



CHAPTER 9

Gender-Sensitive, Climate-Smart Agriculture for Improved Nutrition in Africa South of the Sahara

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⁴⁷ This chapter was prepared as part of the Gender, Climate Change, and Nutrition Integration Initiative (GCAN) funded by the Feed the Future Program of the US Agency for International Development (USAID) and linked to the CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS). The authors thank colleagues from USAID and partner organizations for feedback and input on earlier versions of this framework.

The effects of climate change are already being felt across the globe, particularly among smallholder producers in developing countries, whose livelihoods are strongly affected by climate conditions. Climate change will continue to threaten food production and security, particularly in Africa south of the Sahara, where dramatic increases in temperature (greater than the global average) and changing rainfall patterns are expected to result in declines in staple crop yields and farm profits (Kurukulasuriya 2006; Müller et al. 2011; Nelson et al. 2014; Niang et al. 2014; Seo and Mendelsohn 2008).

Efforts to increase coping and adaptive capacity have accelerated in recent years, resulting in adoption of adaptation strategies that include improved agricultural practices (using different crop and livestock practices and inputs), livelihood diversification strategies (for example, migration, off-farm work, and small enterprises) and risk mitigation strategies (such as improved food and water storage) (Bryan et al. 2009, 2013; Deressa et al. 2009; Kristjanson et al. 2012; Nhemachena and Hassan 2008). More recent efforts of governments and civil society organizations emphasize “climate-smart” practices and approaches that increase the productivity and profitability of agriculture, increase resilience to climate risks, and mitigate greenhouse gas (GHG) emissions (Lipper et al. 2014).⁴⁸

⁴⁸ Several organizations and donors, such as the Food and Agriculture Organization of the United Nations; the CGIAR Research Program on Climate Change, Agriculture and Food Security; the World Bank; and others have converged on a definition of climate-smart agriculture (CSA) that describes it as an approach with three objectives or pillars: (1) sustainably increasing agricultural productivity and incomes, (2) adapting and building resilience to climate change, and (3) reducing or removing GHG emissions, where possible and appropriate. The concept of CSA enables policy makers and practitioners to evaluate their agricultural strategies across these three pillars and to maximize gains across these objectives when possible. Given the risk that climate change poses to poor smallholder producers in developing countries, often the first two objectives are prioritized and mitigation is viewed as a co-benefit.

Despite these efforts, there is consensus that current incremental approaches to adaptation are inadequate to address future climate challenges (Niang et al. 2014; Noble et al. 2014). Recognizing that poor smallholder producers face multiple stressors across a range of complex social and environmental contexts and that resources to respond to these stressors differ by gender and other factors, efforts to support producers’ responses to climate change cannot take place in a vacuum.

Ensuring that responses to climate change are successful in making agricultural production, food systems, and livelihoods more resilient therefore requires careful consideration of all the factors influencing resilience in a given context. Such factors include environmental conditions, the institutional environment, and the policy context. When such factors are considered, responses to climate change also have the potential to accelerate gains toward other development objectives, such as health and nutrition improvements. At the global and regional levels, there is growing recognition of the importance and efficacy of addressing multiple development objectives simultaneously in an integrated fashion, as illustrated by the Sustainable Development Goals (SDGs). Therefore, combating and reducing the adverse impacts of climate change are key objectives of the SDGs; the Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods, adopted by heads of state of the African Union; and many national-level agriculture and development strategies as laid out in nationally-determined contribution documents across the region.

By identifying the synergies and trade-offs implicit in alternative actions, the research community can help identify policies, strategies, and technologies that can achieve multiple development goals while protecting against the negative impacts of climate change. Currently, no studies address the linkages among climate resilience, food security, nutrition, and women's empowerment. However, the literature has begun to connect several of these elements, linking agriculture to nutrition pathways (for example, Herforth and Harris 2014), gender and climate change (for example, Ringler et al. 2014), climate change and nutrition (Fanzo et al. 2017), and gender and nutrition (Meinzen-Dick et al. 2012). Based on a review of these bodies of literature, this chapter develops an integrated gender, climate change, and nutrition (GCAN) conceptual framework that can be used to guide integrated approaches to addressing multiple development challenges in the context of climate change by highlighting entry points for action, potential outcomes of various responses, and the trade-offs and synergies among outcomes.

Gender and Climate Change

Numerous studies have identified the salient factors influencing household-level responses to climate change, including access to rural services (such as extension and credit), access to information, demographic characteristics, agroecological conditions, social capital, and cognitive processes, among others (Bryan et al. 2009, 2013; Deressa et al. 2009; Di Falco and Bulte 2013; Nhemachena and Hassan 2008; Nielsen and Reenberg 2010; Juana,

Kahaka, and Okurut 2013; Grothmann and Patt 2005). However, this research accounts for only the gender of the household head, showing that female-headed households are less likely to adapt to climate change (Bryan et al. 2013; Deressa et al. 2009; Nabikolo et al. 2012). This literature also pays little attention to the nutritional implications of various adaptation strategies and how gender intersects with the pathways from adaptation to nutritional outcomes.

The extensive literature on intrahousehold relations and resource allocation in the context of development demonstrates that men and women have different preferences and responsibilities, and that women are often at a disadvantage regarding access to and control over resources and decision-making authority (Doss 2001; Doss and Morris 2001; Peterman et al. 2011; Quisumbing 2003; Udry 1996). A growing number of studies are beginning to explore the reasons for gender differences in perceptions of climate change, adaptive capacity, and preferences for and adoption of climate-smart or risk management practices, not just between male and female household heads but between male and female decision makers within the same household (Bernier et al. 2015; Jost et al. 2015; Perez et al. 2014; Twyman et al. 2014). A recent review provided a conceptual framework for examining issues on gender and climate change, summarizing the evidence accumulated under the CGIAR Research Program on Climate Change, Agriculture and Food Security (Kristjanson et al. 2017). This section expands on that review by drawing on additional research on these issues.

The literature on gender and climate change suggests that the ways in which gender intersects with vulnerability and resilience to climate change

are very context specific and nuanced, although some common themes emerge, as summarized in Box 9.1.

BOX 9.1—EXAMPLES OF KEY GENDER DIFFERENCES LIKELY TO AFFECT CLIMATE CHANGE ADAPTATION AT THE HOUSEHOLD LEVEL

Preferences for response options: Technology choices, investment choices (e.g., investments in productive inputs, children’s health, education, diets)

Responsibilities: Livelihood strategies, labor roles, migration patterns

Resources: Information, assets, financial capital, natural resources, labor

Institutions: Organizational and group membership, market access, social norms

Source: Authors.

Perceiving climate change is an essential prerequisite for taking action and a factor in the types of response options that are chosen. In general, women tend to be less likely to perceive climate changes, and when they do perceive them, their perceptions often differ from those of men (Oloukoi et al., 2014; Twyman et al., 2014). For example, in Nigeria, these perception differences were related to gender-specific livelihood activities—men were concerned with climate change impacts on the yields of tuber and legume crops, and women perceived a reduction in the availability of fruits, seeds, and herbs from community woodlots (Oloukoi et al. 2014).

Information is also essential for adapting to climate change, but numerous studies show that women lack access to critical sources and types

of information on climate change and appropriate responses (Bernier et al. 2015; Jost et al. 2015; Katungi, Edmeades, and Smale 2008; Lahai, Goldey, and Jones 1999; Tall et al. 2014). Given their different livelihood activities and roles in farming, men and women also have different preferences for information (Jost et al. 2015; Tall et al. 2014). For example, a study from Senegal found that women preferred to receive forecasts of dry spells and information on the cessation of the rainfall season, given that they plant after the men’s fields have been planted (Tall et al. 2014). Information seems to be a critical barrier to women’s adoption of climate-smart practices—a study from Kenya found that, though women’s awareness of climate-smart practices was lower than men’s, women who were aware of improved practices were at least as likely as men to adopt them (Bernier et al. 2015).

