2020 CONFERENCE PAPER 6 • MAY 2014

CAPACITY DEVELOPMENT FOR RESILIENT FOOD SYSTEMS

ISSUES, APPROACHES, AND KNOWLEDGE GAPS

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IFPRI and its 2020 Vision Initiative appreciate the generous support of and active engagement with the consortium of partners for the 2020 conference.

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ABSTRACT

Food systems face shocks varying in breadth and duration from a wide array of sources. These shocks can affect all aspects of a country's food system, threatening the food security of its citizens. Low levels of capacity to address food system shocks are a major development challenge. This paper presents a conceptual framework for assessing the capacity of a food system to become more resilient, regardless of what kind of threat it faces. It suggests that food systems can be categorized into three subsystems: a policy system; markets, trade, and institutions; and a production system. Within each of these systems, three dimensions of capacity are analyzed: individual capacity, organizational capacity, and system capacity. The paper explores examples of building capacity within this framework and identifies key knowledge and research gaps. It also presents a typology as a possible tool for prioritizing investments in capacity building for resilience across countries.

Keywords: capacity development, resilience, institutions, food system, knowledge gaps

1. INTRODUCTION

Creating resilient food systems in developing countries requires building different kinds of capacity in multiple interlinked sectors. Achieving food security for all, the ultimate goal of a resilient food system, includes ensuring food availability, accessibility, utilization, and stability (Pinstrup-Andersen 2011; Headey and Barrett 2014). Food security remains at the top of the development agenda, especially following the food and financial crises of 2007–2008 and 2011 (Pinstrup-Andersen 2014), and the building of resilient food systems has become one of the main focuses of development and humanitarian partners. Food security for all is not only a basic human right but also an important input for many other development goals. Improved capacity to build resilient food systems can help countries to transition from a relief stage to a development path.

A food system can be defined as a process that transforms natural resources and inputs into food and nutrition outcomes. It involves multiple individuals and institutions in different environments in production, processing, exchange, transport, storage, acquisition, preparation, and consumption activities (Sobal, Khan, and Bisogni 1998; Pinstrup-Andersen 2011; FAO 2013). This paper will refer to a food system as all the subsystems, institutions, organizations, and individuals that affect the realization of a country's food security.

Resilient food systems are those in which "people, communities, countries, and global institutions prevent, anticipate, prepare for, cope with, and recover from shocks and not only bounce back to where they were before the shocks occurred, but become even better off."[1] Building capacity for resilient food systems can thus be defined as enabling these different groups to undertake prevention, anticipation, preparation, coping, and recovery. Capacity building for resilient food systems is a nonstatic process to develop stronger capacity that enables food systems to be more resilient to future shocks. This process requires assessing capacity needs and contexts so that food systems continuously learn from the shocks and threats they experience.

Despite progress toward food security at the global level, shocks such as financial crises—combined with slow economic growth; high food prices; high fuel prices; and natural calamities such as droughts, floods, earthquakes, and tsunamis—pose considerable threats to such progress and reduce the stability and resilience of the food systems in developing countries. The Food and Agriculture Organization (FAO) reported that the average number of food emergencies has increased from 15 per year in the 1980s to 30 per year since the start of the new millennium (FAO 2006). Conflict, natural disasters, and health shocks have triggered the majority of these crises in Africa, where the effects of food crises often continue for several years, affecting the food security of millions (Miguel, Satyanath, and Sergenti 2004; Martin 2005; Mulligan 2009). Schaar (2013) noted that the complexity of the challenges faced by poor households suggests a need to shift focus from scaling up crisis-specific emergency response tools to developing a broad-systems risk-management strategy. In addition, resilient food systems must be able to do more than just provide short-term disaster relief (Pingali, Alinovi, and Sutton 2005). There is a need to focus on transitioning from supporting relief activities to supporting the holistic development of food systems, such that countries can exit from an emergency with the resilience needed to withstand future shocks to their food systems (Longley, Christoplos, and Slaymaker 2003; Omamo 2004).

Protracted crises remain a substantial roadblock to achieving global food security, and especially nutrition security. Although the worldwide level of hunger has dropped from the peak it reached in 2009 as a result of the global economic crisis and high food prices, the 2010 level was higher than the level prior to the crisis, suggesting that many countries were struggling with long-standing food-system weaknesses. In 2010, the FAO classified 22 countries as experiencing a protracted crisis that stemmed from myriad issues ranging from weak

[1] Definition developed by the IFPRI 2020 Conference Policy Committee for the 2020 conference Building Resilience for Food and Nutrition Security (Addis Ababa, Ethiopia, May 15–17, 2014).

governance or a collapse of public institutions to conflict or repeated natural disasters (FAO 2010). The underlying issues that turn otherwise short-term shocks into protracted crises pose additional challenges to relief efforts and further suggest a need for resilience-building strategies.

This paper takes an inventory of the capacities needed to improve the resilience of food systems and attempts to answer the following questions:

- Why build capacity for resilience for food and nutrition security?
- How should capacity building for resilience be studied?
- Whose capacity and what type of capacity can enhance the resilience of food systems such that they are capable of facing different policy and program challenges and various shocks and threats?
- Where and how should capacity-building investments be made to maximize the resilience of food systems for food security?
- What are some current modalities for building capacity for resilience?
- What key research and policy gaps need to be addressed to strengthen capacity for resilient food systems?

The paper is organized as follows. The next section develops a conceptual framework to map the capacity weaknesses and needs of a resilient food system. Section 3 describes the capacity needs of a resilient food system by studying its subsystems. Section 4 reviews past approaches to capacity strengthening and identifies research gaps. Concluding remarks constitute the final section.

2. HOW TO STUDY CAPACITY BUILDING FOR RESILIENCE: A CONCEPTUAL FRAMEWORK

This section reviews past approaches to assessing resilience capacity and discusses components and indicators of a resilient food system. It then summarizes the theoretical underpinnings of building capacity for resilience. Finally, it introduces a conceptual framework that facilitates the identification of capacity challenges facing planners and policymakers in developing a resilient food system that achieves the goal of a food-secure country.

