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AGRICULTURE GLOBAL PRACTICE

Gender in Climate-Smart Agriculture

MODULE 18 for the GENDER in AGRICULTURE SOURCEBOOK

WORLD BANK GROUP

Food and Agriculture Organization of the United Nations

IFAD
Investing in rural people

Gender in Climate-Smart Agriculture

Module 18 for the Gender in Agriculture Sourcebook

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ACRONYMS AND ABBREVIATIONS

CAADP	Comprehensive Africa Agriculture Development Programme
CARE	Cooperative for Assistance and Relief Everywhere
CCAFS	Climate Change, Agriculture, and Food Security (program of the CGIAR)
CCGAP	Climate Change and Gender Action Plan (Bangladesh)
CDD	Community-driven development
CGIAR	Consultative Group on International Agricultural Research
CO_2	Carbon dioxide
COP21	21st session of the Conference of the Parties
CSA	Climate-smart agriculture
CSO	Civil society organization
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field School
FHH	Female-headed household
FTT	Thiaroye Fish Smoking Technology
GAAP	Gender, Agriculture, and Assets Project
GACSA	Global Alliance for Climate-Smart Agriculture
GALS	Gender Action Learning System
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	Greenhouse gas
HHMs	Household Methodologies
IAP	Innovative Activity Profile
ICRAF	World Agroforestry Centre
ICT	Information and communication technology
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
IGWDP	Indo-German Watershed Development Program
ILO	International Labour Organization
ILRI	International Livestock Research Institute
IUCN	International Union for Conservation of Nature
JFFLS	Junior Farmer Field and Life School

KACP	Kenya Agricultural Carbon Project
M&E	Monitoring and evaluation
MCC	Millenium Challenge Corporation
MICCA	Mitigation of Climate Change in Agriculture Programme of FAO
NAPA	National Adaptation Programs of Action
NEPAD	New Partnership for Africa's Development
NGO	Nongovernmental organization
PAH	Polycyclic aromatic hydrocarbons
PSP	Participatory scenario planning
REDD	Reducing Emissions from Deforestation and Forest Degradation
SAFE	Safe Access to Fuel and Energy
SDG	Sustainable development goal
SEAGA	Socio-economic and Gender Analysis
TN	Thematic Note
UNDP	United Nations Development Programme
UNEP	United Nations Environment Progamme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United Sates Agency for International Development
VSLA	Village savings and loan association
WBG	World Bank Group
WEAI	Women's Empowerment in Agriculture Index
WEMAN	Women's Empowerment Mainstreaming and Networking
WFP	World Food Program
WOCAN	Women Organizing for Change in Agriculture and Natural Resource Management
WOTR	Watershed Organization Trust
WRI	World Resources Institute

Currency is in U.S. dollars unless otherwise noted.

Photo: Ray Witlin/World Bank

MODULE 18

Gender in Climate-Smart Agriculture

INTRODUCTION

This module provides guidance and a comprehensive menu of practical tools for integrating gender in the planning, design, implementation, and evaluation of projects and investments in climate-smart agriculture (CSA). The module emphasizes the importance and ultimate goal of integrating gender in CSA practices, which is to reduce gender inequalities and ensure that men and women can equally benefit from any intervention in the agricultural sector to reduce risks linked to climate change. Climate change has an impact on food and nutrition security and agriculture, and the agriculture sector is one of the largest emitters of greenhouse gases. It is crucial to recognize that climate change affects men and women differently. The initial assumption is that social differences, particularly gender inequality, must be taken into account to strengthen the effectiveness and sustainability of CSA interventions. Women are key players in the agricultural sector, yet compared to men, they own fewer assets and have access to less land, fewer inputs, and fewer financial and extension services.

The content is drawn from tested good practice and innovative approaches, with an emphasis on lessons learned, benefits and impacts, implementation issues, and replicability. These insights and lessons related to gender in CSA will assist practitioners to improve project planning, design, monitoring, and evaluation; to effectively scale up and enhance the sustainability of efforts that are already underway; or to pursue entirely different solutions. The target audience includes development agencies (multilateral and bilateral); civil society and nongovernmental organizations; research, advisory services, and academic organizations; the private sector; and professional associations and networks related to CSA and gender issues. The module also aims to help governments better integrate gender into their CSA strategies and policies. It adds a new dimension to the *Gender in Agriculture Sourcebook* (World Bank, FAO, and IFAD 2008) and builds on other online learning and resources available by highlighting recent research evidence and experiences with CSA that can inform the decisions of a wide range of stakeholders about opportunities for future gender-responsive agricultural investments and interventions.

This module contains five Thematic Notes (TNs) that provide a concise and technically sound guide to gender integration in the selected themes. These notes summarize what has been done and highlight the success and lessons learned from projects and programs. The three Innovative Activity Profiles (IAPs) describe the design and innovative features of recent projects and activities, which could be considered for scaling up. The profiles are aimed at inspiring technical experts about possibilities that they can explore and adopt in project design.

Overview

This overview describes the CSA approach, discusses why gender is essential in the context of CSA, and synthesizes key issues relating to investment in gender-responsive CSA, including major policy implications and institutional linkages. It is important to emphasize that "gender,"[1] as discussed in this module, is a relational concept and not an alternative term for "women." It is also vital to note that gender equality and gender equity are different concepts. *Gender equality* is equal participation of women and men in decision making, equal ability to exercise their human rights, equal access to and control of resources and the benefits of development, and equal opportunities in employment and in all other aspects of their livelihoods (FAO 2013). *Gender equity* is fairness of treatment for women and men, according to their respective needs (IFAD 2015). Equity and equality both need to be considered in designing CSA interventions.

THE CSA APPROACH

CSA is an approach to developing the technical, policy, and investment conditions—the enabling environment—to support actions aimed at achieving sustainable agricultural development for food and nutrition security under a changing climate. CSA aims to sustainably improve agricultural productivity and enhance food security, increase farmers' resilience and adaptation to climate change, and reduce and/or remove greenhouse gas (GHG) emissions where possible (FAO 2013).[2] FAO launched the term CSA in the background document prepared for the 2010 Hague Conference on Food Security, Agriculture, and Climate Change. A growing number of international actors have endorsed CSA as a means of building widespread climate resilience while contributing to food and nutrition security, development goals, and GHG mitigation. Given this ambitious set of objectives, an important part of the CSA approach is to identify potential trade-offs and prioritize actions (Neufeldt et al. 2013; McCarthy, Lipper, and Branca 2011).

Food and nutrition security are pressing global concerns, especially since the widespread surge in food prices in 2008 and 2010 (Beddington et al. 2012). An important rationale for investing in CSA is that agricultural growth is the most effective way to reduce poverty and increase food and nutrition security in low-income economies that depend heavily on agriculture—precisely those economies where the majority of the world's poor and food-insecure people live (World Bank, FAO, and IFAD 2008). An important driver of agricultural growth is higher returns to farm production; to increase those returns, producers in large numbers must adopt agricultural practices that increase productivity and use resources such as land and water more efficiently, effectively, and in an environmentally sustainable manner. Strategies designed under a CSA approach take into account specific contexts and capacities, as well as prevailing economic, environmental, and social situations, including gender relations (FAO 2013). See box 18.1 for specific examples of CSA practices, and Thematic Note 1 for information on innovative technologies for gender-responsive CSA.

CSA approaches entail greater investment in managing climate risks, which are occurring more rapidly and with greater intensity than in the past (Nelson et al. 2010; IPCC 2014), by understanding and planning for adaptive changes that may be needed in farming or landscape management practices and reducing or removing GHG emissions where possible. CSA explicitly considers the development or adoption of technologies and practices

[1] "Gender" refers to the social attributes and opportunities associated with being male and female and the relationships between women and men and girls and boys, as well as the relations between women and those between men (see http://www.un.org/womenwatch/osagi/conceptsandefinitions.htm).

[2] http://www.fao.org/climate-smart-agriculture/en/.

Box 18.1 Examples of Climate-Smart Agricultural Practices

These examples of climate-smart agricultural practices come from case studies in East Africa, West Africa, and South Asia. Note that the practices are context specific—in other words, they will be applied differently in different environments. A practice may be climate smart in one context but not in another, depending on how, where, and why it is used. Practices also have different social dimensions depending on the area and culture in which they are implemented.

Improved land and water management practices

- ***Agroforestry,*** in which trees are planted together with crops on the farm, generally makes use of trees that produce or are primarily used for fruit, fodder, or fuelwood. Aside from these benefits, the trees can reduce runoff or erosion, enhance soil fertility, and provide shade—functions that are important for adapting to climate change—in addition to sequestering carbon, which has benefits for mitigating the effects of climate change.
- ***Terraces and bunds*** are physical structures placed along contours to slow the runoff of water and enhance its absorption. They can be an important measure for adapting to water scarcity arising from climate change.
- ***Water harvesting structures and systems*** are another important adaptation measure with food and nutrition security impacts—collect water from a surface area for irrigation or for improved filtration. These systems can be small or large, ranging from individual farms and plots to a much more considerable area. Structures can include water ditches and water pans, which must be managed well to control mosquitos and malaria.
- ***Improved agricultural water management*** includes small-scale irrigation and improved management of water from ground and surface sources.
- ***Planting pits*** are pits of different sizes used for planting and to help conserve water.
- ***Crop residue mulching*** involves leaving crop material on the field after the harvest to improve soil texture, prevent erosion, and encourage water filtration.

