CLIMATE RESILIENT VALUE CHAINS AND FOOD SYSTEMS

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Measuring Local Food Systems' Resilience: Lessons learned from Honduras and Nicaragua

Alicia Natalia Zamudio, Livia Bizikova and Marius Keller

This **Briefing Note** presents a series of resilience indicators as examples for measuring the resilience of local food systems based on community consultations in Honduras and Nicaragua. It is primarily addressed to food security and resilience practitioners in Central America and for those working on climate and food security metrics more generally.

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Key Messages

- **Many drivers of food system resilience are similar** across communities and countries even though food security is context dependent. These drivers and food systems' characteristics need to be targeted to increase food security in vulnerable communities in the context of a changing climate.
- **It is key to broaden the approaches used in food security assessments and indicators to encompass the entire food system and complement those with a narrow focus on food availability, access and utilization**. The state of key natural resources and supporting services such as transport, storage and energy and the management systems of these resources is as important as food production. Additionally, supporting policies and institutions that frame the capacities of people to address food insecurities when they occur also need to be taken into account. These need to be designed and adjusted in ways that support climate resilient food systems.
- **The process of developing indicators is as important as the results**. The adoption of iterative participatory processes to develop indicators is key to ensure their relevance and buy-in from involved communities and to decrease the risks of further marginalizing vulnerable groups. It is also important to identify and engage practitioners and policy-makers acting at the various vertical and horizontal spatial scales and involve them as early as possible throughout this process.
- **It is essential to build on what is already out there and complement monitoring schemes**. Work with already-developed food security indicator monitoring systems and link them with the broader system-based indicators presented in this brief. This will allow food security and resilience practitioners to better understand the drivers of vulnerability in food systems

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Introduction

Climate variability and change can significantly affect the food security of vulnerable populations. Whether it is a household suffering from the loss of its subsistence crops due to drought or a district being cut off from food markets because floods have damaged access to roads, these disruptions can increase the risk of hunger, malnutrition and poverty. Poor communities are particularly exposed to climate shocks, as their livelihoods are often highly climate-sensitive, and resources for coping and adapting to change are limited.

Adaptation and resilience-building measures can help reduce adverse impacts on food security. In order to identify appropriate responses, taking a resilience approach is particularly relevant because it centres on exploring if human and natural systems and their interactions are robust enough in the face of climate shocks so they can respond to stresses and recover quickly from extreme events. In the context of food security, this means that systems ensuring food utilization, access and availability are in good condition, flexible and well integrated yet independent, so that changes in and failures of one system element does not cascade through the rest of the system and lead to food insecurity. However, we know little about the resilience of food systems in general and even less about how to measure and monitor that resilience over time.

This briefing note presents a series of resilience indicators and their associated resilience measures resulting from the application of a food security and resilience assessment methodology for food systems (see Figure 1 and Box 2) in Honduras and Nicaragua, and shares lessons learned and recommendations. The note targets practitioners who wish to measure the resilience of food systems in order to provide inputs for food security interventions. It also informs policy-makers about what elements aside from food production need to be targeted by programs and policies and measured through resilience indicators. Additionally, it provides them with concrete ideas on how to increase the resilience of food systems to increase food security.

BOX 1. KEY DEFINITIONS

Resilience is defined as "the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions" (Intergovernmental Panel on Climate Change, 2012).

Food security is described as a condition in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996).

Food system describes the processes, required inputs and generated outputs involved in feeding a population, including growing, harvesting, processing, packaging, transporting, marketing, consuming and disposing of food (Hawkes, 2009).

Indicator is defined as an observed value representative of a studied phenomenon. Indicators point to, provide information about and describe the state of the system with significance extending beyond that directly associated with the observation itself. In general, indicators quantify information by aggregating and synthesizing different and multiple data, thus simplifying information that can help reveal complex phenomena (European Environment Agency, 2006).

A Systems Approach to Assessing Food Security

Indicators can help describe the state of a system. Here, indicators are embedded in a food system and resilience framework developed by Tyler et.al (2013). The framework (see Figure 1) reflects all elements composing food systems to deliver food security, including: (1) food availability: influenced by production, distribution and exchange of food; (2) access to food: including affordability, allocation and preference; (3) food utilization: including nutritional value, social value and food safety (4) and food stability over time (see e.g., Ericksen, 2008; Schmidhuber & Tubiello, 2007). It also includes the specific contexts of the food system represented by available environmental resources, infrastructure, market exchange, social interactions, political leadership and governance systems. These are also shaped by global factors such as global market prices and long transportation routes from production to consumption. Resilience is measured in relation to all these food system elements. Thus, the resilience indicators reflect the various spatial scales influencing food security.