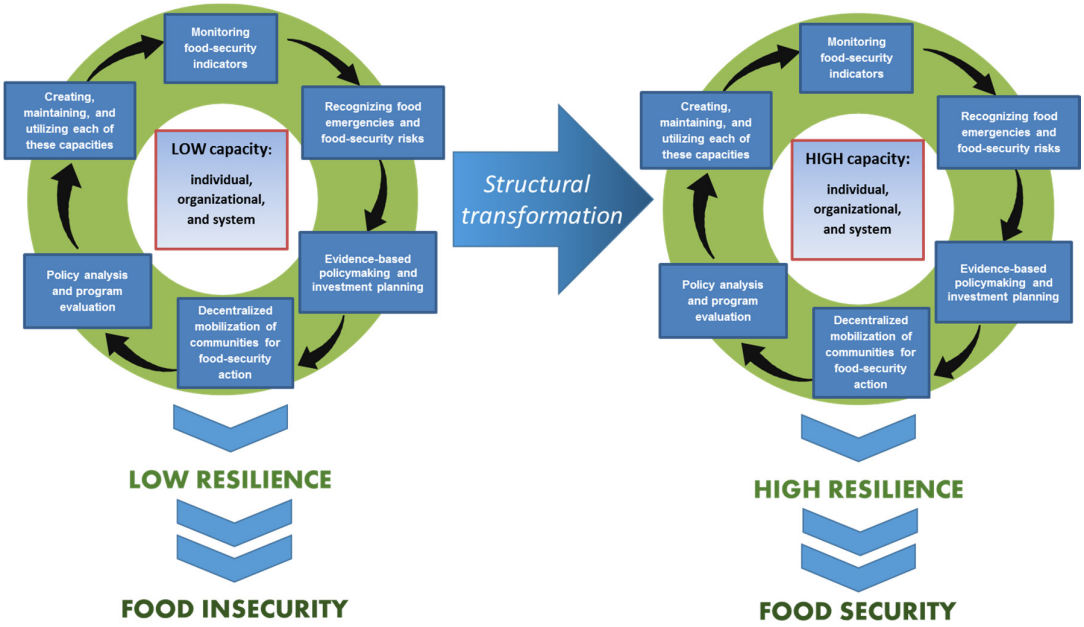
Efforts to develop resilience in the context of traditional *coping mechanisms,* particularly to deal with weather-related crop failures at the household level and to maintain consumption levels in times of food shortage, have been well researched (see, for example, Reardon, Matlon, and Delgado 1988; Bayliss-Smith 1991; Kinsey, Burger, and Gunning 1998; Skoufias 2003; Khandker 2007; Stromberg 2007). The more recent literature on resilience broadens this area to include shocks to food supplies from other types of natural disasters, conflict, and epidemics, as well as political and economic instability. Definitions of resilience vary, as do approaches to studying resilience and hence to building resilience capacity (Varma and Winslow 2004). Managing and reducing risk and vulnerability while making progress on development requires building resilience at the individual and country levels in the context of assets, institutions and entitlements, knowledge and information, innovation, and flexibility and foresight (Evans 2011). Food-system resilience to climate change requires strengthening or enabling household food utilization, food access, and food availability; supporting resources and services; and supporting organizations and policies at the community and national levels. It is crucial to ask the right questions to understand resilience issues in terms of capacity, relationships, and performance (FAO 2006; IISD 2013). Frankenberger and colleagues (2013) suggested that resilience depends on a community's capacity for collective action, which in turn is a function of the community's assets (human, financial, natural, physical, and political) and its utilization of these assets. Alinovi, Mane, and Romano (2009) used social safety nets, access to public services, assets, income and food access, adaptive capacity, and stability to develop a resilience index to measure and compare a household's resilience before and after a shock. These developments help to orient the nature and the amount of capacity needed for building a resilient food system.

A resilient food system will look different depending on the structure of the food system, its current strategies for achieving each dimension of food security (availability, access, utilization, and stability), and the expected threats and shocks to the system. Although every situation is unique and context specific, we identify six common components of food systems that together encompass the strategic capacity needed to be resilient (Levy and Kpundeh 2004; Sutcliffe and Court 2005). These components include food-security monitoring and evaluation (M&E) mechanisms at multiple administrative levels; recognition of food or nutrition emergencies or security risks; processes that reflect evidence-based policymaking and investment planning; decentralized mobilization power of communities for food-security action; analysis and evaluation at multiple administrative levels; and capacity for creating, maintaining, and utilizing resources to ensure that the above components function effectively. If operating resiliently, each individual subsystem (policy, markets and institutions, production) should exhibit all of these components. A resilient food system will exhibit interaction between all three subsystems for each of these components. Indicators of "good" interaction include the following (after NAS 2010): risk and vulnerability information at all levels; resilient strategies / operational plans; proactive investments / program interventions / policy decisions for prevention, preparation, programs, and the postrecovery period; networks/coalitions of organizations to mobilize resources and implement food-security interventions; quick recovery from shocks and cost-effective responses that move from relief to long-term development; and improved and sustainable food security following a shock. These indicators demonstrate a food system's capacity to identify and react to potential shocks and threats, whereas indicators of the capacity of a food system might measure the resources and capabilities of the system in terms of production potential, for example, by land availability, labor supply, or processing capacity.

Depending on the nature and extent of the adverse effects of shocks that countries face, capacity at different levels will be important. Much of the current resilience literature looks at the community level (see, for example, Frankenberger et al. 2013) to understand how a group of people who depend on the food production of a local agroecology can ensure their own food security. However, most communities are members of food systems that span broader geographic areas than their own, a situation that both exposes them to more risks and offers them increased opportunities for risk sharing and contingency planning. Conversely, members of a community may need differing strategies to deal with the same shock. Because of the potential to develop more influential resilience-enhancing policies, markets, and institutions at the national level than at the community level, this paper focuses on country-level capacity, while acknowledging that an indicator of strong country-level resilience is the extent of decentralization of its institutions to adapt policies and programs to local needs and conditions.

We borrow from Timmer's (1988) and Lin's (2011) work on agricultural transformation and structural transformation, respectively, to study how a country's level of capacity affects its resilience. Timmer suggested that agricultural transformations occur in a stepwise fashion triggered by different types of policy changes. We suggest that these policy changes depend on the country's level of agricultural development and its capacity to make strategic policy choices. We extend Timmer's thinking to the context of food-system resilience. We hypothesize that at a low level of capacity for food-system resilience, a country cannot improve its food security because its food and agriculture systems are highly susceptible to any kind of adverse shock and suffer high levels of damage from the shocks. However, with increased capacity for resilience, countries can withstand shocks because of their ability to plan, prevent, and program resilience-oriented approaches to recover from such shocks. Thus we hypothesize that with low resilience capacity, a shock may hit a system with catastrophic results, but at higher levels of resilience, a system is able to withstand shocks and, ultimately, bounce back better. In other words, there is a threshold capacity level of resilience to some shock, at which point the system will recover to a position that is at least as food secure as it was prior to the shock (Figure 2.1).

Figure 2.1 Structural transformations facilitate the progression from a low-capacity country to a high-capacity country that is able to withstand shocks and threats to ensure the food security of its citizens



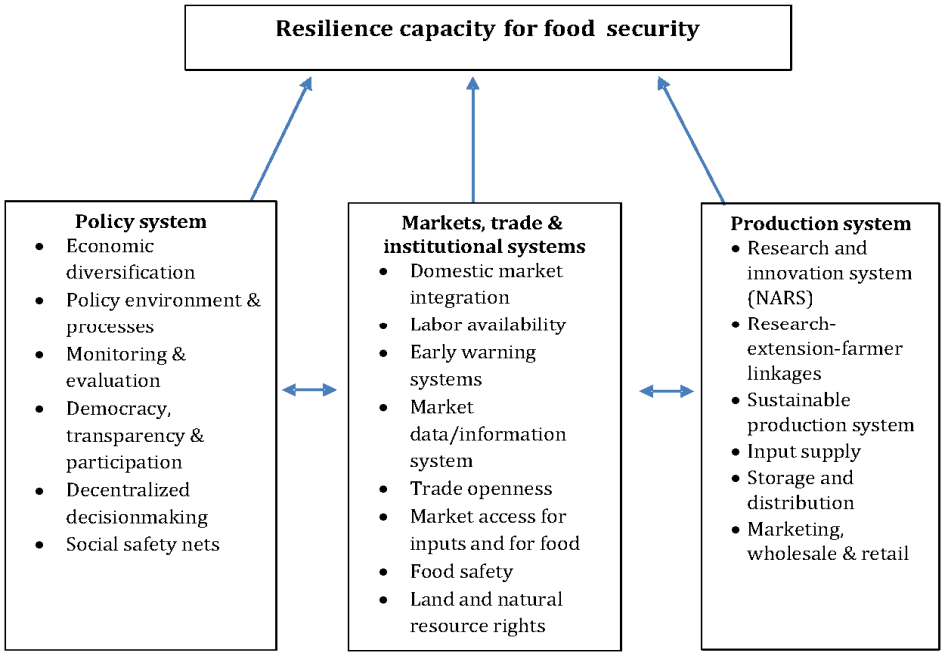
Source: Authors.

How can this resilience capacity threshold level be described? We propose that resilience is a function of three dimensions of capacity: individual capacity, organizational capacity, and system capacity. Depending on the type of shock, the level of each dimension of capacity as well as the aggregate function itself will vary, producing a different threshold level of resilience. To better understand these levels of capacity, we first develop a conceptual framework of a resilient food system, building on our earlier three-pronged subsystem definition.

