected through the online survey.

Figure A16. Divisions and offices perceived as most engaged in resilience



Notes: BL4 = FAO Programme Priority Area: Better Life 4. Question: "Which do you think are the FAO divisions and offices that use the concept of resilience in their daily work?". Divisions and offices are sorted in order from the most to the least selected by all respondents jointly.

Source: Authors' own elaboration from data collected through the online survey.

Table A8. Definitions of resilience provided by stakeholders

Definition of resilience	BL4 participants	FAO divisions	Country offices	Total
Adapting to changing contexts and post-shock conditions	6	6	7	19
Recovering after a shock (bouncing back)	5	5	8	18
Risk management, preparedness, prevention, and anticipation	5	7	5	17
Withstand shocks, avoid adverse consequences, and minimize losses	4	5	6	15
Stability and continuity (of system capacity, operations, production, and access to resources)	5	5	2	12
Responding effectively to challenges	1	2	4	7
Capacity to anticipate, prevent, absorb, adapt, and transform*	3	1	1	5
Other elements included in the definition				
Avoiding long lasting consequences of shocks	1	0	0	1
Capacity building	0	2	4	6
Partnership and collaboration	0	2	2	4
Inclusivity and social justice	1	1	2	4
Policy design and governance	1	2	0	3
Reducing vulnerability	1	2	0	3
Autonomy	0	0	1	1

Notes: BL4 = FAO Programme Priority Area: Better Life 4. * This category only includes answers that explicitly refer to the five capacities (dimensions) of resilience. Types of definitions are listed from the most common to the least common among the answers. Each answer could fall into multiple categories.

Source: Authors' own elaboration from data collected through the online survey.

Table A9. Rank positions assigned to resilience dimensions

Dimension	Position 1	Position 2	Position 3	Position 4	Position 5
Prevention	18	12	4	3	6
Anticipation	12	18	7	6	0
Absorption	5	4	21	9	4
Adaptation	4	7	9	22	1
Transformation	4	2	2	3	32

Notes: Dimensions have been ranked from the most (1st) to the least (5th) important. The table shows the frequency with which each dimension has been assigned to one of the five possible positions.

Source: Authors' own elaboration from data collected through the online survey.

Table A10. Additional relevant subjects of resilience according to respondents

Category	BL4 participants	FAO divisions	Country offices	Total
Poor people	0	2	0	2
Persons with disabilities	0	0	3	3
Population under occupation	0	1	0	1
Fishers, herders, pastoralists	0	1	0	1
Producer associations	0	1	0	1
Private sector	0	0	1	1
Entire agrifood systems	1	0	1	2
Infrastructures	0	1	0	1
Non-governmental organizations and Community-based organizations	0	0	1	1
Institutions and governments	1	2	1	4
Ecosystems and environment	1	1	0	2

Notes: BL4 = FAO Programme Priority Area: Better Life 4. The table reports the frequency of additional resilience-related subjects indicated as relevant by respondents, in addition to the categories already proposed, which are reported in Figure A9.

Source: Authors' own elaboration from data collected through the online survey.

Table A11. Stressors identified by online survey participants

Dimension	BL4 participants	FAO divisions	Country offices
Environmental	Climate change (slow/fast), variability, degradation, extreme events, water stress, rangeland loss	Slow-onset environmental degradation, climate change, biodiversity loss, invasive species	Droughts, floods, water scarcity/contamination, land degradation, desertification, pollution, crop/livestock loss
Economic	Poverty, unemployment, financial instability, inequality	Market instability, price fluctuations, debt, limited market access, land/market concentration	Unemployment, income loss, limited access to resources, sanctions, unfavourable taxation
Social/ institutional	Migration, urbanization, youth outmigration, illiteracy, gender inequality, institutional fragmentation	Governance/institutional stability, knowledge gaps, social inequalities, gender disparities	Conflict, protracted crises, displacement, limited public services, social exclusion, psychosocial stress
Health/ nutrition	Food insecurity, malnutrition	Nutrition security, health burden	Chronic malnutrition, non-communicable diseases, limited access to nutritious food
Other	Brittle, anxious, nonlinear, incomprehensible conditions, geopolitical shifts, protracted crises	Infrastructure/logistics weaknesses, operational stressors	Operational/organizational stressors, psychosocial and cultural factors

Note: BL4 = FAO Programme Priority Area: Better Life 4.