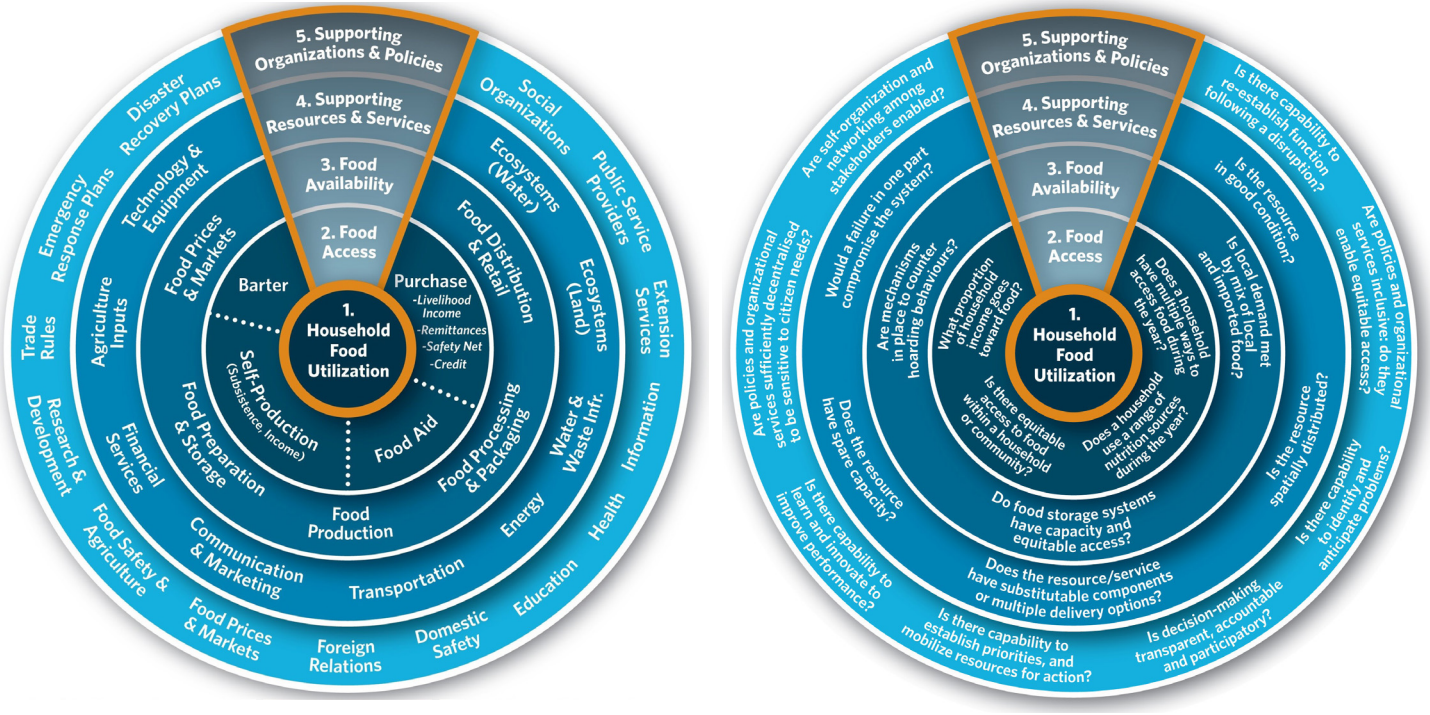


FIGURE 1. COMMUNITY FOOD SYSTEM ANALYSIS AND GUIDING QUESTIONS TO EXPLORE ITS RESILIENCE: SPINWHEEL 1 AND 2 (TYLER ET AL., 2013)