Although productive assets and financial capital are important for adaptation, there is ample evidence of a gender resource gap in agriculture: women tend to have fewer or lower-value assets, less access to capital and labor, fewer agricultural inputs, and less access to other productive resources, such as land (Deere and Doss 2006; Doss and Morris 2001; Peterman, Behrman, and Quisumbing 2014; Perez et al. 2014; Peterman et al. 2011). These gender disparities limit countries’ capacity to adapt to climate change and to achieve several other development goals (Quisumbing 2003).

The literature also suggests that formal and informal institutions, such as local organizations, markets, and social and cultural norms, influence how climate risks are experienced, how resources for adaptation are distributed, and how men and women respond to climate change (Adger 2003; Adger et al. 2009; Agrawal and Perrin 2008; Agrawal 2010). Institutions can promote cooperation and group-based approaches to

adaptation or they may hinder the adoption of particular adaptation strategies (Di Falco and Bulte 2013; Rodima-Taylor 2012). Given that institutions are defined within a local context, the ways in which men and women participate in and are influenced by them vary. In general, women face institutional barriers to adaptation due to social norms governing the division of labor (such as women's heavy domestic workload and inability to engage in certain livelihood activities) and women's ability to participate in group activities, move freely, and use particular technologies or practices (Djoudi and Brockhaus 2011; Jost et al. 2015; Katungi, Edmeades, and Smale 2008; Naab and Koranteng 2012; Nielsen and Reenberg 2010). For example, it is often considered culturally inappropriate for women to engage in agroforestry (Kiptot and Franzel 2012) or certain types of irrigation (Njuki et al. 2014).

The literature also highlights gender differences in preferences for adaptation strategies that vary widely across different contexts, often related to traditional labor roles (Bernier et al. 2015; Djoudi and Brockhaus 2011; Jost et al. 2015; Naab and Koranteng 2012; Twyman et al. 2014). For instance, women in Ghana preferred to invest in infrastructure for improving water access during times of drought due to their responsibility for domestic water collection (Codjoe, Atidoh, and Burkett 2012). Men and women also do not necessarily share the same preferences regarding investment in children's health and education or dietary choices (Gillespie, Harris, and Kadiyala 2012; Quisumbing and Maluccio 2003). Responses to climate change can lead to shifts in traditional gender roles. For example, women in Mali became engaged in charcoal production using local forest resources due to male out-migration as a result of climate change (Djoudi and Brockhaus 2011).

Although there are no empirical studies on the differential long-term impacts of climate change on men and women, there are several studies on the impact of climate shocks on gender-differentiated asset dynamics, food security, and nutrition. The literature on shocks and poverty traps (for example, Barrett and Constanas 2014; Carter et al. 2007; Carter and Barrett 2006; and Dercon 2004) shows that the ways in which shocks differentially affect men's and women's assets depend on the type of shock and the local context. Quisumbing, Kumar, and Behrman (2011) found that the asset holdings of women in Uganda were more severely affected by shocks than those of women in Bangladesh, given Ugandan women's larger role in agricultural production. In Zimbabwe, drought appeared to have a negative impact on the body mass index of women but not of men (Hoddinott 2006). Similarly, a qualitative study from Mali found that food shortages resulting from environmental change affected women more than men (Djoudi and Brockhaus 2011).

New research highlights the fact that technologies and practices adopted at the household level do not benefit all members of the household equally (Theis et al. 2017). Some practices, such as conservation agriculture, may have a negative impact on women due to increased labor requirements (Beuchelt and Badstue 2013; Nelson and Stathers 2009). Climate change responses can affect women both positively and negatively, suggesting that there are important trade-offs across outcomes that must be considered. For example, male out-migration as an adaptive response to climate change may increase women's decision making authority while at the same time increasing their labor burden (Djoudi and Brockhaus 2011; Nelson and Stathers 2009).

Agriculture-to-Nutrition Pathways and the Role of Women

There is increasing interest in leveraging the agricultural sector to complement nutrition-specific interventions and mitigate risks. Researchers and practitioners have identified a set of pathways through which agriculture is hypothesized to affect nutrition (Haddad 2000; Kadiyala et al. 2014; Gillespie, Harris, and Kadiyala 2012; Herforth and Harris 2014; SPRING 2014).

These pathways trace how the rural poor's diverse engagement in agricultural livelihoods can affect their ability to care for infants and young children, allocate income for nutrition- and health-enhancing goods and services, produce healthy and diverse foods, and so on. Key agriculture-nutrition linkages include how production outcomes influence food prices, expenditures, and diet choices; how crop choices influence the consumption decisions of producer households; how nutrient losses can be minimized through processing and preparation; and how agriculture indirectly affects nutrition through income changes, time allocation, and changes in the health environment (Haddad 2000). Because agriculture is at once a source of income and food as well as the main energy expenditure for the majority of the world's rural poor, agricultural work can have both positive and negative impacts on nutrition.

Women's empowerment is thought to interact with the agriculture-to-nutrition pathways in several ways (Meinzen-Dick et al. 2012). First, women's work in agriculture may increase their bargaining power within a household. Given evidence that suggests women are more likely to spend earnings on nutrition-enhancing purchases (Gillespie, Harris, and Kadiyala 2012; Smith et al. 2003), an increase in women's bargaining power could

bring about greater allocation of resources for nutrition. However, as Malapit and Quisumbing (2015) pointed out, without nutrition knowledge, women will not necessarily bargain for better nutrition. In addition, greater bargaining power can benefit nutrition by enabling women to negotiate for access to various health services for themselves and their children.

On the other hand, women's work in agriculture may decrease time available for other activities important for nutrition and, without substitutes for this work, nutrition may suffer (see Komatsu, Malapit, and Theis 2015 for a review of the literature). The impact of women's time displacement from domestic work to agriculture depends on the age of their children, the availability and quality of substitutes for domestic work, the importance of income, and the quantity of food produced relative to care work (Glick 2002). Moreover, the quality of care work may be more important than the quantity (for example, feeding infants appropriate complementary foods at the right time may be more important than overall time spent preparing food and feeding). Finally, women's energy expenditure on physically demanding agricultural tasks, especially while pregnant, can have detrimental impacts on maternal and child nutrition and health (Owens et al. 2015; Rao et al. 2003). Although women's empowerment influences agriculture-to-nutrition pathways, agricultural interventions also directly influence aspects of women's empowerment, including their control over assets, participation in decision making, control over income, and workload (Johnson et al. 2016; Malapit et al. 2014), depending on the degree of gender sensitivity of the implementation approach (van den Bold, Quisumbing, and Gillespie 2013).

The agriculture-to-nutrition framework neglects additional interactions that relate to how farmers respond to climate risks. First, though the framework captures variations in the quantity and quality of food produced,

it does not detail the dynamic ways in which farmers manage risk and respond to failures in agricultural production, and the implications of these actions for nutrition and health outcomes. Rural households are constantly balancing consumption and investment decisions, which are influenced by risk aversion, availability of alternative livelihoods, storage capabilities, access to markets, financial services, and social protection options, among other factors. Distress sales of assets, such as livestock, in response to shocks can smooth short-term consumption but reduce resilience to future shocks, as well as shift the bargaining power of household members whose assets were sold or lost. Although the agriculture-to-nutrition framework works well in a “normal” year without shocks, it needs modification to capture the nutrition implications of households’ complex responses to risk.

Second, the agriculture-to-nutrition literature does not unpack the many factors that influence agricultural decisions and investments, such as access to information (extension and climate information services), access to technology and credit, and tenure security. These factors, implicit in the enabling environment, are important to articulate when looking at how and why farmers choose to shift production in response to climate change. Gender differences in the factors that affect agricultural decisions mean that women face different incentives and constraints than men, resulting in different production choices.