CONCEPTUAL FRAMEWORK

A food system is considered resilient when its individual members and groups have the capacity to prevent, anticipate, prepare for, cope with, and recover from shocks, such that after a shock, they follow a trajectory that ensures their food security is even stronger than it was prior to the shock. Food systems capable of responding to a wide variety of shocks and challenges in a resilient manner require well-built policy, institutional, and production systems at the national level. Selected resilience capacity characteristics of each subsystem are illustrated in Figure 2.2.

Figure 2.2 Capacity components of a resilient national food system



Source: Authors.
Note: NARS = national agricultural research system.

The policy subsystem reflects the need for strategic thinking about resilience (Sutcliffe and Court 2005). When a policy system has strong capacity, policies and programs can be developed that enable farms and markets to be more resilient. These strategies and plans require analytical capacity to anticipate potentially adverse events, to recognize the various ways in which they might affect food security, and to think critically and creatively about preventive measures and emergency support. For example, a policy system can influence a country's financial and economic stability and hence the availability of assets to import food in an unforeseen food shortage. Policy processes should be evidence based, participatory, transparent, open, and democratic for effective policymaking (Grindle and Hilderbrand 1995; Grindle 2002). Communities should be empowered to create and enact contingency plans for small-scale shocks when sufficient local capacity is left intact, and to call for—and guide the implementation of—external support for larger, communitywide shocks.

The policy system is also responsible for developing social safety nets that ensure vulnerable populations are always provided for.

The markets, trade, and institutional system affects the capacity to transfer food from producer to consumer (North 1990; Khan 2005). This system includes government agencies; regulatory organizations; data collection systems; and the laws, regulations, and policies that govern how markets function. These systems represent the capacity to predict potentially adverse effects (environmental, health, social, economic, financial, or political) and implement contingency plans. They have some capacity to control how food systems (especially food supply and prices) are affected by adverse effects, for example by buying excess grains or releasing food stocks. They can also detect and mitigate potential food safety–related disasters, for example, by testing for bacterial contamination or zoonotic diseases and implementing food recalls or increasing safety measures. Markets, trade, and institutional systems refer in large part to how policies and programs developed by the policy system are implemented. These systems produce much of the information used by the policy system to decide how, when, and what policies to foster resilience should be developed at the macro level (Hirschmann 1993). They also provide more specific agroenvironmental data to farmers and agribusinesses for day-to-day decisionmaking.

A resilient food production system (Varma and Winslow 2004; Erskine and Nesbit 2009) must have technical capacity to adapt to physical and environmental changes to the growing fields as well as anywhere inputs or outputs are stored. It must also include a strong research and innovation system that can build on the information produced from markets, trade, and institutional systems to develop specific tools, technologies, or practices that are best suited to anticipated adverse effects. A well-capacitated extension system connects these research innovations to the farmers' fields where they are needed and, conversely, communicates the challenges and ideas of farmers back to the research community for further investigation. While a resilient food production system can withstand or overcome many adverse events on its own, there are many challenges that may require policy intervention or support. Hence, larger challenges faced by the production system must also be communicated to the policy system for overall enhanced resilience.

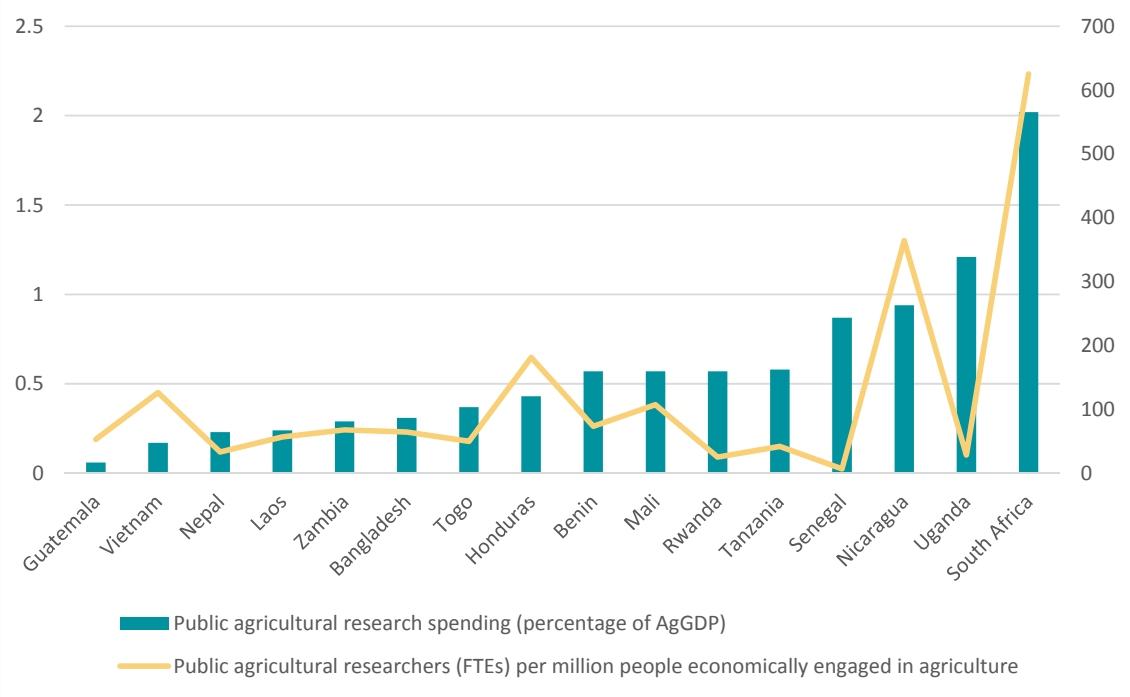
The conceptual framework developed above could be applied to understanding whose capacity should be built, what minimum threshold levels of these capacities should be maintained, and how such capacity-development processes could be understood in the context of resilient food systems. The remainder of this paper addresses these applications.

3. WHOSE CAPACITY TO BUILD: A TYPOLOGY OF COUNTRIES BY HUMAN CAPACITY MANAGEMENT FOR A RESILIENT FOOD SYSTEM

This section develops a typology of countries as a starting point to understand, from a global standpoint, how to prioritize capacity-development needs across countries. This is the first step in identifying where to invest in capacity building. The second step involves undertaking comprehensive capacity needs assessments in each prioritized country. The subsequent subsection, "Conceptual Framework," offers a starting point for the identification of specific capacity needs.

Babu and Dorosh (2013) constructed a food policy research capacity typology of countries on the basis of three aspects of human capacity management, to understand where capacity bottlenecks exist in different countries. We adapt this typology using data from the International Food Policy Research Institute's (IFPRI's) Agricultural Science and Technology Indicators (ASTI) dataset to understand where human capacity may constitute a bottleneck in the context of developing a resilient food system (IFPRI 2013). We classify countries first by their capacity to create human capacity and then by their capacity to maintain and effectively utilize human capacity. Figure 3.1 illustrates the data used in the development of this typology.

Figure 3.1 Public agricultural spending and researchers by country



Source: Agricultural Science and Technology Indicators (IFPRI 2013).
Notes: AgGDP = agricultural gross domestic product; FTE = full-time equivalent.

The first classification, the capacity to create human capacity for a resilient food system, reflects a country's investment in educating its citizens to effectively contribute to the country's food security. This capacity may be built through a country's own educational institutions or by financing its citizens to study abroad. We estimate this capacity using as an indicator ASTI's full-time equivalent (FTE) public agricultural researchers per million people economically engaged in agriculture. The second way in which we classify countries reflects a country's commitment to nurturing its human capacity and utilizing it to enhance the country's food security. Providing sufficient financial incentives to entice agricultural researchers to work in the public sector is a common managerial strategy; hence, we use ASTI's public agricultural research spending as a share of the country's agricultural gross domestic product (GDP) to indicate this capacity.