Monitoring Indicators of Food Security and Resilience of Food Systems

Monitoring food security has been a long-term effort involving numerous international and national agencies, such as the United Nations' World Food Program and the Famine Early Warning System – Network.[1] Examples of current approaches to monitoring food security using indicators include the measurement of the prevalence of undernourishment (Food and Agriculture Organization, 2003)[2] or of living standards through household surveys (de Haen, Klasen, & Qaim, 2011). These monitoring efforts provide important insights on key indicators of food utilization, consumption and food access used to derive measures for improving food security. However, based on the resilience approach, additional important indicators can be identified by looking at the wider components of food systems and their associated characteristics and linkages. Building on the presented conceptual approach to indicator development, we created the CRiSTAL Food Security tool (See Box 2), a standardized Excel-based tool to create a comparable process for data collection across different communities. Through the implementation of CRISTAL Food Security, several resilience actions were identified and a set of indicators to track their implementation progress was developed in twenty 20 communities across Honduras and Nicaragua.[3]

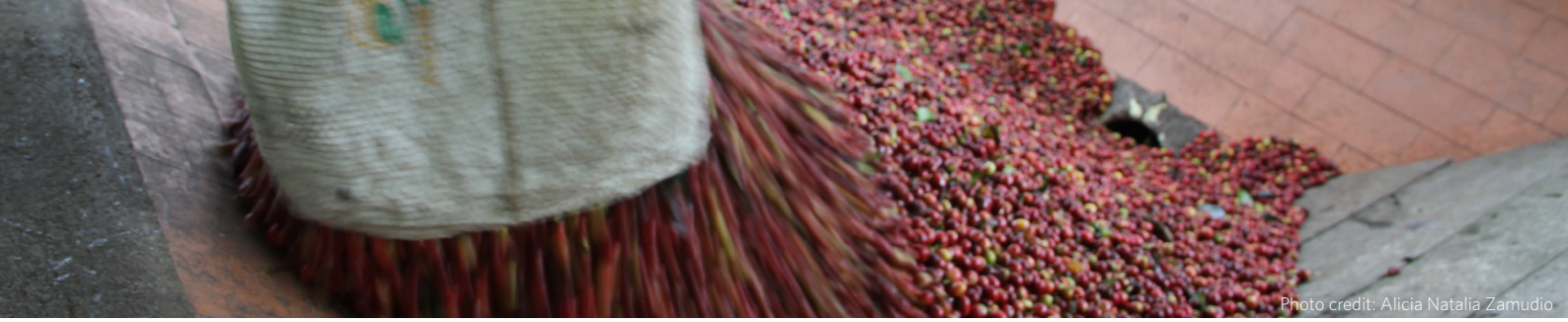
BOX 2. DEVELOPING INDICATORS WITH THE CRISTAL FOOD SECURITY TOOL

The CRiSTAL Food Security tool is directed at project managers and government staff who work directly with communities. It helps them:

- identify the main components of the local food system and their sensitivity to climate hazards
- analyze the resilience of the food system to climate shocks and stresses design resilience actions
- develop indicators that can measure changes in resilience over time

Its analytical framework is based on the Community-based Risk Screening Tool – Adaptation and Livelihoods (CRiSTAL), which supports decision-makers in designing local adaptation solutions. CRiSTAL Food Security is meant to be used in a participatory way and gathers most of the required information from the concerned communities.

[1] http://www.wfp.org/food-security/assessments/food-security-monitoring-system; http://www.fews.net/
[2] Food security methodology: http://www.fao.org/economic/ess/ess-fs/fs-methods/fs-methods1/en/
[3] For more information on communities' locations visit: http://www.iisd.org/adaptation/crefsca/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Indicators in practice

Several resilience indicators were identified and the following two tables give an overview of these potential indicators along the resilience building measures that were previously identified across the communities. Note that not all the presented indicators are meant to track the progress and achievement of a particular resilience building measure. Some of them help track the context that influences the resilience of the food system, while others are more closely linked to specific targets derived from the resilience measures. Overall, indicators developed through the use of the CRiSTAL Food Security tool can be considered as context, process and outcome-based indicators.[4]

Core food system

Table 1 shows examples of resilience measures and indicators focused on the key aspects of the food system that are directly linked to food security, along the core food security elements of utilization, access and availability, in other words: the core food system.