Third, natural resources and the institutions that govern them play a larger role in nutrition than indicated in the agriculture-to-nutrition pathways literature. Collectively managed natural resources can be important for nutrition through the direct harvesting of forest products, fish, fodder, and fuel resources; through provision and maintenance of water resources for irrigation, drinking, and hygiene; and through ecosystem

services that benefit agricultural production, such as erosion control and pollination. Climate change directly affects natural resources, such as water availability, while increasing households’ reliance on natural resource extraction. Subsequent environmental degradation (for example, deforestation or excessive groundwater extraction) may exacerbate the severity of future climate shocks and stresses, with clear implications for food and nutrition security as well as the health and care environment.

Climate Change and Nutrition

Undernutrition is commonly framed as a consequence of climate change (Phalkey et al. 2015; Myers et al. 2017; Fanzo et al. 2017). By some projections, medium-high climate change is expected to result in an additional 4.8 million undernourished children by 2050 (IFPRI 2017). Of the people at risk for hunger, 97 percent will live in developing countries, with the highest number in Africa south of the Sahara (2.4 million) (IFPRI 2017). Climate change affects food availability and prices, impacting overall calorie consumption as well as consumption of healthful foods, such as vegetables, fruits, and animal-source foods. Springmann and colleagues (2016a) estimated that by 2050, climate change would result in 529,000 deaths due to decreased food intake and decreased vegetable and fruit consumption.

Although the effects of climate change on nutrition and health deserve immediate attention, it is also important to recognize the role nutrition plays in determining individuals’, communities’, and nations’ capacities to respond to climate change. Evidence shows that better child nutrition is associated with higher cognitive and educational performance in middle childhood and greater productivity in adulthood due to increased physical

capacity for manual labor (Victora et al. 2008; Haas et al. 1995; Rivera et al. 1995). Therefore, considering the current nutritional status of individuals and larger communities can be helpful for understanding the extent to which these communities are vulnerable to climate shocks and their physical ability to respond.

An underappreciated relationship in the climate change–nutrition literature is the full set of linkages between diet choice and environmental outcomes. It is important to consider the trade-offs and implications of consumption choices and resulting production system changes for future climate change and other environmental outcomes. For example, animal-source food production systems and practices may negatively affect the environment by increasing GHG emissions and contaminating surface and groundwater (Vetter et al. 2017; Ranganathan et al. 2016). Although there may be opportunities for shifting to more plant-based protein sources in developed countries for enhanced environmental outcomes,⁴⁹ animal-source foods are a rich source of protein and micronutrients needed for growth and development that are often lacking in the diets of the poor in developing countries (Murphy and Allen 2003). Therefore, climate mitigation policies may also affect diet choice, health, and malnutrition (Springmann et al. 2016b).

The nutritional context also determines which climate change response strategies may be most effective at addressing the most pressing nutritional challenges. It is helpful to think of the bidirectional relationship between climate change and nutrition using a food systems approach focused on food value chains as a way to leverage agriculture to improve nutrition,

particularly value chains for micronutrient-rich foods (Ruel, Alderman, and the Maternal and Child Nutrition Study Group 2013). Value chain approaches go beyond farm-level production to include the way foods are produced, processed, distributed, and marketed. Climate change and shocks may affect these activities, and response strategies at various stages of the value chain also have implications for food, nutrition, and environmental security (Fanzo et al. 2017).

Fanzo et al. (2017) identified focal areas for interventions to reduce nutrition risks under climate change along the food value chain and discussed ways in which actors can strengthen adaptation-mitigation synergies at different spatial and time scales. Beginning with inputs, increased access to diverse seed varieties and local livestock breeds that are resilient to heat, drought, pests, and disease, along with improved soil quality and water access, have the potential to increase dietary diversity and ensure increased production in the face of climate shocks and stressors. Mitigation and adaptation strategies, such as mixed crop and livestock systems or improved livestock feeding practices, are also needed to minimize the impacts of production on climate change.

Moving along the value chain, food storage and processing is key to ensuring that food is safe, its nutritional content is preserved, and food waste is reduced. One example is the increased risk of aflatoxin production in crops under climate change and its detrimental effects on both health (Kensler et al. 2011) and child growth (Khlanguiset, Shephard, and Wu 2011; PACA 2014).

⁴⁹ For example, Harwatt and others (2017) suggested that shifting to more consumption of beans instead of beef in the United States would contribute to GHG mitigation.

Climate change is expected to affect other components of the value chain, including distribution, marketing, and retail, for example by reducing market access for smallholder farmers, thus affecting availability of and access to foods and, in turn, nutrition outcomes. Climate-proofed infrastructure and transportation can reduce these adverse impacts, protect nutritional value, and reduce food waste through improved connections between farmers and markets (Fanzo et al. 2017).

At the end of the value chain, actors must consider the different dimensions of food consumption and utilization. Ensuring dietary diversity and food security throughout the value chain secures the supply side of nutrition, but the complex relationships between health, nutrition, and the environment require actors to go a step further. For example, infectious disease is affected by climate and can, in turn, increase nutrient demands and requirements while reducing nutrient absorption, ultimately affecting nutritional status. Climate shocks potentially prevent access to local health services, which could also have negative impacts on health and nutrition status. Patz and colleagues (2003) reviewed a wide range of climate change–infectious disease linkages. Burke, Gong, and Jones (2015) provided a useful example of climate–disease linkages by showing that droughts can substantially increase HIV/AIDS infection rates.

It is evident that the relationship between climate change and nutrition is complex and intertwined with other dimensions of well-being. In a vicious cycle, communities without adequate means of risk mitigation and adaptation are forced to make short-term decisions on food consumption; livelihoods; land, water and energy use; and transportation that endanger their nutrition security in the long term and impair effective climate change mitigation, potentially worsening planetary health (Fanzo et al. 2017).

Discussion

The literature reviewed above shows that although considerable work has been done to explore the connections between gender and climate change, agriculture and nutrition, and nutrition and climate change, many research gaps remain. The literature on gender and climate change highlights many ways that the adaptive capacity, preferences and needs for responding to climate change, and decision-making authority of men and women may differ. Though some research is beginning to explore the implications of climate change and alternative responses for better well-being outcomes of men and women, much more is needed in this area to generate actionable evidence. More research is also needed to develop effective approaches to engaging women in actions that increase resilience to climate change. The challenge is that the barriers to women’s participation and the approaches designed to reach women must vary across different sociocultural environments. Similarly, the literature on agriculture for nutrition and health does not articulate production risk due to climate change; the role of decision-making processes in determining nutritional outcomes; and the interactions between agriculture, nutrition, and the environment, particularly the management of natural resources. The nutrition literature has only recently begun to consider the risks due to climate change and the implications of value chains on environmental outcomes, including GHG emissions.

Although recent research has highlighted the concept of resilience as an important factor to consider in development programming and has begun to develop indicators for its measurement (Barrett and Constanas 2014; Béné, Frankenberger, and Nelson 2015; Constanas et al. 2014; Frankenberger et al. 2014), the extent to which issues related to gender and nutrition are addressed remains minimal in the resilience literature. For example,

few resilience frameworks incorporate preferences and decision-making processes, which are fundamental for understanding gender-differentiated aspects and impacts. No comprehensive studies or tools integrate all these concepts, even though governments, NGOs, donors, and other stakeholders that aim to achieve multiple development objectives increasingly emphasize addressing issues of gender and social inclusion, nutrition, and climate resilience in an integrated fashion. The challenges of designing, monitoring, and evaluating such integrated programs are widely acknowledged (Cole et al. 2016).

This article, therefore, develops a GCAN conceptual framework that draws on the existing literature to provide stakeholders from different disciplines and backgrounds with a common point of reference for understanding these complex issues and interlinkages. The framework can be used to identify research and evidence gaps, identify possible trade-offs and synergies among different objectives, and highlight entry points for programs and projects that aim to increase resilience and influence outcomes, such as nutrition or women's empowerment. Given that gender, nutrition, and climate challenges vary across local contexts, the framework is not intended to be prescriptive but rather to provide a means for examining the key issues across the intersection of these issues.