Source: Authors' own elaboration from data collected through the online survey.

Table A12. Risks identified by online survey participants

Dimension	BL4 participants	FAO divisions	Country offices
Environmental/ climate	Climate change (slow/fast), variability, degradation, extreme events, water stress, rangeland loss	Natural disasters, climate variability, extreme events, biodiversity loss, invasive species	Droughts, floods, water scarcity/contamination, land degradation, desertification, pest/disease outbreaks, cyclones
Economic/ market	Poverty, unemployment, financial instability, inequality, systemic risks	Market volatility, commodity price fluctuations, debt, credit constraints, dependence on few suppliers, value chain disruption and trade risks	Income loss, unemployment, market disruption, input price shocks, sanctions, inflation, energy/cash crises
Social/ institutional	Migration, urbanization, youth outmigration, illiteracy, gender inequality, institutional fragmentation	Conflicts, social unrest, inequalities, inadequate infrastructure, gaps in early warning systems	Conflict, protracted crises, displacement, social exclusion, loss of institutional capacity
Health/nutrition	Food insecurity, malnutrition, nutritional vulnerability, pest/disease	Pandemics, crop/livestock disease, food safety risks	Chronic malnutrition, limited access to nutritious food, pandemics
Other	Protracted crises, geopolitical risks, brittle, anxious, nonlinear, incomprehensible context	Geopolitical risks, operational failures	Infrastructure/technological disruption, wild card events, cyber/operational risks

Note: BL4 = FAO Programme Priority Area: Better Life 4.

Source: Authors' own elaboration from data collected through the online survey.

Table A13. Types of resilience-related outcomes referenced by respondents.

Outcome	BL4 participants	FAO divisions	Country offices	Total
Food security and nutrition	7	9	9	25
Income and poverty reduction	6	9	6	21
Production (agricultural)	3	6	6	15
Maintaining stable/decent livelihoods or livelihoods diversification	2	6	3	11
Recovery and bouncing back to pre-shock level/path	1	3	6	10
Market functionality and market access	1	4	4	9
Ecosystem integrity/restoration	3	2	2	7
Access to and protection of capital and assets	2	2	3	7
Institutional and policy strengthening and transformation	4	0	3	7
Reduced vulnerability and uncertainty	2	3	2	7
Social inclusion and cohesion	2	2	2	6
Access to social safety nets and social protection	2	1	2	5
Adoption of early warning systems and anticipatory actions	1	2	1	4
Adoption of climate-smart agriculture practices and investment in sustainable agricultural techniques	1	2	1	4
Health	1	1	1	3
Continuity of and access to essential services	0	0	3	3
Value chain and supply functioning	1	1	0	2
Employment	1	1	0	2
Coping strategies	1	1	0	2
Long-term sustainability	1	0	0	1
Clear reference to long-term / dynamic outcomes	6	6	5	17

Notes: BL4 = FAO Programme Priority Area: Better Life 4. The table reports the frequency of types of relevant outcomes indicated by respondents (N=43). Outcomes are listed in ascending order from the most to the least mentioned.

Source: Authors' own elaboration from data collected through the online survey.

Table A14. Total frequency of resilience dimensions across all responses on outcomes

Resilience dimensions	Frequency in resilience outcomes discussion
Absorption	28
Adaptation	16
Transformation	9
Prevention	6
Anticipation	4

Note: The table reports the frequency with which resilience dimensions are implied or explicitly mentioned when listing relevant outcomes (N=43).

Source: Authors' own elaboration from data collected through the online survey.

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