TABLE 1: RESILIENCE INDICATORS FOR THE CORE FOOD SYSTEMS' ELEMENTS CLUSTERED BY THEIR FOCUS

SYSTEM	RESILIENCE BUILDING ACTIONS	INDICATORS
UTILIZATION	Diversify diets for better nutrition: Establish family gardens and small-scale livestock rearing to complement diets with vegetables, diary and meat products; run education campaigns about healthy diets	Amount of food consumed by type, quantity and frequency per household (HH) member; percentage of HHs consuming vegetables
	Improve nutrition through equality: Include gender issues in monitoring systems; build capacity on gender issues	Records of weight, size, age and weight/age ratios by women, men and children; infant malnutrition index; rates of infant morbidity
	Improve human health: Increase access to community health care; raise awareness on disease prevention; support and ensure the functioning of health committees	Percentage of people affected by respiratory and gastrointestinal diseases; percentage of people vaccinated against diseases; percentage of HHs with access to a functional sanitation service; percentage of HHs having attended awareness-raising talks on hygiene & health related topics
	Food preparation and conservation: Invest in energy and storage systems, in particular in rural electrification programs; ensure access to efficient cook stoves; ensure access to small-scale storage; ensure access to safe water	Percentage of HHs possessing enhanced cook stoves/refrigeration systems/ silos; percentage of HHs using safe food preparation techniques; percentage of HHs with more than one storage facility, percentage of HHs with access to electricity; percentage of HHs with access to drinkable water
ACCESS	Diversify Income sources: Expand tourism activities; create microenterprises and employment opportunities, especially for women	Percentage of HHs with more than one income stream; percentage of HHs dedicating more than x per cent of their income to food purchase; percentage of income sources available to single women and to older people
	Diversify access strategies and improve nutrition: Foment microenterprises and tourism; diversify food production sources and support nutritious diets through family gardens and small-scale livestock rearing; design food aid programs to support nutritional gaps through the regular school meals	Percentage of HHs depending on only one access strategy throughout the year; percentage of HHs with income during summer season; percentage of HHs consuming vegetables; number of food products distributed per year through the food aid program to schools
	Improve land tenure equality: Improve access to community lands and pastures for poor HHs, free access to seed banks or create seed funds in banks available to communities at low interest rates	Percentage of income sources for single women/elderly; percentage of HHs possessing (small) amounts of land

[4] Process indicators are used to measure progress in the implementation of specific strategies that are thought to reduce the probability of negative outcomes or increase the probability of positive outcomes. For example, if you are looking at the percentage of people receiving capacity building in risk management per year, the outcome in itself is better risk management leading to increased food security. Outcome indicators are used to monitor the results of some of the resilience measures developed, where results are understood in terms of increased resilience. For example, looking at the percentage of households with more than one income stream as the outcome of several activities aimed at diversifying income sources, which will lead to an increased access to food.

SYSTEM	RESILIENCE BUILDING ACTIONS	INDICATORS
AVAILABILITY	Increase sustainable production: Use more resistant crop varieties, diversify crops, adopt crop rotation and intercropping methods, adopt agroforestry and other soil conservation methods (e.g., using organic fertilizer), micro-irrigation schemes; establish family gardens &and small-scale livestock rearing	Percentage of food consumed from family orchards; amount of food consumed by type, quantity and frequency per HH member; percentage of households using ecological production techniques; quantity of soil conservation projects implemented
	Expand and increase access to storage: Climate-proof storage infrastructure (including spatial distribution); build capacity for low-cost storage (traditional silos); regular maintenance and monitoring of storage facilities; improve rural access to electricity/ energy networks that support storages	Percentage of HHs possessing refrigeration systems; percentage of HHs (or producers) possessing more than one storage facilities; percentage of fishermen affiliated with a cooperative storage centre; percentage of HHs with access to electricity
	Local versus external food production: Improve food transport options and modes; strengthen local production by, for example, promoting technology transfer and available financial mechanisms; substitute imports for local production when possible to reduce dependence on foreign markets	Records of quantity of food produced within community per season/cycle versus imported food; percentage of HHs with access to multiple markets
	Increase access to markets and better prices: Organize (or strengthen) producers into associations/cooperatives to ensure better prices through wholesale production and lower transaction costs; improve access to market information; improve storage systems to allow for a better control of selling times; reduce number of intermediaries; improve access to small funds; support local and municipal mechanisms to control hoarding behaviours such as through penalties in local risk management protocols	Number of existing cooperatives; percentage of (beans, corn and coffee) commercialized in cooperatives; available rural credits and percentage of producers with access to credits; seasonal price variations of main food items

The food utilization and access pillars are populated with similar indicators across communities. These include monitoring: the availability and stability of the income sources, especially during critical months for food insecurity; the amount and type of purchased food; food type contributions to the diet and key health issues and diseases in all analysed communities. Differences between the studied communities are often due to significantly different dominant livelihoods. For example, coastal communities have designed indicators such as percentage of fishermen affiliated with cooperative storage centres, while most other communities with agriculture-based livelihoods on individual land holdings chose indicators such as the number of individual storage facilities.