This work draws primarily from elements of four existing frameworks: the (Frankenberger et al. (2014) resilience framework; a framework on gender and climate change (Behrman, Bryan, and Goh 2014, cited in Kristjanson et al. 2017); the *Global Nutrition Report's* climate change and nutrition framework (IFPRI 2015); and the Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) agriculture-for-nutrition framework (Herforth and Harris 2014). The appendix presents

visual representations of these frameworks. We selected these four frameworks because they integrate multiple elements of interest or are widely known and used in the development community, or both.

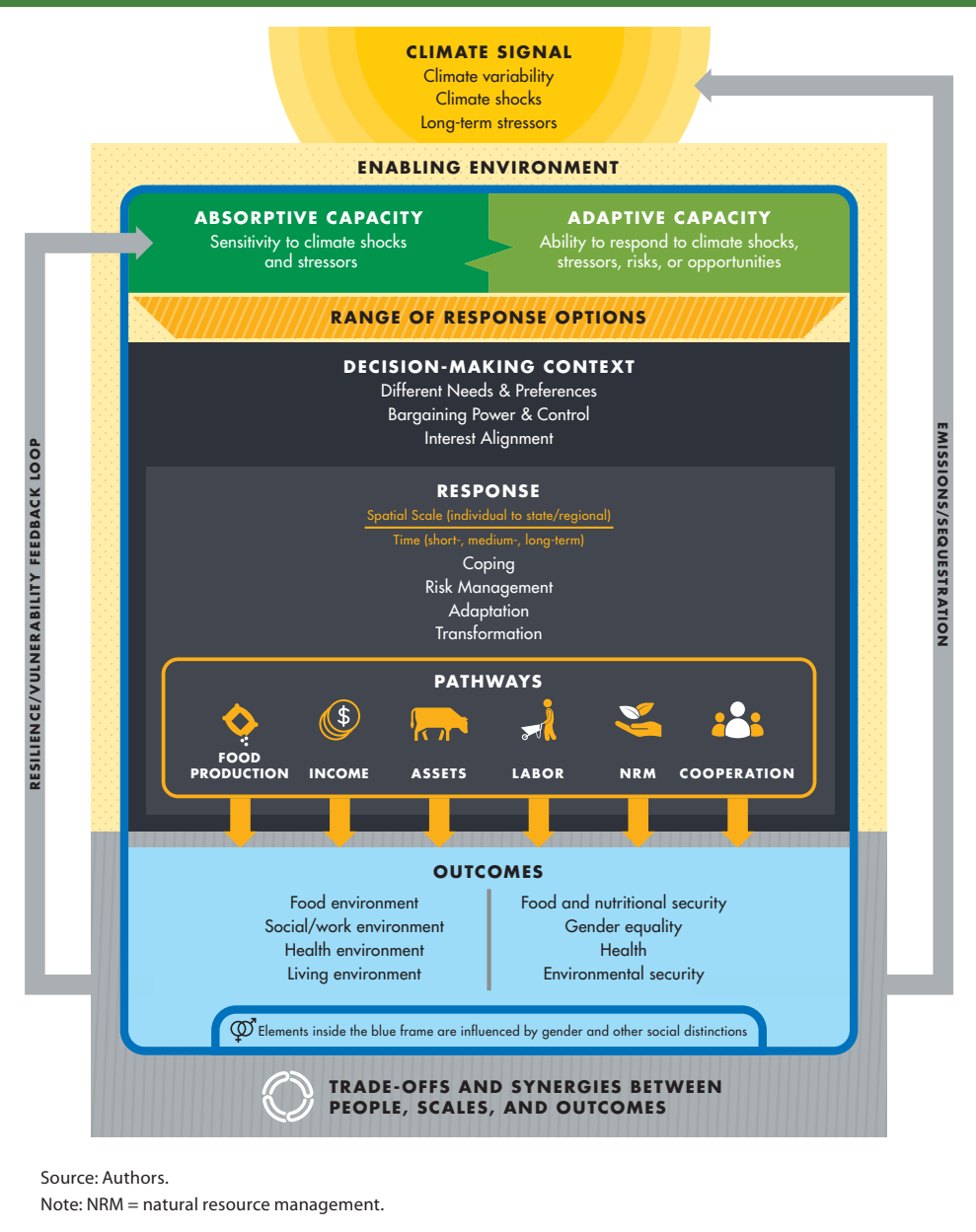
Framework for Integrating Gender, Climate Change, and Nutrition

Resilience is a dynamic, path-dependent concept. People's current state and their ability to respond to shocks and stressors will influence their well-being in the immediate future and their capacity to meet future challenges. In the GCAN framework (Figure 9.1), resilience depends on several key elements including the initial state of absorptive and adaptive capacity when a given climate shock or stress is experienced; the portfolio of available options; the actions taken in response to the climate signal; and the outcomes of those responses, which influence the context in which future climate shocks and stressors are experienced.

Although this framework focuses on climate shocks and stressors, it could also be adapted to assess other sources of livelihood risk, such as food price shocks, political instability, and conflict. It can also be adapted to illustrate the intersection of climate, gender, and nutrition issues within a given local context, development program, or set of response options (for example, on-farm climate-smart practices or technologies).

Numerous underlying factors determine the key elements of the GCAN framework. The framework shown in Figure 9.1 does not attempt to define or list all these factors, which can be categorized in different ways and vary depending on the scale or context of analysis. Rather, to further explore the key elements of this general framework, Figures 9.2 and 9.3 adapt it to

FIGURE 9.1—INTEGRATED FRAMEWORK FOR CLIMATE RESILIENCE, GENDER, AND NUTRITION, GENERAL



show the key variables one might examine at the household and policy levels, respectively. The specific details provided in the household and policy versions of the GCAN framework are not an exhaustive set of factors or characteristics that influence resilience at that level but merely serve to illustrate the key elements of the framework. This section describes the key elements of the overarching framework (Figure 9.1) in more detail, drawing on specific examples from the more detailed household- and policy-level GCAN frameworks (Figures 9.2 and 9.3, respectively).