We divide each indicator into three levels: low, medium, and high. For the FTE researchers indicator, we suggest that low capacity to create human capacity is equivalent to having fewer than 100 researchers per million agricultural laborers, medium capacity is between 100 and 200 researchers, and high capacity is more than 200 researchers. In terms of capacity to maintain and utilize human capacity, low capacity is an allocation of less than 0.5 percent of agricultural GDP to agriculture research, medium capacity is reflected by spending between 0.5 and 1 percent of agricultural GDP on research, and high capacity is any public agricultural research spending exceeding 1 percent of agricultural GDP. We use this typology to classify countries to exemplify a possible strategy to prioritize needs across countries. Table 3.1 exemplifies this typology. Because this table is solely for exemplary purposes, we only present a small number of countries.

Table 3.1 A typology of countries based on their capacity to create human capacity and to maintain and effectively utilize human capacity for a resilient food system

Capacity to create human capacity for a resilient food system	Capacity to maintain and effectively utilize human capacity for a resilient food system		
	Low	*Medium*	*High*
Low	Bangladesh Guatemala Nepal Laos Zambia Togo	Benin Rwanda Senegal Tanzania	Uganda
Medium	Vietnam Honduras	Mali	
High		Nicaragua	South Africa

Legend: Group 1 countries Group 2 countries Group 3 countries

Source: Authors' calculations based on data from IFPRI (2013).

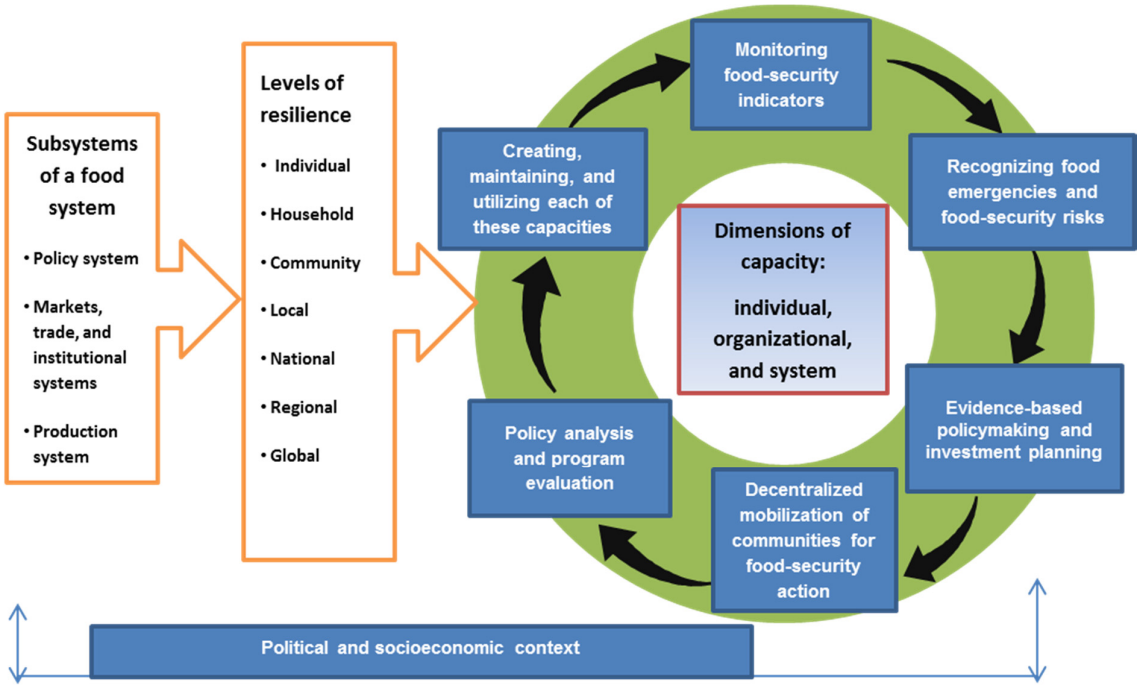
From this typology, we identify three groups of countries. The first group (Group 1) is characterized by low scoring for both variables. The second group (Group 2) includes those with a low score for one capacity and at least a medium score for the other capacity. These countries could be considered as transition countries: countries undertaking some type of investment to improve their human capacity management. The third group (Group 3) includes countries that achieved at least a medium score for both capacities.

Although this typology uses only data that directly reflect human capacity management aspects within the production subsystem, we argue that it is also indicative of the two other subsystems because publicly funded agricultural research comes about only from policy imperative and private-sector demand. However, the human resources situation is only one aspect of each of these subsystems, and additional information about other capacity aspects is crucial to solidifying this typology for future use. This topic is discussed further in the subsection "Research Gaps in Resilience Capacity Building," below.

CONCEPTUAL FRAMEWORK

Capacity development as an input to the progress of nations has a history of success mixed with failure (Moss, Pettersson, and van de Walle 2006; Mulligan and Shaw 2007), and capacity development for achieving resilient food security is no exception (Mueller and Quisumbing 2010). This section discusses how to decompose a national food system in order to begin the capacity needs assessment process, so that capacity-development strategies and programs can be better targeted and yield a higher success rate in terms of improving resilience and food security. Figure 3.2 illustrates the various aspects of resilience capacity. The discussion then expands the dimensions of capacity (individual, organizational, and system) and describes their roles in the context of each food subsystem (policy; markets, trade, and institutions; and production).

Figure 3.2 Framework for understanding the capacity needs of a resilient food system



Source: Authors.

Figure 3.2 illustrates the various factors that affect the capacity of a resilient food system. It starts by separating the food system into three subsystems: policy; markets, trade, and institutions; and production. It then identifies the human levels at which resilience is important. Next it identifies six thematic components of resilience capacity: monitoring of food-security indicators and related data collection; recognition of emergencies, threats, challenges, and risks to food security using data collected from the monitoring system; evidence-based policymaking and investment planning according to the expected duration, extent, and type of expected threat; decentralized mobilization of preventive or emergency programs and services; policy analysis and program evaluation for immediate program changes and long-term policy learning purposes; and last, dedicated capacity strengthening to ensure that the previous five components are functioning effectively and are continuously learning and improving. This latter component includes conducting capacity needs assessments to ensure that the system is periodically assessed for optimal functioning. These assessments should identify capacity challenges, weaknesses, or bottlenecks by assessing the three dimensions of capacity: individual, organizational, and system. Finally, it is important to note that the capacity of a resilient food system depends on the political and socioeconomic context in which it operates.

The Organisation for Economic Co-operation and Development, Development Assistance Committee (OECD/DAC 2009) noted that while donors and development partners still vary slightly in their approaches to capacity development, many have come to see capacity as having three components: individual skills, organizational capacity, and system capacity / enabling environment. Networks are sometimes added to this list or can be thought of as a subset of system capacity. The European Centre for Development Policy Management (ECDPM) and the European Union view capacity from the perspective of the organization, whereby individual competencies are contained within organizational capacity and system capacity is a function of an organization's ability to react to external stimuli and build relationships with other organizations to create a functioning system (OECD/DAC 2005; OECD 2011; Baser and Morgan 2008). We use the common three-pronged approach to studying capacity, pulling from ECDPM's work to delineate organizational capacity.

Individual capacity is often thought of as one's knowledge, skills, and attitudes—that is, one's awareness and understanding of a particular situation, issue, or area; one's technical ability to react, predict, analyze, or

solve in a critical way; and one's personal motivation to apply oneself to the task at hand. Individual capacity in the context of a resilient food system can range from the capacity to write policy that reflects potential adverse events, to the capacity to research and develop resilient varieties of food, to the capacity to negotiate and resolve conflict. The specific capacities needed will depend on what organizations and systems are weak and what potential shocks and threats to the food system exist.

This paper will discuss four types of individual capacity that cut across all three subsystems of a resilient food system and are relevant for all possible shocks and threats. The first type of individual capacity is the capacity for information generation and use. This can include surveying or collecting data of a technical, environmental, economic, agricultural, health, or human nature. Giles (1979) noted the importance of being able to anticipate future data needs, for example to understand the extent of damage to a food system, and to implement a system to collect this information. The second capacity, the capacity to conceptualize problems and potential solutions, indicates the importance of thinking broadly to truly understand the root causes of food and nutrition insecurity and to be able to devise creative strategies that eliminate these causes. The third capacity, research and development capacity, is strongly linked to the second capacity. It refers to the need to critically analyze data and use evidence in building solutions. The fourth capacity is communication and outreach, an essential skill for disseminating information, identifying field-level challenges, gathering feedback, and increasing participation in building resilience. Table 3.2 identifies some characteristics of human capacity within each of the three subsystems.