Diversification is key for increasing resilience and reducing vulnerability throughout the food system, including for the utilization and access pillars. For example, measures propose to establish family orchards and small-scale livestock rearing to diversify access to nutritious food and to expand tourism activities and the creation of microenterprises to diversify income sources and thus stabilize access to food. Corresponding indicators relate to the diets of households, consumption of food with high nutrient content such as vegetables and meat, as well as to the number of income streams and access strategies per households.

Increasing access to storage and financial services seems to be crucial across all core food systems, as illustrated in Table 1. Indicators designed to monitor the resilience of direct availability determinants tend to focus on tracking availability and access to storage facilities and financial services, including measures to support better positioning of farmers in food markets (e.g., access to rural credits). Indicators include tracking the percentage of households possessing one or more storage facilities, including refrigerated ones, while measures attempt to ensure households have access to storage facilities and that these are climate-proofed. Market supporting measures include the organization of producers into cooperatives to ensure they receive better prices for their products through wholesale production, reducing intermediaries and thus at the same time lowering transaction costs. These measures also attempt to ensure producers have access to storage systems through cooperatives and to rural credits or have access to other financial mechanisms as a minimum. Corresponding indicators include recordings of the number of existing cooperatives in a community or the percentage of producers being part of a producer's association, available rural credits and the percentage of producers accessing those credits.

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Support Systems

Table 2 shows examples of resilience measures and indicators focused on monitoring secondary systems that underpin core food systems' elements. These support systems include natural resources such as land and water; built systems such as transportation, communication and other infrastructure, and financial services; and supporting organizations and policies such as food safety policies, trade agreements and disaster management plans. In other words: the supporting systems.