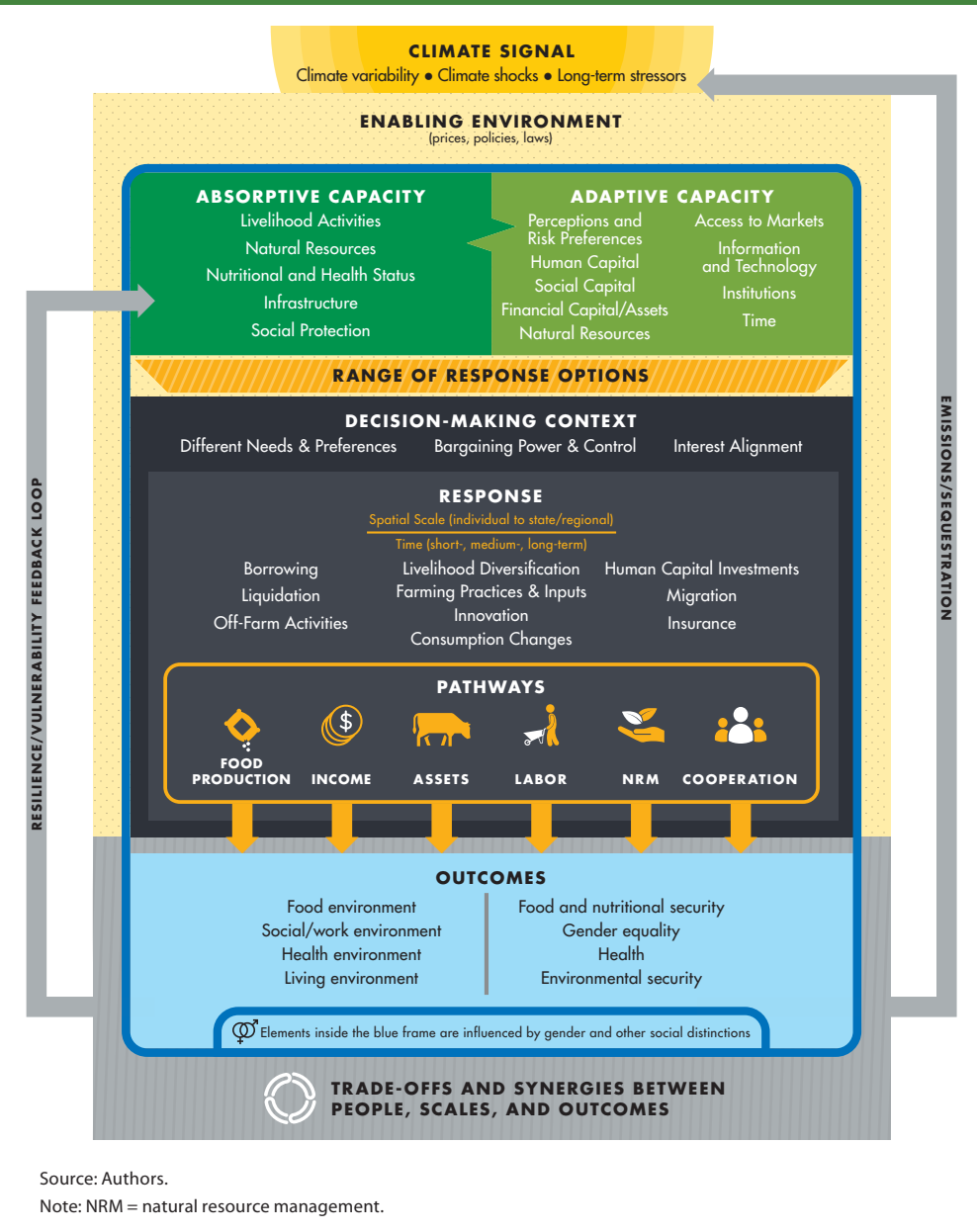
The Climate Signal

The climate signal represents the source of uncertainty, volatility, shocks, and longer-term changes. These shocks or stressors can be characterized in many ways, such as by the scale and magnitude of the event or change (Smithers and Smit 1997). Long-term climate changes involve shifts in average temperature and rainfall conditions, as well as in the frequency of extreme weather events, such as droughts, floods, and storms. This framework not only focuses on long-term climate changes but also illustrates how normal patterns of climate variability and extreme weather events influence resilience.

The Enabling Environment

The effects of climate change occur within a particular context or enabling environment, which influences the ability of individuals and groups—across a broad scale—to absorb and respond to the impact of the changes they experience. Policies, laws, and

FIGURE 9.2— INTEGRATED FRAMEWORK FOR GENDER, CLIMATE CHANGE, AND NUTRITION, HOUSEHOLD LEVEL



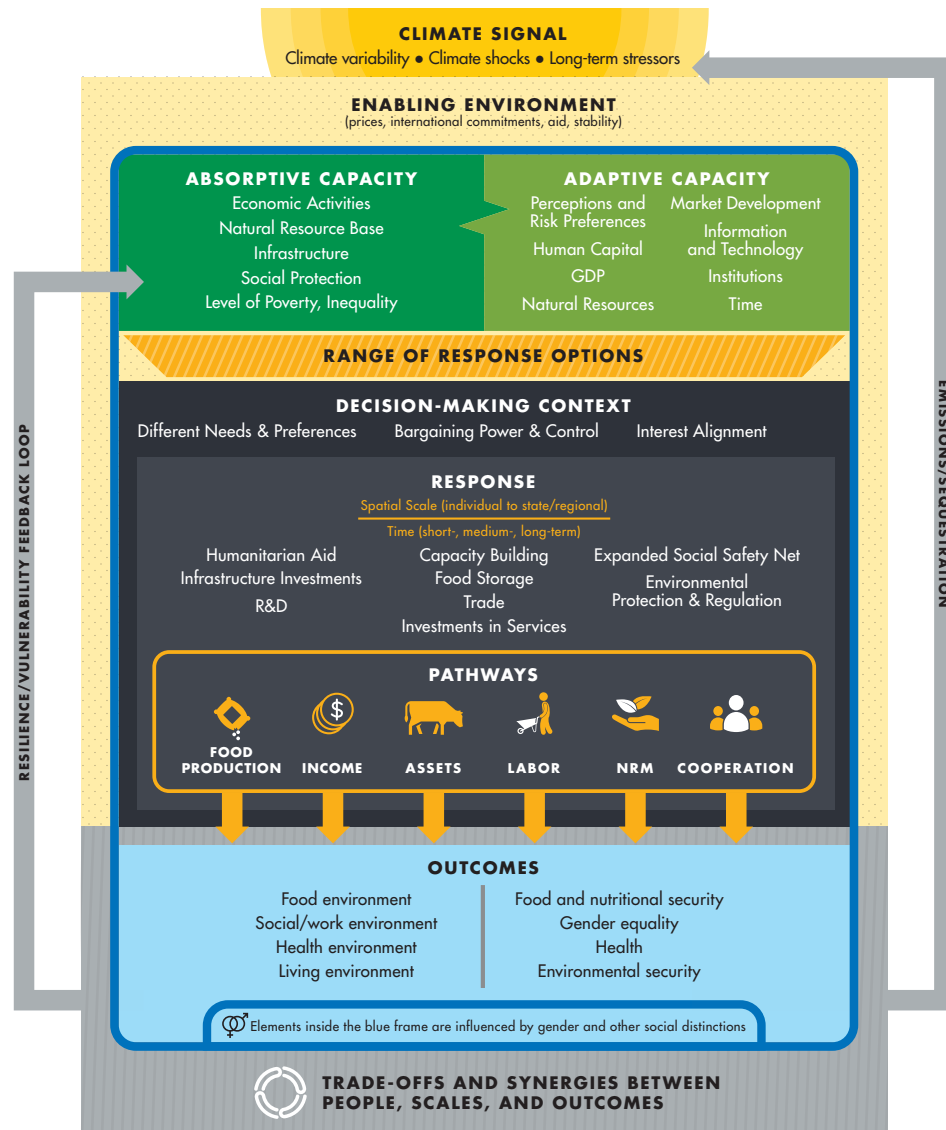
other institutions all influence individual, household, and group responses to climate shocks and stressors (Figure 9.2). At higher levels, such factors as international commitments, international aid flows, and the degree of political stability influence the resilience of nations and regions to climate shocks and stresses (Figure 9.3).

Absorptive and Adaptive Capacity

Drawing on the resilience literature, which sometimes refers to three capacities for resilience—absorptive, adaptive, and transformative (Béné, Frankenberger, and Nelson 2015; Frankenberger et al. 2014)—the GCAN framework includes elements for absorptive and adaptive capacity. Here, absorptive capacity is defined as the sensitivity of individuals, groups, communities, countries, or regions to shocks and stressors—that is, factors that determine the extent to which different actors are directly affected by climate shocks and stressors, and the extent of the changes they need to make to preserve or improve their well-being. For example, a smallholder farmer with a diversified livelihood that includes farm and nonfarm income sources may not experience as great a loss of income upon delayed onset of rains as a neighboring farmer whose livelihood is dependent on a single rainfed crop.

The health and nutritional status of individuals at the time of a climatic shock also affects their absorptive capacity—for example, whether or not they can withstand an increased risk of infectious disease. Because health status affects both the productivity of households and the time burden associated with

FIGURE 9.3— INTEGRATED FRAMEWORK FOR GENDER, CLIMATE CHANGE, AND NUTRITION, POLICY LEVEL



Source: Authors.

Note: GDP = gross domestic product; NRM = natural resource management; R&D = research and development.

providing care to the sick, health status is important to absorptive capacity. Other factors, such as infrastructure and the strength of the social safety net, also influence absorptive capacity at the household level (Figure 9.2). Absorptive capacity at the country level is influenced by such factors as the structure of the economy, the natural resource base, the level of poverty or inequality, and relations with other countries in the region (Figure 9.3).