Improved soil fertility and crop management practices

- ***Composting*** involves removing crop residues to allow them to decompose and then adding them back to the soil to improve soil fertility and texture and allow for improved water filtration.
- ***Cover cropping*** ensures that fields are covered by vegetation that protects soil from eroding between crop production cycles. Some cover crops also enhance soil fertility or suppress pests.
- ***Conservation agriculture*** involves maintaining a permanent organic soil cover from cover crops, intercrops, or residues/mulch, minimizing soil disturbance through tillage, and diversifying crop rotations (for example, with legumes). Conservation agriculture is discussed in detail in Thematic Note 1.
- ***Efficient use of fertilizer*** means that producers optimize the amounts and types of fertilizer (synthetic and organic) they use. Examples of efficient fertilizer practices include using a mix of fertilizer components that reflects actual soil and crop needs; deep placement of fertilizer; microdosing; and changing from one fertilizer application at the beginning of the crop cycle to three (smaller) fertilizer applications throughout the crop cycle.
- ***Improved, high-yielding varieties*** are grain, legume, fruit, and vegetable varieties that have been bred to improve and increase yields and that are purchased and used in conjunction with other CSA practices.
- ***Stress-tolerant varieties*** are bred specifically to be adapted to climate challenges in a particular region, such as droughts, floods and submergence, saline or acidic soils, and pests.
- ***No-till or minimum tillage*** practices involve opening the soil only where the seeds are placed, with as little soil disturbance as possible; it is a component of conservation agriculture.
- ***Alternate wetting and drying for rice management*** involves improved water management and reduces GHG emissions.

Improved livestock management practices

- ***Improved feed management*** entails storing animal feeds (stover, grass, grain) and making better use of feed (by combining types of feed), growing grass varieties specifically suited to the agro-ecological zone, and many other practices, such as fodder conservation and animal fattening.
- ***Livestock manure management*** is the collection and storage of livestock manure for future application to producers' fields.
- ***Destocking*** is a planned effort to reduce the number of livestock and manage the herd more efficiently

Box 18.1 Examples of Climate-Smart Agricultural Practices (*Continued*)

(by selling animals if drought is projected, for example), as opposed to sudden distress sales provoked by hardship. It improves resilience and reduces GHG emissions.

- ***Switching to livestock species or breeds that are more adapted to water scarcity and resistant to disease*** can include buying or breeding such animals or even changing the type or species of animal produced. For example, Zebu cattle and small ruminants are more tolerant of water scarcity.
- ***Pasture management,*** which includes rotational grazing and setting paddocks aside in case of drought, improves risk management and reduces GHG emissions.

Other practices

- ***Improved postharvest practices,*** such as improved storage and processing methods, reduce food losses and women's workloads and improve food safety.
- ***Improved cooking stoves*** can influence agricultural practices because they require less wood, which can reduce women's workload and the time needed to prepare food.
- ***Fisheries and aquaculture*** involve the breeding, rearing, and harvesting of plants and animals in all types of aquatic environments.

Source: Bernier et al. 2015; FAO 2013.

Box 18.2 Gender-Equitable, Decent Work in the Rural Green Economy and Climate-Smart Agriculture

Green jobs and the promotion of a green economy[a] are crucial to achieve economic and social development in an environmentally sustainable manner. When aligned with decent work principles,[b] particularly gender equality, they lay a strong foundation for a well-balanced approach to sustainable agriculture and rural development.[c] Sustainable agriculture has the potential to be a net creator of jobs that provide higher returns to labor inputs than conventional agriculture. Rural women are significantly involved in crucial green economy sectors such as agriculture[d] and energy, and clearly they can potentially benefit by turning their reliance on natural resources into opportunities for green and decent jobs. For instance, rural women can participate in a wide array of newly emerging employment opportunities, from running small, resource-based businesses and the environmental maintenance of nurseries and forests to engaging in water and land management, rural ecotourism, or bio-fuel production based on small-scale, low-input agriculture.

As this module emphasizes, climate change has multiple implications for rural women, so a greener economy will not necessarily translate into equal access to productive jobs and decent work for women. Women's ability to engage in green jobs may be limited by their comparatively more restricted access to training, skills development, and modern technologies. Young rural women may be additionally disadvantaged by their age and lower socioeconomic status. For this reason, it is crucial to integrate gender-related differences and specificities into interventions aimed at promoting green economic development and climate-smart approaches in agriculture. Creating synergies between targeted and innovative rural employment programs, gender-sensitive responses to climate change, and green growth strategies has the potential to lift rural women out of poverty and contribute to the development of sustainable, climate-smart rural landscapes. This effort will involve integrating decent work principles (sensitive to gender equality and age) into the broader agricultural and rural development policy agenda.

Source: Monika Percic and Corina Lefter (FAO)

[a] The United Nations Environment Programme (UNEP 2011) defines a green economy as one that results in *improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.*

[b] Defined by the International Labour Organization (ILO) on its website, "Decent Work Agenda: Promoting Decent Work for All" (http://www.ilo.org/global/about-the-ilo/decent-work-agenda/lang--en/index.htm).

[c] Promotion of "sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all" is embedded into the proposal for the United Nations Sustainable Development Goals (SDGs) under SDG 8.

[d] In this module, agriculture includes also livestock, forestry, fisheries, and management of natural resources.

that can ameliorate food and nutrition insecurity and poverty.

At the plot, farm, and landscape levels, a CSA plan may include many well-known techniques of sustainable land management, such as mulching, intercropping, agroforestry, and pasture management. CSA plans also include consideration of innovative practices, programs, and policies—examples include improved seasonal weather forecasting and crop or livestock insurance based on weather-related risks—not just at the farm level but at the subnational, national, and regional levels. Thinking about the landscape level and not just about CSA practices at the farm or community level can be critical when addressing adaptation and mitigation challenges that require greater diversification in land use across the landscape and the management of multiple land uses at the landscape scale (see Thematic Note 2, "Gender-Responsive, Climate-Smart Landscape Approaches"). CSA also has potential to be a net creator of green jobs that provide higher returns to labor than conventional agriculture (box 18.2).

INTEGRATING GENDER INTO CSA INITIATIVES

To succeed, the climate-smart agricultural practices described in box 18.2 depend on institutional and behavioral change, which is not possible without social analysis (including gender analysis) influencing policies, projects, and other interventions aimed at achieving sustainable CSA. Social inequality and social inclusion, particularly in reference to gender, have been recognized as a foundational issue in development for at least 40 years,[3] and a growing body of evidence demonstrates that more equal gender relations within households and communities lead to better agricultural and development outcomes, including increases in farm productivity and improvements in family nutrition (Farnworth, Kristjanson, and Rijke 2013; Farnworth and Colverson 2015). A number of documents reflect the consensus that gender-based constraints must be addressed to increase agricultural productivity, improve food and nutrition security, reduce poverty, and build the resilience of rural populations.[4] Recent work calls for development practitioners to understand and systematically engage with the complexities and variability of gendered roles and resources in agriculture, based on better data and evidence (Quisumbing et al. 2014), and for projects and programs to shift to gender-transformative approaches (Meinzen-Dick and Quisumbing 2013). By the same token, CSA strategies are unlikely to be effective, let alone equitable or transformative, without active attention to gender (Bernier et al. 2015).

Gender-responsive policy and practice recognize and address the specific needs and realities of women and men based on the social construction of gender roles. *Gender-transformative* interventions seek to transform gender roles and promote more gender-equitable relationships between men and women. They challenge the underlying causes of gender inequality that is rooted in broad political, economic, and sociocultural structures. Because gender-transformative approaches seek to change rigid gender roles and relations, such approaches often go beyond the individual level to focus on interpersonal, social, structural, and institutional practices to address gender inequalities (Morgan 2014).

Gender as it pertains to many sectors—health, education, agriculture—and many domains within agriculture (from crop and livestock production to natural resource management and agro-processing) is also pertinent to CSA, but only recently have gender and CSA been researched together to provide more empirical guidance for deciding how they should be considered together in designing projects, programs, and policies.[5] These studies suggest that more female as well as male farmers adopt climate-smart technologies and practices in agriculture when women's awareness, knowledge, and access to information about such practices increases—with the ultimate effect of strengthening the resilience of households, communities, and food systems exposed to climate-related shocks and climate change. Even more fundamentally, these studies suggest that a host of other factors can influence female producers' adoption of climate-smart approaches, including legal or sociocultural constraints on women's accumulation and control of assets and resources, constraints on women's mobility, as well as the likely effects of climate-smart practices on women's time and labor commitments or share of the benefits.