Table 3.2 Characteristics of human capacity needed by different subsystems of a resilient food system

Individual-level skill	Type of subsystem		
	Policy system	***Markets and institutions***	***Production system***
1. Capacity for information generation and use	Survey design, enumeration, data processing, and statistical analysis of development indicators to track policy outcomes	Price data and trends, inflation/deflation trends, market supply data, prediction capacity, environmental data, food safety information, predictors of other potential shocks, vulnerability assessments	Food production and yield, nutrition content, availability and use of inputs, processing/distribution challenges, waste along the value chain
2. Capacity for conceptualizing problems and potential solutions	Policy advisors and policymakers with cross-training in food, nutrition, agriculture, and related areas (such as climate change, conflict, disaster management)	Ability to know when to intervene in markets and when not to; incorporation of a variety of data into market analysis; risk analysis and contingency planning	Awareness of potential shocks to different value chain segments and extent of risk in food production
3. Capacity for research and development	Economic analysis, modeling, cost-benefit analysis, community studies, focus group discussions	Market trend analysis, ex ante evaluations of increased/decreased regulation, sector growth strategy development	Technical agricultural and environmental research capacity, encouragement of farm-level innovation, assessments of indigenous coping strategies
4. Capacity for communication, outreach, and information dissemination	Communication capacity to discuss new policies and quickly address potential problems; policy memos, radio reports, and so on	Capacity to create information channels to efficiently disseminate early warning information, food prices, market data	Extensionists and agribusiness representatives that link farmers, private businesses, and researchers

Source: Authors.

To assess organizational capacity, we look to ECDPM's framework, which delineates organizational capacity into five capabilities, termed the 5C approach (Baser and Morgan 2008). The first is the capability to act and commit, which addresses the importance of an organization's ability to set goals and to outline steps and processes to achieve these goals. The second capability builds on the first one: it addresses how an organization obtains and allocates resources to meet its objectives. Third, the capability to adapt and self-renew refers to an organization's own resilience, its ability to reflect on changing external circumstances and make changes that allow the organization to remain relevant and effective in its mission. Fourth is the capability to relate to external stakeholders, that is, how the organization interacts, communicates, cooperates, and works with organizations and entities. Finally, the fifth capability is the achievement of coherence, which refers to an organization's leadership and management. Together, these characteristics are widely applicable, including in the context of understanding how organizational capacities are crucial for a resilient food system. Table 3.3 identifies organizational capacity characteristics important within each subsystem.

Table 3.3 Characteristics of organizational capacity needed by different subsystems of a resilient food system

Organizational capability (5C approach)	Type of subsystem		
	Policy system	***Markets and institutions***	***Production system***
1. Act and commit	Policymakers' accountability to citizens for taking action and for the outcomes of food-security policies	Ability to act independently and according to evidence (not based on public or private pressures); rule of law to ensure that politicians do what is expected of them	Innovation along the value chain; vertical links that support system development; empowered, engaged farmers
2. Deliver on development objectives	Policy actors' ability to follow through on pledges; analysts' ability to strategize priorities for research and food-security policy agenda	Automated triggers to implement precautionary or reactionary measures, with everyone's role clearly defined	Sharing of technical advice and mobilization of resources to support actors along value chain
3. Adapt and self-renew	Continued capacity strengthening to educate all relevant stakeholders for informed decisionmaking	Agencies and institutions that reflect on the current threats with sufficient capacity to study potential future threats; capacity for renewed organizational mandates	Analysis of coping mechanisms as well as alternative livelihoods / food sources
4. Relate to external stakeholders	Capacity to link and coordinate various players in policy system, including nontraditional actors such as public, private, and civil society organizations and development partners	Capacity to connect external markets and trade systems; capacity to connect farmers with marketing organizations in domestic and international markets	Understanding of emerging issues and scenarios, and appropriate responses to emergence of new organizations and partnerships
5. Achieve coherence	Feedback channels for different stakeholders, with a focus on facilitating participation of vulnerable populations; capacity to mobilize resources	Marketing systems that are transparent and share data on food prices in a coordinated manner; institutional coherence for market regulations	Capacity to organize production and farming systems to achieve the food-security goals; coherence at community, local, and national levels

Sources: Authors (inner cells) and Baser and Morgan (2008) (organizational capabilities).

The third dimension of capacity addressed in this paper is system capacity. System capacity is sometimes referred to as the enabling environment (Baser and Morgan 2008) or institutional capacity (see North's [1990]

definitions of formal and informal institutions). To understand the system elements of a resilient food system, we look at six different functions or steps involved in building capacity for resilience, whether in reaction to a shock or in prevention of a potentially adverse event that is expected to have long-term crippling effects. Regardless of the type, duration, or onset of an adverse event, the first step is identifying the potential problem. The second step is research and analysis—understanding the extent of the issue, how it will affect food security, and who or what element of the food system is expected to be affected, as well as critically analyzing potential solutions or strategies. Next is the development of the strategy, followed by strategy implementation and then M&E of the strategy and the situation. The final step is assessing whether the strategy is successful, and based on this analysis, either revising it, discarding it, or continuing with it. Table 3.4 identifies important characteristics of system capacity for each subsystem.

Table 3.4 Characteristics of system capacity needed by different subsystems of a resilient food system

Stage of policy process	Type of subsystem		
	Policy system	***Markets and institutions***	***Production system***
1. Issue identification	Communication channels or forums between farmers, vulnerable communities, and policymakers; connections to early warning systems; institutions and production data to identify potential policy issues; capacity to articulate food-security shocks and challenges at all levels	Automatic warnings from various early warning systems to regulators (based on trends in data or sudden changes, for example, in weather conditions or global prices); capacity to identify market and institutional challenges affecting resilience of food system	Connections between extension workers and farmers that allow for information to move in both directions; increased awareness of value chain functioning among all stakeholders to ensure decisions are based on full information (to minimize detrimental effects down the value chain, for example)
2. Research	Linked network of private, public, nonprofit, and academic researchers that hold each other accountable for unbiased evidence generation	Public- and private-sector analysts held accountable to public sector; research evidence made available to public	Strong interdisciplinary research connections (for example, to environmental scientists, nutritionists, climatologists, and so on)
3. Strategy development	Participatory processes with multiple opportunities to obtain stakeholder and public input that yields evidence-based solutions	Transparent, evidence-driven process that reflects country's vulnerability to different shocks and human development needs	Consultation with stakeholders from all along value chain, including industry experts
4. Implementation	Strong decentralized capacity and clear communication channels between administrative levels	Capacity for implementation of market and institutional policy changes	Capable and adaptable extension system and private sector
5. Monitoring and evaluation (M&E)	M&E data on policy outputs and outcomes that are integrated with national statistical collection system; evaluation as a mandatory component of policymaking	Data collected to both predict and monitor shocks or threats; capacity for assessment of impact of policy implementation	M&E of production process, from farmer to consumer, integrated into the agricultural research system

Stage of policy process	Type of subsystem		
	Policy system	***Markets and institutions***	***Production system***
6. Strategy revision	Sufficient decentralization of power to ensure strategies can be immediately adapted or revised as needed to fit local contexts	Capacity for analysis and development of marketing and institutional strategies dictated by data from the monitoring systems	Capacity to develop policy strategy revisions based on the effects of shocks on the food production systems

Source: Authors.