TABLE 2: RESILIENCE INDICATORS FOR SUPPORT SYSTEMS CLUSTERED BY THEIR FOCUS

SYSTEM	RESILIENCE BUILDING ACTIONS	INDICATORS
SUPPORTING RESOURCES & SERVICES	Increase access to financial services: Establish saving mechanisms; increase access to credits and insurances; reduce dependency on short-term funding, humanitarian aid and ad-hoc projects; establish permanent budgets for risk reduction	Number of available rural credits and percentage of producers with access to credits (using them); percentage of (beans, corn and coffee) commercialized in cooperatives
	Improve water resource management: Implement water conservation measures such as protection of water catchment areas (e.g., through reforestation and improvement of sanitation and waste management); improve infrastructure maintenance and expand infrastructure; facilitate rainwater and groundwater harvesting; build additional water storage facilities	Number of water sources available to the community; percentage of HHs with access to safe drinkable water throughout the year/cubic metre of water consumed per HH in conformity with sanitary rules; percentage of HHs with water catchment techniques; deforestation rate in recharge water areas; river flow rate in rainy and dry seasons; frequency of control and maintenance work on water system (e.g., dams); percentage of HHs with water storage facilities
	Expand the energy network: Increase access to small-scale renewables (e.g., solar panels) and back-up systems (e.g., batteries) to ensure constant supply; ensure access to credits and other financial instruments to purchase small-scale renewables	Percentage of HHs with access to electricity
	Expand and improve transport system: Maintenance of roads, bridges; pavement of roads; monitor roads' conditions; ensure alternative roads are available; increase access to several transport modes	Percentage of paved roads; number of alternative access roads; percentage share of community/municipality budget for maintenance of access roads/ infrastructure restoration; frequency of infrastructure maintenance works; percentage of blocked/affected access roads during floods; number of damaged key infrastructure (e.g., bridges) during floods or cyclone events; percentage of HHs with access to multiple markets
	Improve land management: Implement soil conservation measures such as agroforestry, use of organic fertilizer and crop rotation and intercropping methods to reduce erosion and degradation of land; implement land tenure programs for HHs with no land holdings	Annual erosion rate of soils; yield rates per unit land area; percentage of producers accessing programmatic resources for land ownership; percentage of productive land under agroforestry coffee production per year; percentage of producers implementing soil conservation measures
	Resource management: Develop emergency preparedness plans for those resources supporting systems susceptible to collapse after a climate event; incorporate protocols and means needed for resource restoration and recovery in local risk management plans	Time needed to restore and/or recover the affected resources after an extreme climate event
SUPPORTING ORGANIZATIONS AND POLICIES	Risk management: Develop or improve early warning systems (including warning systems of climate hazards and trends for key resources such as water); build permanent management, technical and economic capacity to manage risk; design or improve emergency plans; render more efficient the structures and management systems; allocate sufficient budget to disaster responses	Percentage of farmers using forecasting systems; presence of an early warning/monitoring systems; presence and number of contingency plans; percentage of available resources invested (e.g., for prevention and emergency response, for climate risk management) per year; percentage of implemented projects from development plans per year
	Governance: Render decision-making processes more participatory; ensure participation of most vulnerable groups in development plans; ensure better collaboration between relevant institutions (local government institutions and community organizations, local and external organizations, planners in emergency departments with those in other departments such as food security, health, etc.)	Percentage of community members actively participating in local organizations/decision making; percentage of HHs benefitting from food security projects coordinated between external and community organizations
	Capacity building and knowledge management: Build permanent management, technical and economic capacity to manage risk (e.g., capacity building of water committees); foment evidence base on most appropriate interventions; review planning procedures and policies after an extreme climate event to draw lessons learned; make public the information on consultations, protocols and plans	Percentage of group/committee members receiving capacity building (e.g., in risk management) per year; number of times lessons learned from emergency situations are systematically collected per relevant documents


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The identified indicators mainly focus on the management of key supporting resources and services such as land, water, energy and transport, including the capacities to manage these and on the enabling environment or governance structures framing the food system. Strengthening the capacity, diversity and maintenance of key supporting resources and services is critical to increase resilience. For example, road quality needs to be improved by paving and alternative access routes should be established in order to maintain connections to markets despite disruptions caused by extreme climate events. Indicators include: the percentage of paved roads and number of alternative access roads; the percentage of community/municipality budget set aside for maintenance and infrastructure restoration works; and the frequency of infrastructure maintenance works.

Likewise, the electric energy system should have more diversified and modular sources—for example, through small-scale renewable energy—so as to avoid cascading effects in case of failure of one production source or distribution system and in turn contribute to storage capacities (e.g., refrigerated storage). Possible developed indicators include the percentage of households with access to electricity or those with access to refrigerated storage systems.

Similarly, water and land resources are generally supporting and limiting resources. Their availability should be increased as much as possible, protected and their use better managed. This can be done by adopting water and soil conservation methods and implementing other measures to better harness their potential while avoiding further degrading its basis. Corresponding indicators include, among others: recordings of the number of water sources available to the community, the percentage of households with access to safe drinking water throughout the year, deforestation rate in recharge water areas and percentage of producers implementing soil/water conservation measures.

Improvements in institutional capacity and governance structures are also needed. Local and regional governments need to include permanent risk reduction shares in their budgets, thus tracking the percentage of available resources invested in prevention and emergency responses is useful. Permanent capacities to respond to climate events through increased human and financial resources to manage climate risk are needed, including through the design and implementation of early warning systems and emergency response plans. Indicators helping to monitor these aspects include, for example, the presence of an early warning system and the percentage of farmers or other stakeholders actually using them, and percentage of community groups/committees members receiving capacity building in risk management per year. Finally, deeper changes in governance are needed, including improved participation, more transparent rules within local organizations, municipalities and external organizations, and better collaboration between these different actors. The percentage of community members actively participating in local decision making or the percentage of households benefiting from food security projects being coordinated between external and local organizations can help track these resilience building measures.