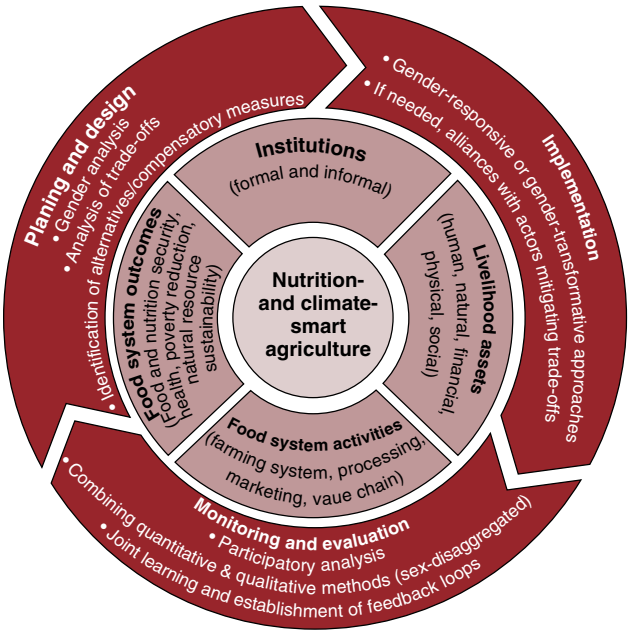
Beuchelt and Badstue (2013) present a helpful framework for thinking about opportunities and trade-offs in interventions, policies, and actions aimed at enhancing gender and social equity in CSA (figure 18.1). The inner part of the circle shows key considerations that include livelihood

[3] For example, Boserup's landmark book on women and economic development was published in 1970.

[4] Recent examples include World Bank (2009), Meinzen-Dick et al. (2010), and FAO (2011).

[5] See, for example, Beuchelt and Badstue (2013) and Bernier et al. (2015).

Figure 18.1 Conceptual Framework for Enhancing Gender and Social Equity in Nutrition- and Climate-Smart Agriculture



Source: Beuchelt and Badstue 2013.

assets, institutions, and broader food system activities (such as processing) and outcomes (such as food and nutrition security). The outer part of the circle shows the main program cycle steps of planning and design, implementation, and monitoring and evaluation (M&E). Opportunities exist to integrate gender into CSA initiatives at each phase of the project/program cycle seen in figure 18.1. Thematic Note 3, "Monitoring and Evaluation through the Project Cycle," describes these opportunities in detail.

Sex-disaggregated data on CSA in countries as diverse as Kenya, Senegal, Uganda, and Bangladesh show that both men and women are indeed taking up new agricultural practices that are likely to enhance their resilience[6] to the effects of climate change. These practices have tended to feature incremental changes (such as modifications in planting date or changes in crop varieties), yet practices leading to more transformative change (such as diversified livelihoods and an increase in assets) are needed if agriculture is to withstand the effects of climate change while bringing about improved productivity and food and nutrition security, increased economic growth, shared prosperity, and the ultimate goal of growth with social equality (boxes 18.3 and 18.4 present examples). Producers will require enhanced targeted incentives, improved agricultural services, more efficient input and output markets, and policy changes. Policy changes are particularly critical for effective, sustainable, and inclusive CSA. For example, securing women's right to own land (and thus protect their investments in CSA) may require efforts to address customary and civil law regarding property rights; in areas where the definition of a household excludes women from participation in farmer groups, women's inclusion in CSA initiatives will be restricted.

[6] "Adaptive capacity" is the ability to adapt. "Resilience" is the ability to absorb and recover from change, stresses, and shocks (examples include extreme events such as droughts or floods). Hills et al. (2015) operationalize the concept of resilience by developing a monitoring instrument for project managers. This instrument can be used for program planning and management of projects aimed at enhancing the resilience of communities, better managing ecosystem services, and creating positive and sustainable development impacts.

Box 18.3 Women's Adoption of Transformational Changes in Agricultural Practices: Evidence from Bangladesh, Kenya, Senegal, and Uganda

Transformational CSA practices include those that contribute to diversified livelihoods, aim to buffer the household against climate change, increase assets, take a relatively long time for benefits to accrue, and require substantial investments of time, labor, or cash. An intrahousehold study in four countries in East and West Africa and South Asia reports that improvements in women's access to information and credit enhance the likelihood that they will adopt new, transformational CSA practices. Local agricultural groups are key sources of information on CSA, and for women, in particular, they are also important for sharing labor. The study also finds that although male farmers supported by extension officers are more likely to make transformative changes, female farmers who receive extension advice are not. The risks and trade-offs specific to women as they decide whether to invest in new practices imply that without more targeted support and services that address women's needs, the challenge of achieving the multiple goals of CSA will remain significant.

Source: Author, based on findings reported in Bernier et al. 2015.

Box 18.4 Increasing Rural Women's Income through Climate-Smart Agriculture in Western Kenya

Climate change in northwestern Kenya—a major source of food crops and livestock products for the country as a whole—may provoke major changes in the productivity of key agricultural enterprises, with far-reaching implications for national food and nutrition security and farmers' livelihoods. A pilot project under FAO's Mitigation of Climate Change in Agriculture (MICCA) program, initiated in Kenya in September 2011, focused on small-scale female and male dairy farmers, with the aim of integrating CSA into the farming system and improving farm and milk productivity, income, and livelihoods.

In the Kamotony area, women concerned about providing for their children in hard economic times formed a group but could not determine what they could do to improve their prospects. Through the pilot project, they received training in CSA practices and decided to establish a tree nursery. Sales of indigenous tree seedlings, tea cuttings for planting material, ornamental trees, and garden flowers gave them a financial stepping-stone for investing in dairy production. They increased their farms' milk productivity after applying the knowledge gained through training in improved fodder production, feed storage, and dairy cattle management. The new practices allowed them to reduce risks and access credit, which enabled them to make further investments in their agricultural enterprises.

The women report that now they can pay their children's school fees without difficulty. Some use the proceeds from milk sales to make monthly contributions to the National Health Insurance Fund for their family members. They have improved household nutrition by applying compost and manure to home gardens and growing passionfruit. The members of this group were among the 90 percent of the female-headed households in the project area who perceived that the adoption of climate-smart agriculture practices had increased their incomes and household food and nutrition security. They also suggest that the adoption of CSA practices has generally reduced their stress levels and enhanced cohesion in their homes.

The success has made it easier for the women groups' to adopt some practices such as agroforestry, which ordinarily would be difficult for cultural and gender reasons. The trees they planted provide herbs and fuelwood; time that is no longer spent collecting wood is used productively in other activities. Looking forward, this women's group will use income from milk sales not only to build social capital as a dairy management group but also to increase their financial capital through regular savings.

Source: Adapted from Mutoko, Rioux, and Kirui 2015.

Lessons from development partners suggest that participatory, inclusive approaches aimed at building adaptive capacity, such as farmer-to-farmer extension or farmer-led innovation, are scalable, but individual innovations—including some that are particularly attractive to women—are difficult to scale out, because they are suited to highly specific environments and contexts.[7] Another lesson from climate change adaptation projects is that it is valuable to recognize that women make an active and important contribution to climate adaptation based on their local knowledge and capacity, and that it is limiting and simplistic to view them as passive victims of climate change (Otzelberger 2011). Successful adaptation projects increase women's opportunities to add value to their agricultural activities—for example, through agricultural processing and marketing—and diversify their income-earning opportunities (Njuki et al. 2011). In other words, they promote transformational change in agriculture and acknowledge women's role in that process.

KEY ISSUES AND EMERGING TRENDS RELATING TO GENDER IN CSA

The sections that follow highlight issues and emerging trends with significant implications for gender in CSA. Specific aspects of many of these issues are taken up in the Thematic Notes and Innovative Activity Profiles.

Gender and adoption of CSA practices

A recent study by World Bank and ONE (*Levelling the Field: Improving Opportunities for Women Farmers in Africa*, World Bank and ONE 2014) reports that in six African countries,

[7] For example, see Waters-Bayer et al. (2015).

productivity per hectare is significantly lower on women's farms than on men's farms, ranging from 13 percent lower in Uganda to 25 percent lower in Malawi. A separate study in Niger finds that on average plots managed by women produce 19 percent less per hectare than plots managed by men, and the gender gap tends to be widest among Niger's most productive farmers (Backiny-Yitna and McGee 2015). Reinforcing earlier findings on the gender gap in agriculture (FAO 2011), the researchers attribute the gender productivity gap to the challenges women experience in accessing, using, and supervising male farm labor; to the fact that women use less fertilizer, of lower quality, than men use; and to the fact that land ownership is lower among women than men. As Thematic Note 3 on M&E describes, these reasons for the gender productivity gap are similar to the typical constraints on women's (and often men's) uptake of CSA practices. They include a lack of the following:

- Land ownership, or long-term user rights
- Access to agricultural credit
- Access to productive farm inputs (including fertilizers, pesticides, and farming tools)
- Access to timely labor
- Support from extension and other rural advisory services
- Access to markets and market information
- Access to productive land
- Access to weather and climate information

Box 18.4 describes a climate change project led by FAO that targeted women and CSA. The project addressed several of these constraints by building the capacity of women's groups to use CSA.

Determining just how men's and women's constraints may differ by climate-smart option is a first step in understanding the range of issues that must be considered in designing projects and programs to make agricultural systems more resilient (table 18.1). Based on experience in South Asia and Africa in the CGIAR's Climate Change, Agriculture, and Food Security (CCAFS) program and expert opinion,[8] table 18.1 indicates the relative contribution (high, medium, low) of a given practice to CSA goals—adaptation, mitigation, and food and nutrition security—as well as its gender impact (here measured as the degree to which women are likely to control income from the practice) and the relative importance of various requirements for women to adopt the practice. This type of assessment to date has been subjective and based on expert opinion, but more and more sex-disaggregated evidence is being gathered on these requirements and impacts, and it will provide a broader evidence base in the future.