Drawing from the typology introduced earlier (Table 3.1) and the three tables of individual, organizational, and system characteristics of resilience capacity (Tables 3.2–3.4), we now discuss capacity strengths and weaknesses faced by countries with differing levels of resilience capacity (classified in the typology in Table 3.1). The Group 1 countries, who were found to have low capacity to create human capacity as well as low capacity to utilize and maintain human capacity, are the most vulnerable and hence the most in need of capacity-building support. Group 1 countries are hypothesized to be heavily constrained by weak policy system capacity and governance. Research supply often exceeds demand for policymaking, and international donors and agencies often focus on guiding the policy agenda and making policy recommendations (Owens, Hoddinott, and Kinsey 2003; Rajan and Subramanian 2005). Organizations, especially government entities, are generally perceived to be more constrained by a mismanagement of resources (including human, financial, and other) than by a lack of resources. There may be strong academic institutes and profitable agribusinesses, but they likely operate independently of the policy agenda, and regulatory institutions (if they exist) are too weak to enforce or encourage compliance (Rhoe, Shantharam, and Babu 2002). The topics of academic research projects, for example, depend on the source of funding, not the potential threats or shocks to the country. The production system is typically characterized by subsistence farmers and some private companies. Although private companies generally make business decisions according to their needs and may feel little pressure from the government to enact a pro-poor business plan, they are often the best source of data on the threats and shocks facing a country's food system (Mapila et al. 2012).

Group 2 countries are in various stages of transition in terms of their resilience capacity. Their strengths and weaknesses vary widely and pose different challenges and opportunities to increasing resilience. They may appear to have resilience capacity but be unable to adequately bounce back from a shock, or it may take longer than expected to recover. There are likely hidden gaps in capacity that emerge when a shock hits. Conducting a capacity needs assessment is hence especially important in these countries because it will identify the areas with the weakest capacity, and even small investments in capacity building may be able to yield large returns in terms of resilience capacity. Often the main obstacles may still lie within public institutions and government capacity (Rondinelli 2003; Babu and Dorosh 2013).

Finally, Group 3 countries exhibit the highest levels of resilience capacity. They are hypothesized to be more likely to have food and nutrition warning systems, to be connected to environmental monitoring systems, and to have sufficient national statistical capacity to monitor how shocks impact food security and whether policy solutions have addressed or mitigated the shock. These countries may be more democratic than those in the other groups, which may slow reaction time; however, the process for developing or revising policies may be more participatory and evidence based (Olowu 2002). Organizational capacity across all subsystems is expected to be strong. Advocacy organizations (nonprofit, civil society, or private) are likely to voice their opinions through formal feedback systems. Production systems are expected to be better connected and better serviced; both public and private researchers and extensionists work in the value chain to improve resilience. There may be underutilized resources, bureaucratic challenges, and some disconnect between subsystems, but basic resilience capacity is evident (Mashelkar 2003). Increasing awareness of different types of shocks, how and why they should be addressed differently, and the analysis needed to devise these strategies might well be a potential entry point for capacity strengthening in these countries.

4. CAPACITY-DEVELOPMENT APPROACHES: WHAT HAS WORKED AND WHY?

This section reviews some past approaches to capacity development to build resilient food systems in developing countries and identifies factors contributing to successful approaches. Looking to selected experiences of development organizations, partners, and donors, it assesses the various approaches by the type of capacity they intend to build: individual, organizational, network, or system capacity in the context of resilience for food security. Table 4.1 presents examples of strategies at each level.

Table 4.1 Summary of capacity-development approaches for building resilient food systems

Individual	Organizational	Networks of organizations	Enabling environment
• Training (short-term, long-term) • Workshops • Study tours • Tool kits / handbooks • Practitioners' guides • Twinning approach or exchange programs • ICT (e-learning, portals, open education) • Kiosks or advisory service centers • Writeshops or joint writing sessions • Partnership or collaborative programs • Peer learning events • Participatory research • South-South learning workshops • Research grants	• Technical assistance • Training • International best practices (best fit) • Participatory institutional analysis • Study tours • Partnerships (exchange scholars, exchange students) • South-South learning • Supporting regional networks • Supporting centers of excellence • Participatory M&E • Training on organizational management • Visiting research programs	• Technical assistance for platforms, networks • Supporting regional networks • Documentation and sharing of good practices	• Media campaign • Public awareness campaign • CD support for policy and social analysis • CD support for institutional analysis • Training for media • CD support for advocacy • Learning/workshop for policymakers and decisionmakers • Policy networks

Source: Ragasa et al. (2010).
Notes: CD = capacity-development; ICT = information and communication technology; M&E = monitoring and evaluation.

INDIVIDUAL APPROACHES

Capacity for collaborative research on droughts and famines: In the past, academic institutions have collaborated with researchers in several African countries south of the Sahara to better understand the effect of famines on food security and markets (Babu and Mthindi 1994; Dercon 2004). Conducting research jointly enabled local researchers to learn analytical methods for future crisis situations while contributing to the broader literature on policy solutions in crisis situations, thus generating useful information for other countries.

Regulatory capacity: Countries' capacities to prevent, face, and mitigate disasters depend on the capacity to regulate institutional policies and programs during and after a shock. For example, biosafety and food safety capacity-development activities aim at aiding countries in safely adopting biosafety and food safety systems. These programs vary by country according to need but generally provide technical and regulatory training to local staff to develop local institutions. Preliminary evidence from IFPRI's Program for Biosafety in Kenya suggests that success depends on the existence of high-level commitment (Wafula et al. 2011).

Policy brief writing and communication: Enhancing the capacity of policy analysts and policymakers is perhaps key to helping policy researchers improve their capacity to provide succinct briefing notes to policymakers that summarize research findings and policy implications. There is anecdotal evidence that this training is increasingly needed, especially as technical experts (for example, climatologists) become involved in food policymaking (Babu et al. 2013).

ORGANIZATIONAL APPROACHES

Building organizational capacity to address resilience for food security: Individual capacities alone are not enough to have effective functioning of the organizations involved in resilience for food security. For example, in the late 1980s and early 1990s, IFPRI worked directly with the Pakistan Institute of Development Economics, providing guidance and support on several fronts that facilitated the institute to think strategically about investing in data collection capacity and research areas that would better position it within Pakistan's policy system (Sohail Malik, senior research fellow, IFPRI, personal communication, April 8, 2014). More recently, similar efforts have been made in other countries such as Ethiopia and Ghana to develop the capacity of organizations to generate data and information for routine and emergency policymaking.

NETWORK APPROACHES

Bringing researchers and analysts into a region: Cross-country learning to develop and implement program and policy interventions related to resilience building has been useful in the past (Babu and Pinstrup-Andersen 1994). Bringing researchers together to address issues related to food security on a regional basis has also been reported to have high payoffs (Babu et al. 2004). More recently, the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) network and its nodes are providing a platform for developing-country researchers and policymakers to share resources, research, and ideas and to support each other in times of crisis. One facet of the ReSAKSS strategy is connecting undergraduate students in agriculture or rural development programs to thesis or research opportunities on current policy topics. This practice increases the current evidence base for policymaking while increasing the experience and skill of future policymakers, likely increasing the efficiency of the system (Benin et al. 2011).

Stimulating demand through supply of high-quality evidence: In the early years of the 21st century, the Asian Development Bank funded the development of the South Asia Initiative (SAI), a regional project that brought common poverty issues to the forefront. The project increased dialogue between researchers, policymakers, and politicians from different South Asian countries through platforms, training courses, joint research projects, and conferences. A key outcome of this project was that it heightened the importance of evidence in the minds of Indian politicians, who asked SAI to aid in briefing Indian parliamentarians about pressing issues such as World Trade Organization reforms (Babu and Ergeneman 2005). Having a network of knowledgeable experts who can advise on pressing issues when threats suddenly appear is a key component of resilience capacity.