Lessons Learned

- **There are similarities in food system resilience drivers across communities and countries**: Similarities between the identified resilience indicators across consulted communities suggest that food security depends on the resilience of the same food system elements. Such key aspects include: availability and access to storage systems and their supporting energy systems; access to markets for food exchange, which is often dependent on the conditions and accessibility of roads and transport networks as well as on national and international policies, agreements and global processes influencing international food prices (as part of the influencing context to be monitored); and the condition, availability, access and diversity of water and other natural resources (e.g., land, forests, sea) and their management systems, which support subsistence or income generating-livelihoods. The capacities of key food system actors, including households, are also critical. These entail having good response, resources and management capacities for disaster preparedness planning and early warning monitoring systems. Finally, governance aspects are also key and resilience depends on having participatory, fair and clear decision-making processes and supporting local institutions as well as strengthened collaboration. It is all these elements that need to be better understood, monitored and targeted by interventions to contribute to the food security of vulnerable communities, even if food security is and should still be understood within its specific context.

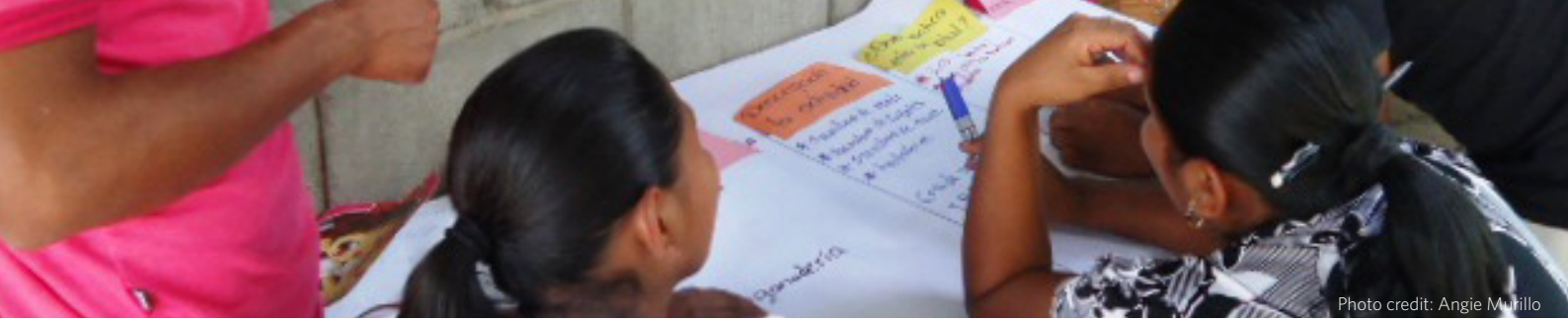
Photo credit: Angie Murillo

- **The CRiSTAL Food Security tool allows for broadening the scope of food security assessments and its indicators**: Even though standard food security indicators such as nutritional indices appear, using the CRiSTAL Food Security tool to guide their design allows users to go further than these common indicators. For instance, it enables the development of indicators tracking the status of main access roads, storage facilities and the systems they depend on such as energy for fridges, gas or wood for cook-stoves. The tool also allows the identification of indicators measuring resource management and governance aspects such as decision-making processes, program effectiveness in supporting emergency preparedness and services available to producers for improving food security.
- **It is important to complement existing food security monitoring schemes with these broader indicators:** Ideally, these types of indicators and the more standard food security indicators focusing on utilization and access as used in famine early warning systems should be viewed as complementary. Together they can help get a more comprehensive understanding of the drivers of food insecurity and vulnerability of food systems as well as provide entry points for interventions.
- **It is crucial to track institutional and governance factors**: The large number of governance-focused indicators points to the key role of institutions in improving resilience within natural systems (e.g., land and water management) and within infrastructure, as well as in improving the capacities of people to prevent food insecurities and/or address them effectively when climate vulnerabilities occur. These capacities encompass the ability to form and manage social networks and production cooperatives that are important by themselves and even more so when affected by climate impacts.

  A comparison of core food system and support system indicators shows that when moving from the household-level to support systems, the focus gradually shifts from nutrition to resource management, infrastructure and governance aspects. This further reflects the diminishing control of communities over key drivers of food security and the importance of these wider elements for local food systems. Even though these elements might not be under the direct control of the concerned communities, tracking them as part of the influencing context of food security should be an important component of food security resilience indicators' schemes. This allows an understanding of how the risk profile evolves over time and, consequently, how it might shape vulnerabilities differently within the local food system.