More research is also needed—and some is underway[9]—to make the type of information provided in table 18.1 context specific, given that many very localized social, cultural, and biophysical factors will influence this evaluation. For example, women's ability to control the income from fruit trees may be high in some communities but low in others due to social stigmas, and their control of that income can also change from high to low if the income from that activity increases and the men take it over. Options such as conservation agriculture have high potential to increase crop yields under certain conditions, but not in others with certain water or soil constraints. Conservation agriculture can also increase women's labor burden (Beuchelt and Badstue 2014). Investment in research to develop tested (by women and men) "CSA options by context" will help to fill the real—and wide—knowledge gap encountered by local and national policy makers seeking to develop adaptation and mitigation plans. Project managers could use table 18.1 as a guide to the kinds of questions they might ask about the effects of improved CSA technologies and practices proposed in target communities.[10]

Gender-differentiated perceptions and impacts of climate risks, adaptive capacities, and approaches

Everyone operating in the agricultural sector faces many types of risk that are often interrelated, including those posed by markets and prices, policies, institutions, and production in addition to weather and climate risk. Evidence indicates that women farmers are more exposed to climate risks compared to men for many of the same reasons that farm productivity is lower for females than males—namely, women have fewer endowments and entitlements, they have less access to information and services, and they are

[8] See https://ccafs.cgiar.org. The CGIAR is the Consultative Group on International Agricultural Research.

[9] For example, in the CGIAR (http://humidtropics.cgiar.org/), FAO (http://www.fao.org/climatechange/micca), the ODI project on Gender Equality and Climate Compatible Development (http://cdkn.org/project/gender-equality-climate-compatible-development/), and other programs.

[10] Beuchelt and Badstue (2014:715) also provide guidance on key questions for exploring the potential effects on women and men of conservation agriculture practices.

Table 18.1 Potential Gender Considerations of Various CSA Practices

	Contribution to CSA Goals Relating to			Gender Impact	Requirements for Adoption of Practice					
CSA Options/Practices	Climate Change Adaptation	Mitigation (Reducing GHGs)	Potential Household Food Security and Nutritional Impacts	Women's Control of Income From Practice	Relative Amount of Time until Benefits Are Realized	Potential for Women to Benefit from Increased Productivity	Female and Youth Labor Availability	Female Access to and Control of Land	Female Access to Water for Agriculture	Female Access to Cash and Ability to Spend it
Stress-tolerant varieties	High	Low	High	Low	Low	Medium	Medium	High	Low	High
High-yielding varieties	Low	Low	High	Low	Low	High	Medium	High	High	High
Conservation agriculture	High	Medium	High	Low	High	High	Low–Medium	High	Low	Low
Improved home gardens	High	Medium	High	High	Low	High	High	High	High	High
On-farm tree planting	High	High	Low–Medium	Low	High	Medium	High initially; Low later	High	High	Medium
Composting	Medium	Medium	Medium	Medium	Low	Medium	High	Medium	Low	Low
Small-scale irrigation	High	Low	High	Low–Medium	Low	High	Medium	High	High	Medium
Fodder shrubs	High	Medium–High	High	High	Medium	Medium	High	High	Medium	Low–Medium
Herbaceous legumes	High	Medium	High	High	Medium	High	High	High	Medium	Low–Medium
Improved grasses (for example, Napier)	High	Medium	High	High	Low	High	High	High	Medium	Low
Livestock genetic improvement	High	Medium	Medium–High	Low–High	High	High	Low–High	Low	High	Medium
Restoration of degraded rangeland	High	High	Medium	Low	High	High	Low–High	High	Low	Low

Source: Author, based on a range of expert opinions.
Note: Beuchelt and Badstue (2014: 715) also provide useful guidance on key questions for exploring similar kinds of potential effects on women and men of conservation agriculture practices.

less mobile.[11] Some climate-related risks can impede the adoption of a new practice that reduces those very risks; for example, an increased incidence of drought may discourage producers from planting trees. In other instances, improved practices can in fact mitigate climate risks (the impacts of increased variability in rainfall can be reduced by planting drought-tolerant crop varieties). Access to markets may reduce certain climate-related risks for women (by reducing the risk of on-farm storage losses), but it can also increase them (by increasing their exposure to market price volatility).

Perceptions and types of climate-related risks faced by male and female farmers can also differ. A review of agricultural innovation and female farmers in Africa (Doss 2001) concludes that women lack incentives to adopt soil management measures on their plots because of the risk of losing access to the land and their investments. As a consequence, they are more exposed to climate risk. Investments are clearly needed in projects and interventions that reduce the risks (such as losing access to land) that present formidable barriers to women wanting to adopt new technologies and practices and actively participate in markets.

Approaches based on information and communication technology (ICT), including radio, TV, cellphones, and social media, promise to enhance women's access to CSA and weather and climate information, reduce the perceived risks, and strengthen women's participation in commodity value chains (see Innovative Activity Profile 1, "Harnessing Information and Communication Technology for Gender-Responsive CSA"). A World Bank study on whether and how ICT could support agro-enterprises operated and managed by women in Kenya and Zambia concludes that women and men differ in their access to, use of, and need for ICT tools (World Bank 2015), and Zambia is now developing a pilot project to introduce ICT solutions targeted at women. Like many studies, the World Bank study finds a high demand for extension information among women farmers; that level of demand presents an opportunity to train agricultural extension officers to use ICTs to reach an increased number of farmers more cost effectively. The study provides a useful step-by-step guide to introducing ICT-based solutions with a gender focus in agricultural projects (World Bank 2015:xvi).

Within the wide range of frameworks, tools, and approaches for collecting and analyzing sex-disaggregated data, some recent options are particularly useful for CSA (table 18.2). Thematic Notes 3 and 4 describe additional approaches.

[11] See, for example, Ahmad et al. (2014) and Jost et al. (2015).

Institutions, policies, and finance options

It is clear that policies, institutional arrangements, and investments that create an environment conducive to gender-responsive CSA will be needed as countries continue to develop plans for climate change adaptation and mitigation as well as strategies for promoting gender equality in agriculture (see Thematic Note 5, "The Role of Institutions for Gender-Responsive CSA"). As an initial step, the CCAFS program and FAO have been working with climate negotiators (men and women) from many countries to build their CSA capacity and support their active participation in global climate meetings.

Because a wide array of ministries and organizations operate at the nexus of gender and CSA, forward-planning processes that link research to policy and practice are critical. For example, FAO's Mitigation of Climate Change in Agriculture (MICCA) program, along with the CCAFS program, World Agroforestry Centre, and Kenyan Ministry of Agriculture, Livestock, and Fisheries, has engaged national stakeholders from research, practice, and policy and interactively shared and analyzed scientific evidence and field experience from over 40 projects related to CSA, some with a gender focus, in integrated farming systems in Kenya (Chesterman and Neely 2015). Key policy recommendations reflect the need to consider how CSA fits into development priorities; fill knowledge gaps; connect interdisciplinary research, practice, and policy; integrate farm and landscape systems; and ensure the inclusion of women and young people (Chesterman and Neely 2015). Support for, and investment in, such inclusive dialogues are essential in making gender equality an integral part of the planning processes.

One knowledge gap that is only beginning to be addressed concerns the type of financing and investment opportunities capable of promoting gender and CSA (for an example, see Innovative Activity Profile 2, "Using Impact Investment to Promote Gender Equality and Climate-Smart Agriculture"). The Climate Investment Funds and Global Environmental Facility (GEF), which finances adaptation and mitigation and also aims to mainstream gender, offers opportunities to support gender-responsive CSA initiatives. New climate financing instruments are also under development; the Green Climate Fund (GCF) could reach $100 billion per year from 2020 if commitments are maintained. The GCF has mandated that implementing institutions fully integrate

Table 18.2 Frameworks, Tools, and Approaches for Collecting Sex-Disaggregated Data and Gender Analysis in Relation to Climate-Smart Agriculture