Thematic networks: Development of capacity for resilience to health-related food-security shocks has been in high demand in all African countries in the past two decades. The AIDS epidemic in Africa presented numerous challenges to the continent's food security, from decreasing labor for food production to increasing the need for food support programs for orphaned children. The Regional Network on AIDS, Livelihoods, and Food Security (RENEWAL)[2] was a joint project between the International Service for National Agricultural Research and IFPRI, established to foster dialogue across subsystems, including public health, agricultural production, social welfare, and policymaking. The production of policy-relevant global public goods and the

[2] Further information is available at http://programs.ifpri.org/renewal/.

capacity strengthening of network members resulted in the incorporation of HIV/AIDS-relevant policies in national strategic plans (Frankenberger and Nelson 2011).

SYSTEM APPROACHES

Food policy monitoring unit within the government: Systemwide capacity to face shocks to food systems has been shown to be effective in chronically food-insecure countries. For example, in the late 1980s, international donors aided in the establishment of a food policy monitoring unit within Bangladesh's Ministry of Food and Disaster Management, and in the early years of the present decade, organizations such as FAO and IFPRI supported the development of an agricultural policy situation room within the country's Ministry of Agriculture. Although both units continue to receive external support, they have become reliable sources of information for actors across the whole food system, enabling stakeholders to be better informed about trends, threats, and challenges to Bangladesh's food security (Eubanks, Reza, and Talukder 1993).

Building capacity for capacity building: In a number of countries, including India, Malawi, and Mozambique, external institutions have worked directly with teachers or in academic institutions to build their capacity to train future generations of researchers, analysts, and policymakers. Included in this training and suggested curricula were policy lessons and newer analytical techniques, so that new cadres of policymakers would be better equipped to address new shocks and threats than were previous generations (Weber et al. 1988; Staatz and D'Agostino 1990; Ryan 1999). Recently, based on such experiences, new efforts are underway to build intermediary capacity that can further help in increasing local capacities (iAGRI 2013).

Rural Economy Knowledge Support System: Developing knowledge systems that address emergency, short-term, and long-term policymaking needs has become an important capacity-building strategy for food-security resilience. For example, in Nigeria, the capacity-building strategy is to improve systemwide outcomes by developing a Rural Economy Knowledge Support System (REKSS). National organizations will take part in Nigeria's REKSS, which will offer courses, conduct analyses, and disseminate relevant research evidence. Currently IFPRI's Strategic Analysis and Knowledge Support System, as part of the Comprehensive Africa Agriculture Development Programme implementation, is building this kind of capacity in many African countries (Ragasa et al. 2010).

MULTIDIMENSIONAL APPROACHES

ENVIRONMENTAL MANAGEMENT AND FOOD SECURITY IN ETHIOPIA

Food insecurity has been a perpetual problem in Ethiopia, a country plagued with frequent droughts and an increasingly erratic pattern of rainfall, exacerbated by land degradation and high population density (Nedessa and Wickrema 2010). In 1980, the Ethiopian Ministry of Agriculture, the World Food Programme (WFP), and the FAO initiated a development project aimed at rehabilitating forest, grazing, and agricultural land, termed Project 2488. This project used a top-down approach to agricultural development that failed to reverse the downward trend of agricultural production. In the early 1990s, the government began to decentralize its activities at the same time that the WFP was rethinking its project strategy and developing its local-level participatory planning approach (LLPPA), whereby communities were brought in on all stages of project planning and implementation. The LLPPA strategy showed great promise, but early outcomes were lower than expected and it was found that "the new policy of decentralization pointed clearly to the need for wide-scale capacity building before any planning could be effective" (Nedessa and Wickrema 2010, 144).

To build on this strategy and focus on providing support that will lead to sustained improvements in livelihoods, the WFP established a new program, titled Managing Environmental Resources to Enable Transition (MERET). The goal of this program is to "enable food-insecure communities to increase their resilience to weather-related shocks" (Nedessa and Wickrema 2010, 146). The project combines capacity development of communities with technical support for environmental conservation and livelihood

development. It provides short-term food assistance during the training phase to allow community members to focus on building the knowledge and skills needed to ultimately undertake the environmental management and development activities on their own. The capacity-building strategy focuses on the community as a system and provides individual training (natural resource management, business management, and results-based management), organizational capacity building (incentives for innovation and technology development), and system strengthening (community management support, demonstration sites, and study visits). By holistically building capacity at the community level in all three dimensions, MERET has yielded substantial positive results (Nedessa and Wickrema 2010). A midterm evaluation of a continuation of the program (MERET-PLUS) found that 86 percent of participating households experienced income gains and 50 percent reported reduced food deficits (Riley et al. 2009).

REGIONAL NETWORKING IN LATIN AMERICA AND THE CARIBBEAN

Latin American and Caribbean countries are often hit by repeated, small-scale environmental shocks, which turn into large-scale disasters because of the high number of rural poor in these countries. Because there are many similarities in the disasters faced by these countries and the corresponding response needs, the WFP initiated a regional strategy, called the Latin America and Caribbean Emergency Preparedness and Response Network (LACERN), to increase the effectiveness and efficiency of both preparation and response strategies and programs. The goals of LACERN included, inter alia, building four hubs for cross-country resource sharing and learning; strengthening risk analysis capacity; building national capacity through visits, exchanges, and distance learning; and facilitating South-South cooperation and coordination (Balletto and Wertheimer 2010).

The LACERN strategy builds capacity for resilience through individual training, organizational strengthening, and network development. The WFP has led courses on logistics, vulnerability analysis, needs assessments, and food procurement for individuals working in national disaster prevention and response bodies. The WFP also supports these organizations through sharing of best practices and lessons learned. LACERN has also brought together these organizations to support each other and coordinate strategies for responding to multicountry disasters. Finally, the countries have been linked to existing networks in Latin America and the Caribbean region that aim to coordinate early warning systems, exchange information, further develop local capacity, and coordinate emergency operations. The hub system has aided the WFP and local governments in expediting the distribution of food aid in times of disaster. One lesson learned from this process was related to the choice of hub location—Barbados was expected to be an optimal choice for a hub (one of several in the Latin America and Caribbean region) because of the preexisting human capacity there, but the location lacked the transportation infrastructure to ensure action could be taken immediately in times of crisis, and eventually hubs in Panama and El Salvador were used for regional emergencies (Balletto and Wertheimer 2010). Hence careful analysis must be undertaken in developing networks, such as LACERN, to maximize use of existing resources and capacity and to minimize costs.

CYCLONES AND DISASTER MANAGEMENT IN ODISHA

The Indian state of Odisha (formerly known as Orissa) is highly vulnerable to floods, droughts, heat waves, and cyclones, and during the past half century the frequency and spatial distribution of these events has been on the rise (Brenkert and Malone 2005). In 1998, 1,500 people lost their lives due to a heat wave. In 1999, two cyclones hit Odisha within two weeks of each other, affecting 19 million people and killing more than 10,000 (Thomalla and Schmuck 2004). Odisha's high vulnerability, coupled with its poor, densely populated rural setting, necessitates the highest level of resilience capacity. The 1999 cyclones triggered the start of the capacity-development process.

Dash (2002) argued that weak government capacity to issue warnings and directives to local organizations and individuals in the 48 hours prior to the cyclones' hitting Odisha was a primary reason for the extent of the damage. There was poor coordination among governmental organizations, and information regarding the extent of the expected damage and the emergency protocol to be followed was not communicated clearly.

Following the cyclones, the government was unable to coordinate relief efforts, and nongovernmental organizations (NGOs) worked primarily among themselves to procure and distribute supplies throughout the affected regions (Behera 2002). However, the government's failure to react effectively to the 1999 cyclones triggered the creation of the Odisha State Disaster Mitigation Authority (OSDMA). OSDMA has two aims—the first is focused on disaster management, the second on strengthening physical infrastructure to reduce vulnerability. The disaster management plan focused on building capacity at the community level, especially in terms of disaster preparation, as well as at the local level, by coordinating the network of NGOs involved in disaster relief. In November 2002, this capacity building was put to the test. Thomalla and Schmuck (2004) found that OSDMA's community-based resilience strategy was effective: warnings were received in local villages the day before the expected landfall of the 2002 cyclone, shelters were supplied with food, and villagers were warned in sufficient time to report to their local shelters. However, the capacity of OSDMA and Odisha's communities to respond to other environmental shocks, including heat waves and floods, and the resilience capacity of the agricultural production system in particular, remains unknown.