- **Some resilience-building measures are interlinked and provide co-benefits**: Some of the measures and subsequently their indicators are even similar across the different categories presented here. This is not surprising as food system elements are heavily interlinked. Resilience-building measures such as those aimed at building capacity to manage risk (technical and economic) will contribute to the management of all supporting resources and services, as well as improve the supporting organizations and policies. Moreover some resilience-building measures such as those aimed at improving the transport system will provide benefits likely to trickle down to storage facilities and access to markets levels, displaying high levels of interactions and positive (and negative) feedbacks within the system.
- **The approach captures overall resilience rather than just climate resilience**: Only one community designed climate-related indicators.[5] This has to do with the structure of the tool along resilience factors and questions. It can either be seen as an advantage or a limitation of the resilience concept used to frame the analysis and the development of the resilience indicators, depending on who the audience of these indicators is. The resilience concept is broader than vulnerability to one specific hazard and therefore can serve as a good basis for designing resilience indicators of a system to any threats and stresses. However, the approach's broadness might discourage practitioners used to working with specific methods and collecting data on specific aspects of food security, which might not be the primary focus here.
- **Indicator examples should not be used as a blueprint checklist**: Even though there are many common issues across communities, indicator examples should not be used as a simple checklist that can be applied anywhere. Indeed, indicators need to be considered in relation to what they are trying to measure. In this case, relevant indicators were developed to measure progress of specific resilience actions by the consulted communities or of their influencing context. The presented indicators and resilience measures are meant to provide an indication of what other possible elements need to be considered for measuring food security.

[5] Puerto Morazán in Nicaragua


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Recommendations

The ability to measure what makes a food system resilient to shocks and stresses, and to identify where the weaker and stronger elements might be located can help inform investments and the type of measures that are needed to build resilience and avoid additional costs from losses, damages or food aid in times of emergencies. The following recommendations for indicator development emerge from the results above:

Process

- **Recognize that the process is often as important as the results**. The process of developing indicators has provided communities, non-governmental and governmental organizations with several entry points for actions to increase resilience at household and regional levels. Therefore, it is crucial to not only work at the local level but involve practitioners and policy-makers at the regional/national levels to address and monitor issues such as infrastructure changes, resource management and access to credit that are often beyond the control of communities.
- **Identify and engage practitioners and policy-makers acting at the various vertical and horizontal spatial scales** and involve them as early as possible in developing the indicators. Engagement needs to extend from the local to the national and from the ministries that have traditionally been in charge of food security—ministries of agriculture-livestock and of health—to the less familiar ones of climate change, natural resources and disaster risk prevention, including the finance and trade ministries. These include national-level ministries and relevant programs, but also technical staff working at the subnational level, such as the municipalities that are effectively in charge of implementing those interventions.
- **Adopt a participatory and iterative process to develop resilience indicators**. This increases the relevance of the indicators and buy-in from the participating communities or local policy-makers, who need to be involved in monitoring and/or coordinating the data collection. Such processes need to include vulnerable groups and be led by trained facilitators who understand the principles of resilience, are able to adapt and reframe concepts and questions to the local context as needed, and build capacity on indicator development and monitoring.

Approach

- **Adopt a systems perspective to food security to be able to encompass the many factors determining food security beyond food production**. It is important to track resilience indicators for both core and supporting elements of the food systems to cover a broad range of resilience indicators from nutritional elements to governance aspects. This allows the measurement of the whole food system and thereby provides a more comprehensive and dynamic view from which community members and policy-makers can work with. This has become vital, as changes far away from the local food system can contribute to food insecurity in the studied location.

Implementation

- **Build on existing monitoring systems.** There is little potential for long-term uptake if the indicator monitoring system developed pretends to replace existing monitoring schemes or does not consider them at all. It is important to work with already-developed food security monitoring systems and indicators and link them with the broader system-based indicators presented in this brief. This allows food security and resilience practitioners to better understand the drivers of vulnerability in food systems and to identify entry-points for potentially effective responses to food insecurity that do not necessarily only occur at the core food-system level of food utilization, food access and availability.

Photo credit: Alicia Natalia Zamudio

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International Institute for Sustainable Development
Head Office
161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Website: www.iisd.org

Geneva Office
International Environment House 2; 9 chemin de Balexert, 1219 Châtelaine, Geneva, Switzerland
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Website: www.iisd.org

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