Tool/Method/Approach	Description and Sources of Additional Information
Gender transformative agricultural research in development approach	Development of impact pathways and theories of change to achieve gender outcome. (See CGIAR 2012; http://aas.cgiar.org/publications/using-theory-change-achieve-impact-aas#.VQCHTmacwiE).
Gender and climate change research in agriculture and food security, and gender and inclusion toolboxes: (i) FAO and CCAFS (CGIAR), and (ii) CCAFS (CGIAR), World Agroforestry Centre (ICRAF), and CARE International	Two training guides with resources and participatory action research tools for collecting, analyzing, and sharing gender-responsive information about agricultural communities, households, and individuals facing climate change. Modules include coproduction of knowledge, climate-resilient agriculture, climate information services, and climate change mitigation. Tools include village resource map and goal tree, perceptions of women's empowerment, climate-information ranking, information flow map, changing farming practices, cobenefit analysis, and many others. (See http://www.fao.org/climatechange/micca/75949/en/ and http://ccafs.cgiar.org/research-highlight/new-toolbox-gender-and-inclusion-climate-change-projects#.VRGpQ2acwiG).
Gender asset gap (International Food Policy Research Institute [IFPRI])	"Reducing the Gender Asset Gap through Agricultural Development" explains the importance of tangible assets (land, labor, and animals) and intangible assets (education, financial capital, and social networks) for development and outlines the wide gap between men and women in the use, control, and ownership of such assets. Through practical lessons and recommendations, the guide shows how to collect data and design and monitor projects to address the gender asset gap. It specifies how each step of a project, from design to evaluation, can attend to gender differences, and it identifies qualitative and quantitative tools for collecting and analyzing sex-disaggregated data on assets. (See http://gaap.ifpri.info/; http://www.ifpri.org/publication/reducing-gender-asset-gap-through-agricultural-development; http://genderassetgap.org/sites/default/files/ResearchBrief2.pdf.)
Women's Empowerment in Agriculture Index (WEAI) (IFPRI, USAID)	The index is based on five factors that are considered indicative of women's overall empowerment in the agricultural sector: decisions over agricultural production; power over productive resources such as land and livestock; decisions over income; leadership in the community; and time use. Women are considered empowered if they score adequately in at least four of the five components. Data on individual men and women in the same household are used to calculate a women's empowerment index and a gender parity index. (See IFPRI 2012; http://www.ifpri.org/book-9075/ourwork/program/weai-resource-center.)
Mapping gendered farm management systems (IFPRI)	Provides a method for classifying gendered farm management systems with pilots of four different approaches to collecting and georeferencing information on the dominant pattern in each area. (See Meinzen-Dick et al. 2012; www.ifpri.org/sites/default/files/publications/ifpridp01153.pdf.)
Integrating gender in agricultural value chains (USAID)	Provides a five-phase approach for analyzing and integrating gender in value-chain analysis and development: mapping gender roles and relations along the value chain; moving from gender inequalities to gender-based constraints; assessing the consequences of gender-based constraints; taking action to remove gender-based constraints; and measuring the success of actions. (See Rubin, Manfre, and Nichols Barrett 2009; https://agrilinks.org/sites/default/files/resource/files/gender_agriculture_value_chain_guide.pdf)
Guiding questions to explore potential effects of conservation agriculture on women and men in smallholder agricultural systems	Set of questions in the following categories: food security and nutrition diversity, health, access to information and technology, resources and labor, income, and marketing and value chains. (See Beuchelt and Badstue 2013; http://link.springer.com/article/10.1007%2Fs12571-013-0290-8.)

gender in their projects. It has a gender policy and action plan and is developing new gender-responsive indicators.[12] Climate finance can also be provided by governments through instruments such as National Climate Change Funds, National Climate Change and Agricultural Investment Plans, National Adaptation Action/Adaptation Plans, and Nationally Appropriate Mitigation Actions. The degree to which these instruments are gender responsive varies considerably across countries and merits more attention. Box 18.5 describes some key regional and global policy initiatives to support CSA.

KEY MESSAGES

This module highlights the importance of gender considerations in the context of CSA, touching on critical issues and giving examples of major considerations and good practices for effective projects and investments in this area. One of the most significant points is that many knowledge gaps remain with regard to CSA and gender. More information is becoming available on technical aspects of CSA, yet information on the socioeconomic factors surrounding CSA, such as the reasons

[12] See https://portals.iucn.org/union/sites/union/files/doc/boell-iucn_gcf_indicators_workshop_report_final.pdf.

Box 18.5 Regional and Global Policy Initiatives That Support CSA

At the global level, the United Nations Framework Convention on Climate Change (UNFCCC) addresses issues related to CSA through a number of frameworks such as REDD+ (Reducing Emissions from Deforestation and Forest Degradation, conservation and sustainable management of forests, and enhancement of forest carbon stocks) as well as the Ad-Hoc Durban Platform, National Adaptation Plans, and technology transfer (Campbell et al. 2014). At the 20th session of the Conference to the Parties of the UNFCCC, the Parties adopted the **Lima Work Programme on Gender,** a two-year work program that includes, among other tasks, a review of the implementation of all gender-related mandates by the UNFCCC Secretariat and various activities related to gender-responsive climate policy, mitigation, technology, adaptation, and capacity building.

The Global Alliance for Climate-Smart Agriculture (GACSA), launched at the UN Climate Summit 2014, is a voluntary association of national governments, intergovernmental organizations, development banks, and private, civil society, and research organizations. It aims to build national and international support for efforts to increase food production while enhancing people's resilience to climate change and lowering agriculture's GHG emissions intensity (FAO 2013). The Knowledge Action Group of GACSA initiated consultations online and face to face to identify high-priority investment areas and knowledge gaps. Participants identified gender as an important cross-cutting topic.

In March 2015, the Global Forum for Innovations in Agriculture featured a global CSA summit.[a] Later in 2015, COP21 (21st session of the Conference of the Parties) will be held in Paris, France, and aim to achieve a legally binding and universal agreement on climate from all nations. Even though CSA is starting to be discussed more substantially in these arenas, social and gender issues remain largely in the domain of civil society organizations, which try to participate more in the global dialogue.

At the regional level, the Africa CSA Alliance—formed by several governments, nongovernmental organizations, and research bodies—aims to scale up the adoption of CSA practices. Convened by NEPAD/CAADP,[b] and aligned with the African Union's 2014 Malabo Declaration,[c] the alliance conducted vulnerability and capacity assessments across Africa. Three countries (Ethiopia, Niger, and Zambia) were selected to develop proposals for scaling out CSA.[d] It remains to be seen if this alliance can raise the resources to achieve its goal of empowering 6 million smallholder farmers by 2021. So far, gender is not a central issue, although each country will likely take different approaches in its scaling-out efforts.

Source: Authors.

[a] (http://climate-l.iisd.org/news/gfia-focuses-on-sustainable-and-climate-smart-agriculture/282516/.

[b] NEPAD is the New Partnership for Africa's Development; CAADP is the Comprehensive Africa Agriculture Development Programme.

[c] The Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods (http://caadp.net/sites/default/files/documents/sustaining-CAADP-momentum/Malabo_Declaration_on_Accelerated_Agricultural_Growth_and_Transformation_for_Shared_Prosperity_and_Improved_Livelihoods_adopted_June_2014-2.pdf).

[d] See http://africacsa.org.

that farmers fail to adopt CSA practices, remains limited. Many agricultural project innovations face the same issues, so the lack of information on socioeconomic constraints is perhaps not unique to CSA technologies. A general lack of sex-disaggregated data means that little evidence is available on the benefits of investing in approaches that seek to transform gender roles and promote more gender-equitable relationships between men and women. New tools and approaches, such as the Women's Agricultural Empowerment Index and the Gender and Inclusion Toolbox (table 18.2), have been developed in recent years to fill the knowledge gaps, but they must be used more widely to generate evidence on the efficiency and equity-related benefits of gender-responsive CSA investments, policies, projects, and programs.

The Thematic Notes and Innovative Activity Profiles in this module demonstrate that new technologies must be appropriate to women's and men's different resources and needs, and women's innovations need to be recognized and supported. This imperative implies an increased investment in strengthening agricultural extension and advisory services, as well as climate information services, in order to serve both women and men. In addition, institutions—public and private, at all levels—need to address women's and men's unique priorities. Policy processes must include women's voices to

achieve more gender-responsive agricultural- and climate-related policies. Central to this outcome are local-level institutions—local government, agricultural advisory services, civil society organizations (CSOs), and nongovernmental organizations (NGOs)—that are working on the ground closely with women and men, as they are the ones that will enable the scaling up and sustainability of CSA projects.

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THEMATIC NOTE 1

The Role of Innovative Technologies for Gender-Responsive CSA

This Thematic Note describes innovative technologies that highlight opportunities and issues relevant to the challenge of finding gender-responsive CSA approaches. It defines "innovative technologies" very broadly to include agricultural inputs (improved seed, fertilizer), tools or machines (plow, mills, mobile phones to obtain and exchange market information, and so forth), or techniques and strategies (practices to enhance soil fertility, retaining crop residues to prevent erosion, improved water management methods) that can be introduced in a new context through a user-driven process of adoption and adaptation.

INNOVATION AND CLIMATE-SMART AGRICULTURE

Historically, innovation in agriculture is often focused on introducing a recommended package of technologies or best practices, without necessarily considering the different accessibility, relevance, and impacts of these technologies for women and men. More recently, farmer-led innovation has been shown to generate "locally appropriate innovations and adaptations" that introduce benefits in the form of improved yields, food and nutrition security, incomes, and environmental outcomes. Studies of farmer-led research and innovation suggest that for scaling up, the focus—rather than being placed on any specific technology or technology package—should be on understanding and replicating the innovation processes in which producers (female and male) test and adjust current and new technologies and management strategies to meet their needs, preferences, and opportunities (Waters-Bayer et al. 2015).