RESEARCH GAPS IN RESILIENCE CAPACITY BUILDING

There is limited literature on how and where to develop capacity to build food systems that are resilient to a wide variety of shocks with varying degrees of impact. Following is a summary of a few of the areas where further research is needed.

COST AND BENEFITS OF RESILIENCE CAPACITY BUILDING

In most situations, a more resilient food system has financial and economic benefits if a country's agriculture sector can continue producing. In this case, capacity building may be considered an investment in the agricultural development and economic growth of a country (Morgan, Land, and Baser 2005) and should be integrated into a country's development strategy. The cost-benefit aspects of different capacity-development strategies, especially in relation to the capacity for research innovations (Archibugi, Howels, and Michie 1999) have not yet been thoroughly investigated to understand an economically optimal rate of investment in resilience capacity building. This approach to capacity building may possibly have the added benefit of making resilience a higher priority to growth-minded politicians and policymakers in developing countries (Horton et al. 2003) or to private agricultural enterprises (IPCC 2014).

EFFECTIVENESS OF ORGANIZATIONAL CAPACITY BUILDING

Despite much organizational capacity strengthening over the past half century (see, for example, Eicher 2004), there has been minimal economic evaluation of the various strategies and activities undertaken (Harris 1996; Pitcoff 2004). Such evaluations could also compare costs and benefits of short- and long-term strategies for different organizations, such as research, extension, and farmer-based organizations (Lele 1991; Land 2000).

CAPACITY STRENGTHENING FOR ORGANIZATION AND MANAGEMENT OF NATIONAL AGRICULTURAL RESEARCH SYSTEMS

There is potential to use national agricultural research systems (NARS) as an entry point to undertake resilience capacity needs assessments that better reflect local needs and potential threats. Strengthening the capacity of NARS researchers to assess capacity needs within their own local food systems may improve the relevance of these assessments because local researchers who are knowledgeable about the major threats to their food systems can help to refine questions and identify missing issues or areas of opportunity (Mapila, Kirsten, and Meyer 2011).

STUDYING TECHNICAL ASSISTANCE/COOPERATION AND ITS EFFECT ON FOOD SYSTEMS

There is increased agreement within the development community that previous strategies whereby technical assistance was brought in with the aim of supporting or backstopping local capacity have not yielded sustained

local capacity, and have at times eroded local capacity, in essence making a country less resilient (Berg 1993; Fukuyama 2004). There is a need to study these cases carefully to understand what went wrong and to prevent these mistakes from recurring.

CAPACITY FOR INSTITUTIONAL CHANGE AND INNOVATIVE SYSTEMS: BUILDING ON LOCAL RESILIENCE STRATEGIES

Innovation occurs, as is needed, in all areas of a resilient food system (Rivera 2000). No two food systems are alike, and hence effective capacity-building strategies to improve a system's resilience must encourage creativity and critical thinking to be truly relevant. How to stimulate innovation through capacity building, however, is not yet fully understood. Research on adaptation strategies for all aspects of the value chain, including production, processing, transportation, storage, and distribution, is currently insufficient (IPCC 2014).

DECENTRALIZATION AND LOCAL CAPACITY

Historically, much capacity building has occurred at the national level, in national agencies and ministries with minimal filtering down to lower administrative levels. However, the localized nature of many food systems and the fact that shocks rarely hit an entire country suggest that capacity for resilience is heavily needed at municipal levels. How capacity can be efficiently built at local levels, especially given the secluded nature of many communities and weak communication channels, remains a knowledge gap in the resilience capacity–building literature (Babu and Mthindi 1995; Bhouraskar and Babu 2002).

INFORMATION AND COMMUNICATION TECHNOLOGY FOR RESILIENCE CAPACITY

Information and communication technology (ICT) is increasingly being used by early warning systems to quickly distribute information and evacuation orders, especially in the case of natural disasters (Munyua 2000). Radio warnings have often allowed communities to react quickly to prevent major losses of human life. However, the use of ICT to disseminate information about nonimmediate shocks and to build decentralized capacity is not as common, and research is needed to understand how ICT can be used as a resilience capacity–building strategy.

MACRO INDICATORS OF RESILIENCE CAPACITY

There are few data that can be used to assess, at the national level, how development strategies have fared in improving organizational and system capacity. Indicators that could track capacity of a country over time would be useful to help researchers understand the success of a particular strategy, while cross-country comparisons could be used to identify high-priority countries. IFPRI's ASTI and food policy research capacity indicators databases (IFPRI 2013) are isolated examples of recent efforts to fill this gap.

GOVERNANCE CAPACITY OF A RESILIENT FOOD SYSTEM

Despite broad agreement on the need for better institutions and governance for development in general, there is little evidence of effective capacity-building strategies for government (Grindle 1997; Kernaghan 2004). In the context of resilience, where adaptability and effective decisionmaking capacity are essential at multiple levels of government and across all subsystems, strengthening governance capacity is especially important. Hence there is a need for rigorous analysis of both successful and failed governance capacity–strengthening strategies in different contexts, such as in times of differing levels of stress.

INTERDISCIPLINARY CAPACITY STRENGTHENING

The wide variety of potential shocks and stressors to a food system and the intertwined relationship of food and nutrition security, health, and economic development, among other factors, suggest that increased capacity to understand how these different issues interact is a crucial component of resilience (Babu, Gajanan, Sanyal 2014). Climate change, in particular, has been noted as a threat that intensifies other shocks and deepens poverty traps (IPCC 2014). Identifying where connections do and do not exist between specialist capacities related to food security (for example between food and nutrition or between climate change and agriculture) will identify opportunities for capacity building (Babu and Mthindi 1995; Babu 2012).

5. CONCLUDING REMARKS

Recent experiences with increased levels of shocks, both natural and economic, show that achieving food and nutrition security for all depends crucially on building resilient food systems in developing countries. Additionally, the development of a resilient food system is increasingly recognized as an integral part of investment in food and agricultural sector development. However, a systematic understanding of capacity needs and challenges, approaches that work and the factors that influence their rate of success, and remaining research and policy gaps is not adequately covered in the literature. This paper attempts to respond to this need. Understanding the capacity needs for resilient food and nutrition security requires an understanding of the food system and which components contribute to its resilience. This paper first identified three subsystems of a national food system: the policy system; markets, trade, and institutions; and the production system. Within each system, it explored various challenges and opportunities for capacity development at the individual level, organizational level, and system level. It developed a typology of how countries invest in capacity creation, management, and utilization, and it classified several countries as low, transitional, or high in terms of their capacity for managing a resilient food system. Although a dearth of data on country capacity for resilience limits the robustness of this typology, we introduce this methodology to begin a dialogue on how to prioritize capacity-building investments across countries. The data on indicators of capacity related to markets and institutional systems remains a significant and important gap. A review of various approaches to and modalities for capacity development suggests that the current level of capacity investment is likely inadequate, in both breadth and depth, to develop resilient food systems and hence resilient food security in the developing world. As shown by the typology, countries' capacities vary widely, but with a large cluster that can be classified as having low capacity. Even in countries where adequate capacities exist for meeting long-term planning and policymaking, capacity for predicting, preventing, planning, and implementing policies and programs to bounce back (better) from recurring shocks to food security may be too low. While some of the existing capacity could be reoriented, additional capacity needs to be built to address the specific challenges of attaining resilient food security. From the capacity-development perspective, there is a large gap in research and policy for building a resilient food system. This gap indicates that given the possibly increasing vulnerability of developing countries to shocks, the role of research and action to understand, develop, manage, and utilize individual, organizational, and policy system capacities in meeting countries' changing needs should be emphasized.

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