Adaptive capacity is defined as the ability of different actors or groups of actors to respond to climate shocks, stressors, risks, or opportunities. This ability depends on a variety of factors that interact in different ways based on social demographics, such as gender and age. At the individual or household levels, these factors include the capacity of individuals to perceive and understand climate risks, their access to financial capital and assets, their human and social capital, their access to information and technology, and their time constraints (Figure 9.2). At the state or policy level, factors influencing adaptive capacity include the perceptions and risk preferences of policy makers, gross domestic product, information systems and the availability of technology, health systems, and access to markets (Figure 9.3).

High absorptive capacity reduces the urgency of adaptation. To a certain extent, absorptive capacity can offset adaptive capacity. Conversely, low absorptive capacity necessitates higher adaptive capacity to respond to shocks and stressors. However, many of the factors that drive absorptive and adaptive capacity are positively correlated, so people with high absorptive capacity often also have a high adaptive capacity and vice versa.

Absorptive and adaptive capacity interact with the enabling environment to determine the range of response options available to decision makers from the individual to the state level. As mentioned in the literature review, important gender differences, such as women's lack of access to information, often limit the range of response options available to them. Women's low adaptive capacity relative to men's limits their potential contribution to increasing resilience at the household, community, and national scales, and poses the risk that adaptation will occur in ways that do not reflect women's needs and priorities.

Response Options

Different actors—including individuals, households, groups, communities, and policy makers—respond differently to the climatic challenges they have experienced or anticipate. Drawing on the literature on climate change adaptation and resilience, in the GCAN framework, responses can take several forms, from actions directed toward coping with the immediate impacts of a climate shock or stress, to adaptive or transformative approaches that protect or improve livelihoods and well-being outcomes over the longer run. Coping responses generally refer to strategies that utilize available resources, skills, and opportunities to address, manage, and overcome adverse climate stresses and shocks in the short to medium term. Risk management strategies involve plans, actions, or policies that aim to reduce the likelihood or impact of future negative events (or both). Adaptation involves adjustments to actual or expected climate stimuli in order to avoid harm or exploit potential benefits to return to, maintain, or achieve a desired state. Transformative responses aim to change the fundamental attributes of a system or context to improve well-being

outcomes, and include actions such as those that address underlying social vulnerabilities.

The GCAN framework shows that responses to climate shocks and stressors take place across different spatial scales, from individual actions to state or regional responses. These actions can also be characterized by the time scale at which they occur. Some actions can be implemented in the short term, such as an individual farmer's or farm household's decision to plant a new crop variety, whereas others take time to implement, such as switching from annual crops to tree crops, or developing new crop varieties.

Decision-Making Context

The actions households take in response to climate challenges often depend on internal negotiations between different actors who advocate for their own needs, preferences, and priorities that may overlap but often diverge. The ability of different actors to influence the outcomes of these decision-making processes depends on their own bargaining power and control over resources.

The extent to which the chosen responses reflect the needs and priorities of different individuals also depends on the degree to which the interests of different actors involved in the decision-making process align. For example, a husband and wife who tend to agree on a course of action are both likely to be satisfied with the decision. On the other hand, disagreement among decision makers is likely to result in one or more individuals' being dissatisfied with decisions that are made, as well as skewing of benefits toward individuals with more decision-making power. Divergent preferences around responses to climate shocks and stressors may be seen in decisions to migrate and in the prioritization of uses of limited resources, such as water and land.

Pathways to Change

Drawing on the agriculture-to-nutrition literature, the GCAN framework shows that actions taken in response to climate shocks and stressors potentially influence well-being outcomes through six possible pathways: (1) food production, (2) income, (3) asset dynamics, (4) labor, (5) natural resources, and (6) cooperation.

Changes in farming practices, crops, or inputs have implications for food production at the farm level. In the absence of fully functioning markets, as is the case in many developing countries, these changes in food production have dramatic impacts on the food environment. Similarly, changes in income or assets (or both) as a result of responses to climate shocks and stressors influence nutrition and health outcomes—differently depending on who controls the income or asset. Livestock assets, in particular, may directly influence nutritional and health status—potentially positively by increasing access to animal-source foods, or negatively by worsening the water, sanitation, and hygiene environment via exposure to disease and fecal matter.

Many responses to climate challenges also have implications for labor allocation, which in turn influences outcomes such as care practices (that is, the amount of time people—often women—spend caring for children or the elderly) and leisure time, an indicator often linked with well-being and empowerment. In addition, practices that affect the management and use of natural resources also have implications for outcomes, such as the WASH environmental and health status. Another key pathway pertains to the degree to which coordination or cooperation exists at the household, community, or broader scales. At the household scale, such coordination would indicate greater cooperation among household members for

BOX 9.2—THE FOOD, SOCIAL/WORK, HEALTH, AND LIVING ENVIRONMENTS

The food environment includes food availability, quality, and access. Food availability entails temporal stability through production and storage, both of which are directly affected by climate shocks. Quality refers to both the nutritional value of diets and the safety of food. Access to food necessitates adequate market access and affordability. Price increases, ruptures in market access, production failures, and shifts in production diversity are ways in which the food environment can be affected by environmental shocks and stressors.

The social/work environment refers to shifts in time use as well as access to and control over assets as people alter their livelihood strategies in response to climate change. Such shifts affect the intrahousehold bargaining power and empowerment status of men and women, with implications also for intergenerational gender equality. An increased time burden for men, women, and children may intensify human energy expenditure and carry possible opportunity costs in terms of alternative livelihood activities, access to services, investment in human and social capital, and in some cases greater physical risk. Shifts in time use may also affect care practices and the ability to raise healthy children and care for the elderly.

The health environment entails health stresses and health care. Transmission of viral, bacterial, and parasitic diseases is projected to increase with climate change. Gender-based violence is also a health risk associated with climate shocks, stressors, and responses. Health care service delivery may be disrupted by climate shocks that reduce access to health facilities.

The living environment refers to changes in water security (reliable, safe, affordable, and physically accessible water services for human use and consumption), physical infrastructure for access to services (such as education and health), sanitation and hygiene, disaster risk reduction (such as flood infrastructure and cyclone shelters), and the natural resource base as a result of climate shocks and stressors and the responses to them. Changes in the living environment also have implications for greenhouse gas emissions.

Source: Adapted from IFPRI (2015).

common interests. At the community scale, it refers to cooperation around shared resources and social capital, which can greatly facilitate access to information, learning, social insurance, resources, and labor (Bernier and Meinzen-Dick 2014). At higher scales, cooperation could refer to coordination among regional states to ensure a stable food supply through trade or cross-boundary water management.

Well-Being Outcomes

The GCAN framework focuses on food and nutritional security, environmental security, gender equality, and health as four final outcomes that are affected by the interactions between climate shocks and stresses and by the various responses to these challenges at different scales.

Four interrelated “environments” that mediate these outcomes are highlighted in the blue area of Figures 9.1–9.3: the food environment, the social/work environment, the health environment, and the living environment (Box 9.2).

Linkages, Trade-Offs, and Synergies between People, Outcomes, and Time Scales

Importantly, considerable linkages, trade-offs, and synergies arise across these “environments” or development outcomes, temporal scales, and different groups of people. For example, poor water quality in the living environment increases vulnerability to other health stresses; people may cope by seeking different water sources, which increases their time burden and potentially their security risk. Practices that improve food availability and access in the food environment, such as increasing the use of chemical

fertilizers or pesticides, may have negative implications for the health and living environment, such as water quality and GHG emissions.

In terms of temporal trade-offs, responses that may yield benefits in the short term, such as selling assets to meet consumptive demands, may improve nutritional status in the short term but have negative implications for long-term availability of and access to food. Intergenerational trade-offs also exist. For example, when women’s workloads increase to secure livelihoods in the face of climate change, there can be negative implications for the health status of pregnant women and their infants (Owens et al. 2015).

Moreover, there are differences in terms of how the costs and benefits of the chosen response options are distributed. For example, responses to climate change and shocks may intensify or alleviate inequalities between men and women and require us to examine who bears the brunt of shifts in time burden, human energy expenditure, control over assets and income, and subsequent bargaining power and empowerment.