In the context of CSA, much technological innovation is aimed at sustainable agricultural intensification—in other words, at increasing food production from existing farmland with reduced environmental impacts and without limiting options for continuing to produce food in the future (Garnett et al. 2013). Sustainable intensification includes, for example, approaches that rely on natural processes and ecosystems, decrease external inorganic inputs, minimize waste, and combine traditional and new technologies in innovative ways. Such approaches can build climate resilience and adaptive capacity, improve management of competing land-use systems at the landscape level, and in parallel, reduce poverty, enhance biodiversity, and reduce GHG emissions.

Gender differences within and outside of a household relate to differing needs and preferences, access to assets and resources, vulnerability to risk and willingness to take on risk, modes of access to information, and sources of information. All of these factors influence whether and how specific land management practices, including CSA practices, are adopted (Villamor et al. 2014; Pandolfelli et al. 2008). Research by Prolinnova on farmer-led research in Africa, Asia, and Latin America indicates that experiments with introduced technologies tend to bring more benefits to medium-scale and better-off farmers. For poorer households, especially those headed by women, experiments based on endogenous innovation using local resources were found to be more relevant. When female and male farmers' capacity to experiment and innovate was strengthened, they were equally innovative and recognized by farming peers as well as external actors in this capacity (Wettasinha 2014).

The potential for innovative CSA technologies to generate additional benefits related to gender equality is greatest where these technologies contribute to sustainable agricultural intensification, when they are adopted by women to improve their own situations, and at the same time involve less time, labor, and energy, particularly for women, but also for men and resource-poor households in general. The next sections look specifically at climate change and women's work burden.

CLIMATE CHANGE, WOMEN'S WORK BURDEN, AND LABOR CONSTRAINTS

Although women's time use patterns vary by region, income status, and livelihood, most women in rural areas work an average of 16 hours a day, mainly on unpaid chores and productive activities (Carr and Hartl 2010; ActionAid 2013). Across developing countries in Africa, Asia, and the Pacific, men work on average 12 hours a week less than women, and in some countries in West Africa and elsewhere men work as much as 50 percent less than women.[13] The typically overburdened rural woman has little time to participate in paid economic activities and education.

The impacts of climate change, through increased temperatures, changing rainfall patterns, and more frequent extreme events, will in many cases require women to travel longer to collect water and fuelwood, increase the frequency of crop failures, and accelerate trends such as male migration from rural areas to earn cash to mitigate the risk of crop failure. In many parts of the world, from southern Africa to Latin America and Central Asia, the male exodus from rural areas is reducing the farm labor force. Women's expanding farm responsibilities require them to assume all agricultural tasks in addition to domestic chores, including tasks traditionally performed by men. Chronic illnesses such as HIV/AIDS increase with male migration and further limit the supply of family labor. Recent studies (World Bank and ONE 2014, among others) conclude that the gradual loss of adult male labor in the household and women's expanding responsibilities for managing agricultural activities may partially explain the gender gap in agricultural production and could potentially limit women's ability to benefit from CSA technologies. For these reasons, when practices and technologies are developed for CSA, the overall labor requirements and labor impacts on all household members must be considered.

LABOR-SAVING, CLIMATE-SMART TECHNOLOGIES: WHO BENEFITS?

Labor-saving technologies and practices, defined as "tools and equipment which reduce drudgery and/or improve efficiency of performing various farming or household activities," (Bishop-Sambrook 2003) play several important roles. They reduce the burden on women through potential time and labor savings, provide men and women farmers with a wider range of choices to make in their productive and reproductive spheres, and directly and indirectly enhance household climate resilience.

As with all new agricultural technologies, innovative CSA technologies will have gender-specific impacts and may alter the labor allocation within the household, as well as the distribution of benefits. Some ostensibly labor-saving agricultural technologies (examples include zero grazing or "cut-and-carry" feed systems for dairy cows) may introduce additional tasks, add to the work on other tasks, and/or shift peak labor demand to other stages in the agricultural cycle (sometimes because of increased production) (Doss 2001). In most cases, women will benefit from labor-saving technologies and practices if they reduce women's time and labor and are accessible and affordable. Where women (particularly poor or landless women) rely on income from farm labor, the introduction of technologies that reduce women's labor burden can actually reduce their incomes, as occurred after mechanical threshers were introduced in Bangladesh and row seeders were adopted in Vietnam (Beuchelt and Badstue 2013). It is vital to distinguish between technologies that reduce women's paid versus unpaid labor and assign priority to technologies that reduce unpaid labor.

To look more closely at CSA technologies and the trade-offs involved for women and men, the sections that follow present two examples of innovative and potentially labor-saving technologies for CSA. The first is flexi-biogas, and the second is conservation agriculture.

Flexi-biogas: Reducing fuelwood collection

Flexi-biogas is a new technology that provides cooking gas, lighting, and even electricity for smallholder farmers with livestock. The basic design consists of a plastic digester bag under a greenhouse covering together with simple input and output pipes, and pipes to transport biogas to home or storage. Compared to conventional biogas systems, flexi-biogas costs less and is easier to install, use, and maintain—features that appeal particularly to women. The technology's portability makes it suitable even for landless households (Sovacool, Kryman, and Smith 2014). An advantage for female smallholders, who typically own few livestock, is that one or two cows are sufficient for a flexi-biogas system.

In 2011, the International Fund for Agricultural Development (IFAD) piloted a flexi-biogas program in Kenya; following positive feedback, it was scaled up in Rwanda and India. Over three years of implementation, the system

[13] http://www.ifad.org/gender/learning/role/workload/61.htm.

showed great economic and social benefits in terms of time and labor savings for women, environmental impact, and climate change mitigation. Specifically, this experience showed the following:

- By providing an alternative source of fuel, flexi-biogas saved women 2–3 hours per day previously spent gathering fuelwood. They dedicated that time to income-generating activities or simply to leisure, both of which greatly enhanced their quality of life (IFAD 2014b).
- The ability to use biogas stoves inside the house, instead of cooking outside on fires, allowed women to engage more with family members and increased their status within the family. The ease of using biogas compared to open fires made men more willing to take responsibility for cooking.
- Women, girls, and other household members suffered less from the chronic respiratory diseases and eye infections caused by cooking over wood or charcoal fires.
- Environmental benefits included reduced methane emissions (owing to improved management of livestock manure) and less need of fuelwood (which also reduced deforestation and land degradation).
- Crop productivity was enhanced when the bioslurry produced as a waste product was applied to fields as an organic fertilizer, improving soil health and increasing yields by 6–10 percent (Sovacool, Kryman, and Smith 2014). Biogas stoves were also used to keep the temperature suitable for chicks, decreasing poultry mortality, reducing women's labor, and increasing women's income (Sovacool, Kryman, and Smith 2014).

A farmer-driven process of incremental improvement to the flexi-biogas system (supported by IFAD and Biogas International) developed low-cost enhancements that improved its digestion and reliability. Following reports of low gas generation during the rainy season, different sizes of system were developed to respond to the local needs of the entire household throughout the year (Sovacool 2015). Another effort to provide women with safe access to fuel and energy is described in box 18.6.

Box 18.6 Safe Access to Fuel and Energy in Darfur

Traditional cooking practices and the harvesting of fuelwood can have significant global warming effects and reduce resilience to climate change by contributing to land degradation and health problems. In Sudan, FAO and its partners have addressed the multiple risks and challenges faced by women in accessing and using cooking fuel. The project introduced fuel-efficient mudstoves for vulnerable households, and trained women in North and West Darfur States in the local production and use of mudstoves, with several positive impacts. The stoves reduced the amount of fuelwood needed for cooking by 35–60 percent, and beneficiaries spend less money on fuel. Furthermore, a number of women started to sell stoves as an income-generating activity. The project has had a noticeable impact on safety and health. It has reduced the incidence of gender-based violence by reducing the number of times that women must go out to collect fuelwood. Exposure to indoor air pollution also declined, so women and children experienced fewer respiratory illnesses and other health complications.

At a global level, experiences such as those from Darfur are coordinated through the Safe Access to Fuel and Energy (SAFE) partnership, which addresses the multisectoral challenges and risks associated with access to energy in protracted crises and complex emergencies, including the links between climate change impacts and the use of traditional stoves and biomass for cooking.

Source: FAO 2010b and Practical Action 2014.

Reducing Women's Labor with Conservation Agriculture

Conservation agriculture consists of three core principles: (i) maintain permanent organic soil cover by using cover crops, intercropping, and/or mulch provided by residues of the previous crops; (ii) minimize soil disturbance from tillage and cultivation; and (iii) diversify crop rotations, especially by including legumes (Kassam et al. 2009). These principles can inform a suite of Good Agricultural Practices adapted to the specific agro-ecology and socioeconomic context in which they are implemented (Giller et al. 2009). In the long run, they can improve climate resilience by improving soil structure, fertility, and moisture retention; lessening the effects of droughts; and reducing irrigation requirements.

The labor-saving benefits of conservation agriculture are mainly related to minimum tillage (involving mulching, cover crops, and the use of herbicides for weeding). Conservation agriculture interventions have implications for investment decisions concerning mechanization and

herbicide use, crop choice, and residue management. Conservation agriculture practices may affect household nutrition in terms of the availability of particular crops, wild plants, insects, and small animals (Farnworth et al. forthcoming). They also have important implications for labor requirements and allocation both within and outside the household, which can either reduce or increase women's workloads (for an example of how mechanization in conservation agriculture affected women's workload, see box 18.7). Who benefits from conservation agriculture, and in what way, is contingent on the gender relations within the specific social context, gender roles in decision making over technology adoption, form of farming currently practiced (plow or hoe based), access to and control over productive assets, and women's roles in the production system.

For instance, in hoe-based systems in southern Africa, where women are responsible for land preparation, conservation agriculture disturbs the soil on a smaller area because women dig planting basins rather than follow the traditional practice of inverting soil across the entire field. Digging planting basins increases women's labor in the first years of adopting conservation agriculture, but over time their labor in land preparation decreases compared to traditional hoe tillage. In areas farmed with plows, where men are typically responsible for preparing land, minimum tillage reduces the time men spend on land preparation but can actually increase women's labor requirements for weeding, because more weeds grow with minimum tillage compared to plowing. Weeds can also increase in hoe-based minimum tillage systems, so in both cases it is important to address concerns related to saving women's labor, including issues with obtaining herbicides and concerns with herbicides' negative impact on health (they affect women and men in different ways and to different degrees) and the environment (Baudron et al. 2012b; Nyanga et al. 2012). On the other hand, if weeding is an important source of wage income for women, promoting herbicide use as a conservation agriculture practice can have negative consequences by eliminating this income-earning opportunity. The definition of "weeds" also requires consideration. Many plants destroyed by herbicides may in fact be important foodstuffs collected by women when they weed, so herbicide use can affect household food and nutrition security (Beuchelt and Badstue 2013).

Leaving crop residues on fields to create mulch, which is a key practice of conservation agriculture, can also increase the labor intensity of weeding (Baudron et al. 2012b). It also reduces the availability of crop residues to feed livestock, and if women are responsible for feeding livestock, or grazing small stock, they may be forced to travel farther for livestock feed or to purchase a resource that was previously freely provided in the form of open grazing of crop residues left in the field.

Where land is plentiful, reduced tillage may encourage men to enlarge the area they farm, which may generate

Box 18.7 Small-Scale Mechanization in Conservation Agriculture: Who Benefits?

Cultural norms and gender-biased access to, and control over, productive resources—such as livestock or mechanized farm equipment—affect women's role differently in animal-drawn tillage systems versus mechanized tillage systems. Although women generally do not access or control small-scale farm machinery, when farmers can afford it, women may benefit indirectly in terms of labor savings.

The FACASI Project (Farm Power in Conservation Agriculture for Sustainable Intensification) promotes the use of appropriate mechanization in conservation agriculture systems in sub-Saharan Africa[a] by introducing two-wheel tractors to overcome labor shortages and the limited availability of draft animals at crucial moments in the agricultural calendar. Two-wheel tractors allow timely land preparation and planting. Timely planting leads to better crop establishment and fewer weeds—which reduces weeding, a task traditionally designated to women (Baudron et al. 2012; Van Eerdewijk et al. 2014). Two-wheel tractors and other small mechanized equipment can be used for multiple purposes and ease traditional tasks undertaken by women, such as pumping and transporting water (Biggs et al. 2011; Diao et al. 2012). In Bangladesh, local manufacturers produced self-propelled reapers and then connected them to a two-wheel tractor to harvest. Small mechanized threshers and shellers are also available; this equipment affects harvesting and postharvest operations, which are often overlooked when conservation agriculture's benefits are evaluated in terms of labor and time. Again, attention should be paid to how mechanization affects women's income-earning opportunities.[b] For example, another conservation agriculture technology, direct rice seeders, eliminated the need to transplant rice (an important source of wage labor and income for women) and affected household incomes in areas where they were introduced.

[a] See http://facasi.act-africa.org/index.php?com=1.
[b] Beuchelt and Badstue 2013.

more labor for women in harvesting and postharvest operations. In this case, the peak labor requirement shifts from land preparation to harvesting and from men to women. In India, diverse conservation agriculture practices had different impacts on women's labor input. Two different rice intensification systems required 69 percent more or 70 percent less work by female household members compared to their current practices, depending on the system adopted and the roles played by women in rice production in different regions.[14] These effects may be positive or negative, depending on the importance of women's labor as a source of income.

Other practices such as the diversification of crop rotations or intercropping can highlight men's and women's contrasting crop preferences and threaten women's control over crops that are key to household food and nutrition security. Although men typically focus on crops with a higher market value, prioritizing yield, appearance, and market demand, women often prioritize crops that are more nutritious, better tasting, and easier to cook. If these different preferences and priorities are not recognized, women may resist efforts by extension agents and others to promote crop types or crop rotations based on characteristics such as drought resistance or nitrogen fixing (Beuchelt and Badstue 2013).

Recent reviews of anecdotal evidence on gender-specific impacts of conservation agriculture systems on household labor[15] emphasize the highly localized and context-specific nature of those impacts. Few findings are clear and consistent enough to apply across countries or regions. A practical response is to conduct in-depth participatory consultations prior to encouraging the adoption of conservation agriculture practices. These consultations must involve male and female stakeholders for an accurate assessment of how specific changes in practices are likely to affect men and women and how they are likely to unfold over time.

BLENDING INDIGENOUS AND MODERN TECHNOLOGIES AND VALUING WOMEN'S KNOWLEDGE

All communities are engaged in an autonomous climate change adaptation process, triggered by ecological changes in the natural systems. Given their responsibilities to manage critical household assets, and as stewards of natural resources, women are important agents of change, whose different adaptation strategies, compared to those used by men, must be considered. A World Bank study in Bolivia (Ashwill et al. 2011) reveals, for example, that men focus on large-scale community interventions such as irrigation, whereas women prefer practical improvements such as planting new crop varieties or supplementing traditional revenue with diversified production activities. It is therefore essential to draw on the local knowledge of female and male smallholders to develop strategies for families and communities to adapt to and cope with changing climates.

Another relevant example, also from Bolivia, is the IFAD-funded Economic Inclusion Program for Families and Rural Communities (ACCESSOS). During the design phase, participatory consultations were held in 20 municipalities using the gender-responsive Climate Vulnerability and Capacity Analysis framework (CARE International 2009). This framework emphasizes differential vulnerability within communities and households to identify who is vulnerable and why, and it has practical guidelines on how to apply a gender lens. Community members explained their difficulties and potential opportunities when dealing with current climate variability. For example, because of temperature increases in the highlands, women farmers tend to explore the possibility of growing fruit trees, because fruit has a higher market value than current crops such as potatoes.

The program aims to recover indigenous environmental knowledge, especially women's knowledge, so that it can be blended with modern techniques and technologies for a more effective response to climate change. Based on the local knowledge of the community, a list of potential adaptation practices can be identified, such as the restoration and adaptive management of soil and vegetative cover, home gardens with a large number of local species (or a better water supply; see box 18.8), and improved food preservation systems. Practices particularly suited to women and girls will be identified and shared with participating communities, which will also be trained in the concept of intellectual property (IFAD 2014a).

POLICY AND SOCIAL/CULTURAL ISSUES

Many studies have found that women are at least as willing as men to adopt innovative climate-smart technologies, but they typically face different and often less visible obstacles. These obstacles can include formal legal or regulatory issues regarding women's land tenure (women without formal title to land cannot obtain credit to finance climate-smart innovations). They may also include informal social and cultural

[14] See http://ccafs.cgiar.org/are-there-gender-impacts-climate-smart-agriculture#.VT4YMCGqqko.

[15] See, for example, Beuchelt and Badstue (2013).

Box 18.8 Water Harvesting or Recycling Systems for Women's Home Gardens

Home gardens are typically women's domain in developing countries, but their productivity is often constrained by a lack of water, an issue that will become increasingly common in many areas due to climate change. Small-scale rainwater harvesting, or gray-water recycling systems combined with simple irrigation systems can ensure a significant and steady supply of water for home gardens, even in times of drought, and permit year-round vegetable cultivation with significant nutritional impacts for families. By reducing the risk that a lack of water will lead to crop failure, such systems can increase the value of an asset and activity over which women have control and encourage greater investment in food production in home gardens. Small-scale rainwater harvesting systems can also reduce the time that women and girls spend collecting water and increase time and energy available for education and productive work.

norms that dictate whether women can leave the farm to secure resources that need to be purchased (fuel, herbicides, or even manure are some examples), the types and amount of work considered suitable for women, and women's role in decision making at the household or community level. It is a priority to address these restrictions, because they limit women's ability to adopt new technologies and to build the climate resilience and adaptive capacity of their households and communities.

Climate-smart technologies that are easier for women to adopt tend to have no or low cost, to require behavioral changes more than the acquisition of new tools or equipment, or to take place wholly on the farm using available inputs. A study in Kenya found that women's access to credit is positively associated with the adoption of CSA practices, but access of the household to credit is not a factor in adoption of CSA (Bernier 2015). As a general rule, innovations requiring limited external inputs and generating clear benefits spread quickly, primarily through informal farmer-to-farmer networks, though organized knowledge-sharing events can also be effective (Waters-Bayer et al. 2015). Likewise, processes of innovation that are centered on the farm and rely on locally available resources are more accessible for women and for poorer and more marginalized groups. Women must be empowered participants in the innovation process if they are to help refine and improve technologies and practices to fit their own needs. Evidence shows that involving women in facilitated innovation can initiate a virtuous circle of empowerment characterized by increasing confidence, status, and engagement in community activities, including activities unrelated to agriculture (Waters-Bayer et al. 2015).