The GCAN framework shows that outcomes at any given point in time influence future absorptive and adaptive capacity as well as future potential response options. Similarly, actions taken in response to existing climate conditions have implications for the trajectory of future climate changes by influencing GHG emissions and carbon sequestration. These feedback loops illustrate the dynamic nature of resilience or vulnerability to climate conditions and change, highlighting the fact that outcomes, such as nutrition and health status, are never static.

The flow of the elements of this framework, from top to bottom and back up again, can follow several possible scenarios. For example, actors may be able to increase their resilience to climate shocks and stressors due to high initial absorptive and adaptive capacity, which enables them to

make changes that improve their well-being outcomes and, in turn, increase their future absorptive and adaptive capacity. Alternatively, vulnerability to climate shocks and stressors may increase, given low absorptive and adaptive capacity and limited response options, which causes well-being to deteriorate. Adapting the framework to explore a specific shock or stress in the context of a particular community, program, or country can yield valuable insights into the potential consequences of that shock; how different people or groups may be affected; how they may respond; and what policies, programs, or actions might be implemented to improve well-being outcomes in both the short and the long term.

Conclusions

Development programming is moving toward more integrated, systems-based approaches that address multiple, interlinked development challenges simultaneously. However, these approaches require coordination across different disciplines and areas of expertise. A conceptual framework can help identify key elements and connections between disciplines and provide a common ground for different disciplines to see how they affect each other and what synergies they may find in complex challenges. In particular, it highlights possible unintended consequences of interventions, hidden factors that influence specific development outcomes, and relationships and trade-offs between processes and outcomes.

The GCAN framework provides guidance on key areas to consider, including (1) the importance of gender-differentiated capacities to respond to climate change, needs and preferences for response options, and outcomes of different practices and approaches; (2) the food system and

nutritional status as factors influencing capacities to respond to shocks and stressors; (3) the linkages between various well-being outcomes, such as how environmental impacts and women's empowerment affect nutrition and health outcomes; and (4) the importance of multiple pathways through which climate change responses influence nutrition, health, gender equality, and other development outcomes.

A suitable framework also clarifies the types of information that must be collected to adequately understand the system. The present framework draws on available evidence but also identifies numerous gaps that require further study. Specifically, there is little evidence on which approaches are effective to improve the nutrition and women's empowerment outcomes of agricultural interventions while also ensuring that these approaches increase resilience to climate shocks and stressors. Moreover, although resilience and climate-smart interventions are starting to be promoted more widely, few studies evaluate the differential impacts of interventions on well-being outcomes for men and women and the implications of these interventions for nutrition and health. By highlighting often-overlooked differences in men and women's preferences and ability to actualize those preferences, the framework shows that future research requires a fundamentally inclusive, participatory approach that seeks to identify distinct priorities and concerns by social group and develops solutions with marginalized groups and local actors (for example, Cole et al. 2016; Douthwaite and Hoffecker 2017; Kirstjanson et al. 2017).

More research is also needed on the trade-offs and synergies across different development outcomes, such as agricultural productivity, livelihood resilience, and ecosystem resilience / environmental outcomes. Such research would be able to identify any potential multiplier effects of

development interventions that effectively integrate gender and nutrition considerations (for example, development outcomes when women are empowered to be more involved in increasing resilience).

The GCAN framework was designed with the aim of identifying entry points for cross-sectoral actions that can achieve positive impacts across multiple outcomes. Therefore, it can also be used to guide the needs assessments, design, and monitoring and evaluation of agricultural programs and other development interventions to ensure that their climate risk, gender, and nutrition implications are considered. This framework enables program implementers and policy makers to think of the systems and institutions across different scales that affect each other, and how to properly measure and monitor the interactions between them. It also provides a guide for identifying opportunities and obstacles related to the program and outcomes of interest and for tracing the impact pathways from interventions to outcomes. Participatory tools and guides will be developed based on this framework to further support the design, implementation, and assessment of integrated programs that improve the livelihoods and well-being of vulnerable populations.

Appendix

FIGURE 9A.1—RESILIENCE ASSESSMENT FRAMEWORK

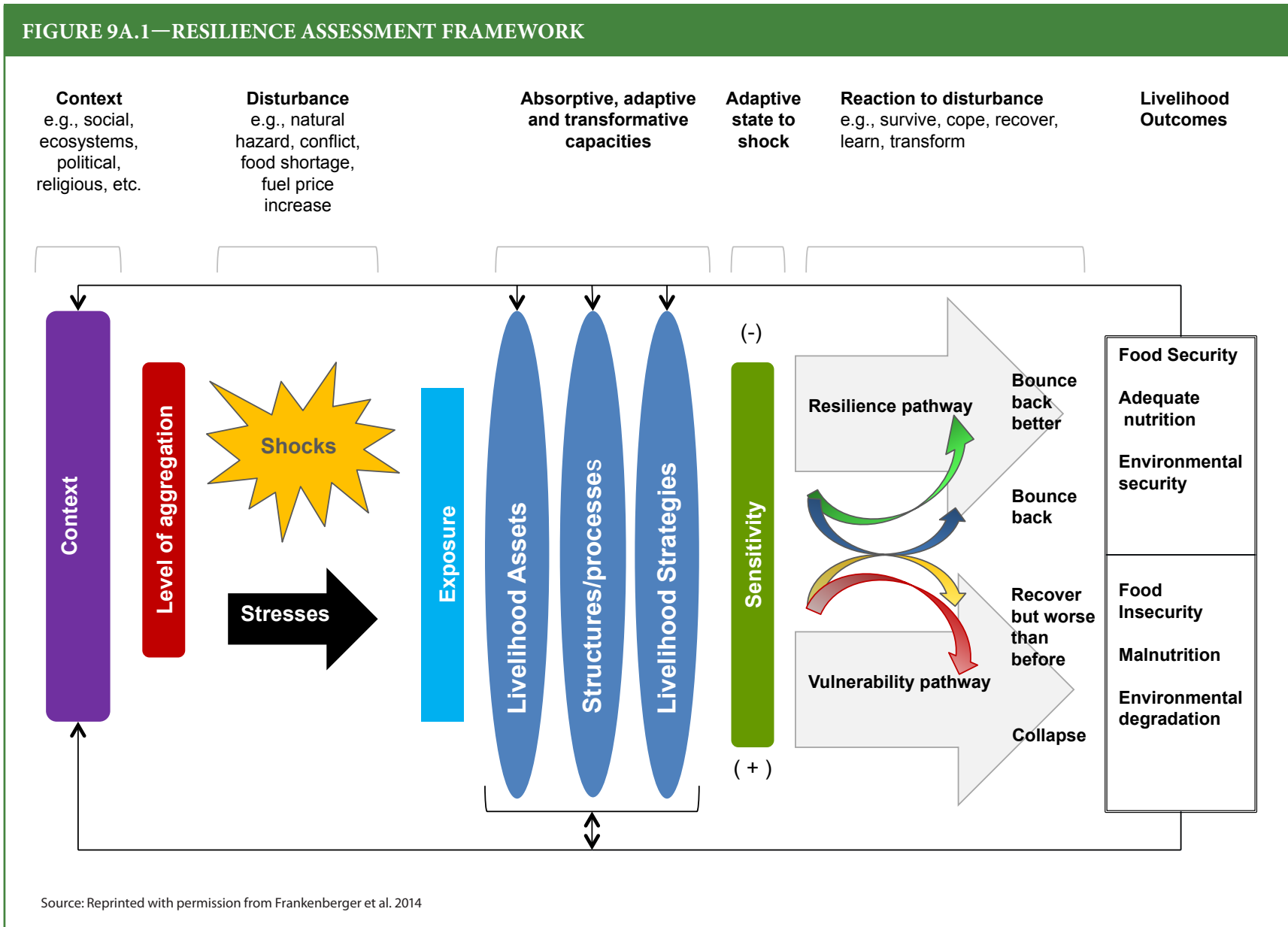


FIGURE 9A.2—FRAMEWORK ON GENDER, AGRICULTURAL DEVELOPMENT, AND CLIMATE CHANGE

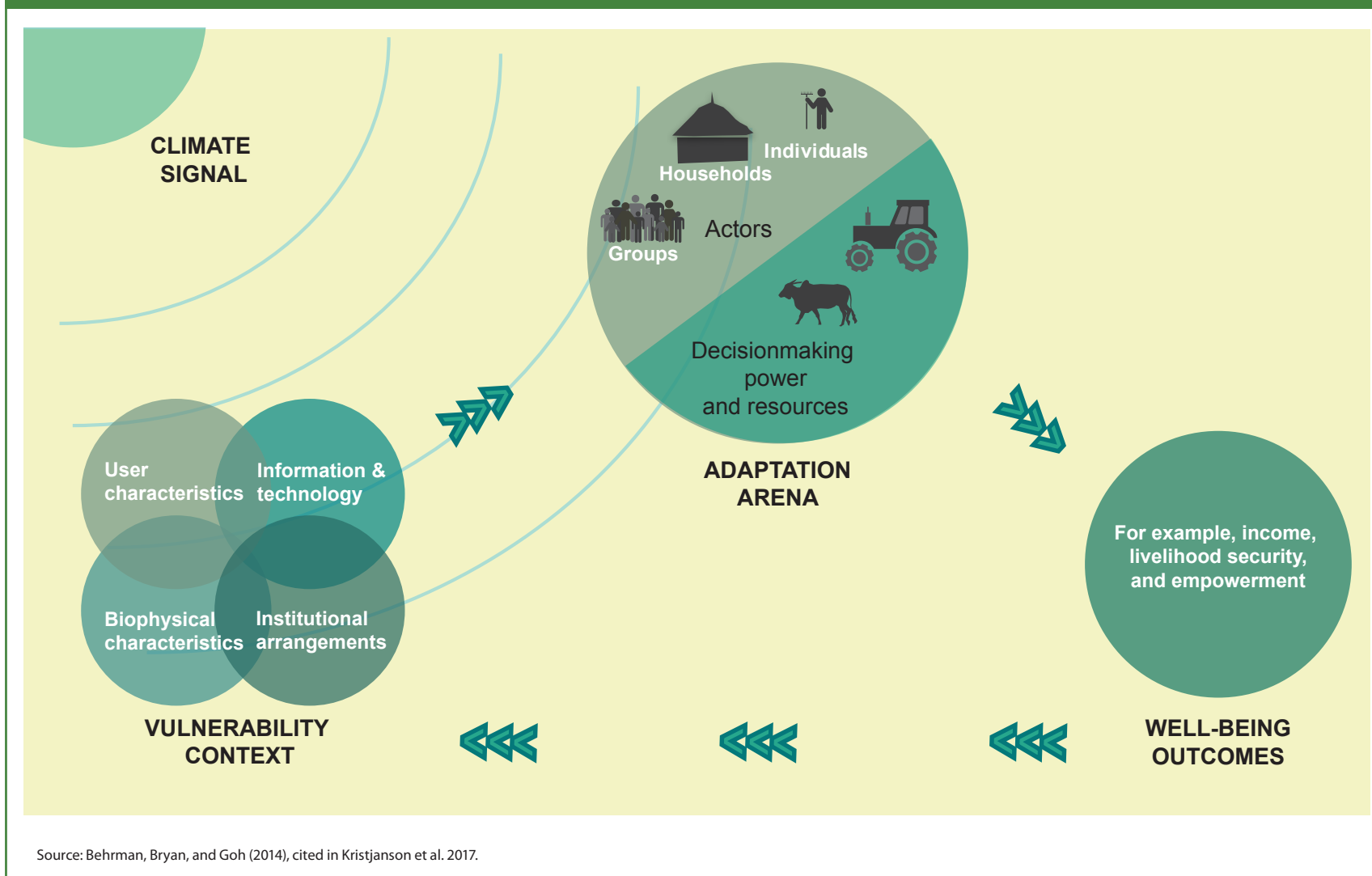


FIGURE 9A.3—AGRICULTURE-TO-NUTRITION PATHWAYS

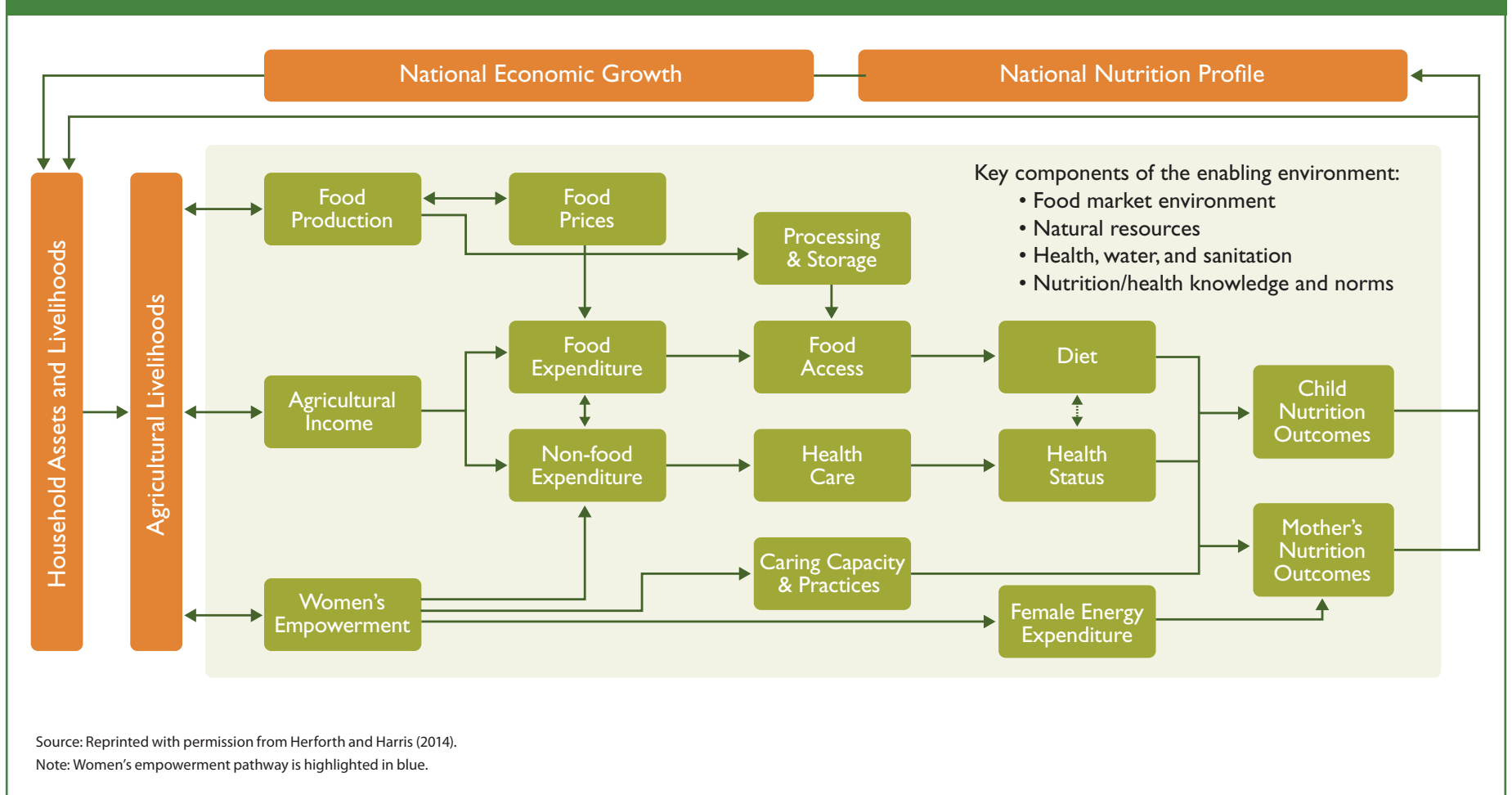


FIGURE 9A.4—CONCEPTUAL LINKS BETWEEN CLIMATE CHANGE AND NUTRITION