Identifying women as the primary users of particular innovative technologies that meet these criteria or that concern traditional female tasks such as cooking (biogas is one example) may, however, unknowingly reinforce unequal gender roles and power relations. In promoting the use of innovations, it is essential to have a detailed understanding of the complexities of the policy and social context and their effect on women's ability to engage in processes of innovation and adoption of new tools and ways of work. Both men and women need to be engaged in planning and implementation to develop a broad understanding of the technologies, their benefits, and the changes they will bring to people's lives, as well as to identify potential obstacles and unforeseen consequences for everyone. For this strategy to succeed, extension agents and facilitators must be sensitive to gender issues and willing and able to encourage critical reflection on traditional ideas about women's and men's roles and responsibilities within the household and community (Beuchelt and Badstue 2013).

CONCLUSIONS

The examples provided here show that aside from their other social, biophysical, and technological aspects, climate-smart technologies have substantial and highly context-specific implications for gender roles. Similarly, gender roles influence and drive the adoption of CSA technologies. Considering that no "one-size-fits-all" approach exists for projects to support women's uptake of innovative, climate-smart technologies and promote women's engagement in the innovation process, it is important that all CSA projects:

- Are based on a clear understanding of the local productive and reproductive roles of men and women, and knowledge gained through participatory processes.
- Consider men's and women's different access to, and control over, physical and financial resources, including land, livestock, and access to credit or income from off-farm work.
- Ensure women's participation in decision-making processes by establishing community-level bodies with an adequate representation of women members.

- Analyze the potential and actual effects on labor requirements of the household and hired laborers.
- Provide men and women with equal access to training and services. Support the development of capacity for project staff, extension agents, and others involved in disseminating new technologies and facilitating innovation, and create appropriate opportunities for female community members.
- Target information on CSA to women and young people, using gender- and age-appropriate communication channels.

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THEMATIC NOTE 2

Gender-Responsive, Climate-Smart Landscape Approaches

This Thematic Note aims to facilitate the application of gender-responsive climate-smart landscape approaches for project teams focusing on landscapes rather than on work at the farm or village level, which is the scale at which many CSA projects operate. The note sets out the steps required for men and women to participate equally in such initiatives and for their benefits to be distributed fairly.

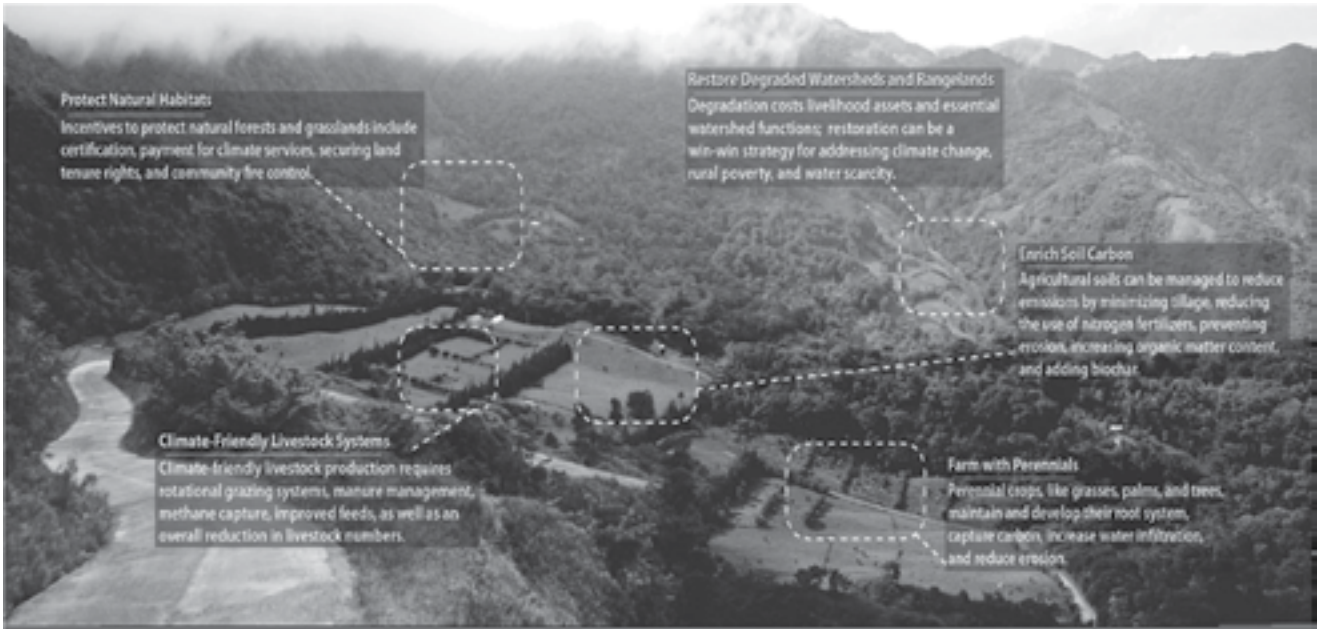
Communities and people live in landscapes, where they are united by complex linkages and challenges. Farmers, livestock producers, foresters, and fisherfolk use, manage, and conserve natural resources, biodiversity, and the ecosystem services they provide. Because the knowledge of these individuals is the key to sustainable management of landscapes, it is important to think beyond climate-smart agriculture to climate-smart landscapes (Scherr, Shames, and Friedman 2012). The demand for land and water will be even greater in the future as the population grows and other drivers of change come into play, including an increasingly variable and harsh climate. It is a demanding task to develop an understanding of climate risks together with an understanding of how people interact within their communities and landscapes, but projects and policies that do so are more likely to devise good (and sometimes quite simple) solutions to climate challenges (IFAD 2012). The range of tools and approaches available to map risk and vulnerability at the landscape level is expanding rapidly. For example, better spatial analysis supported by geographic information systems can identify how investments or management practices in some parts of a landscape or watershed can produce benefits or reduce negative impacts in other parts (for example, by linking hydrological systems or wildlife habitats to make them more effective or tenable) (IFAD 2012).

As with climate-smart interventions at the farm or village level, interventions at the landscape level have multiple goals, including enhanced productivity, increased resilience/adaptation, and reduced GHG emissions. Landscape approaches involve dynamic processes for managing land, water, and forest resources (Buck and Bailey 2014); for example, the components of a climate-smart landscape can include climate-smart practices at the field and farm scale, diversified land uses across the landscape, as well as the management of multiple land uses at the landscape scale (figure 18.2) (Scherr, Shames, and Friedman 2012). These approaches involve interventions that integrate spatial, ecological, and socioeconomic considerations (gender issues being one among many socioeconomic considerations). A landscape approach presents many challenges (Sayer et al. 2014), but in many places around the world, it is aiding people and communities to protect biodiversity, produce food, and secure rural livelihoods. (Box 18.9 provides examples of tree-based landscape initiatives.) This Thematic Note summarizes good practices at the landscape level that have potentially high payoffs with respect to CSA and particularly with respect to gender equality.

GENDER-RESPONSIVE LANDSCAPE APPROACHES IN PRACTICE

Conservation approaches responsive to climate change often focus on natural resources and not on the poor communities and men and women who depend on those resources, although many NGOs and others use community-focused livelihood approaches. A landscape approach tries to bring these perspectives together to ensure that protecting natural resources provides benefits to individuals, households, and communities. Despite knowledge gaps, it is increasingly clear that a number of gender issues are inherent in a landscape approach, including but not limited to participation, power in decision making, and voice. Few landscape approaches have been undertaken with an explicit gender focus. If landscape planning is to be effective, it must incorporate women's as well as men's concerns, yet a real knowledge gap remains with regard to

Figure 18.2 Components of a Climate-Smart Landscape



Source: Scherr, Shames, and Friedman 2012.

Box 18.9 Examples of Tree-Based Landscape Initiatives

- ***Rehabilitated natural forest***: Expansion of natural forest in areas that are not currently forested.
- ***Agroforestry (agri-silviculture, silvo-pastoralism, agro-silvo-pastoralism)***: Increase in number/introduction of trees in existing cropland, pastoral land, and agro-pastoral land.
- ***Productive forest:*** Expansion of commercial timber and bamboo plantations.
- ***Restocking of degraded natural forest***: Increase in stock of existing degraded natural forest.
- ***Tree-based buffer zone along riverbanks and boundaries of water bodies***: Expansion of natural forest along water bodies.
- ***Woodlots***: Expansion of small-scale production of tree products such as woodfuel or timber for construction.

For additional examples on landscape approach, see https://www.youtube.com/watch?v=uetUPdZB-tQ

how gender plays out in different landscapes. For example, it is not clear whether or how different types of landscape initiatives benefit or challenge women and men in different ways, or how women (men) shape landscapes in different settings. By ensuring that women are fully involved, research and planning tools such as participatory mapping and future scenarios can help to clarify the reality on the ground.

Landscape approaches involve a host of decision makers who are managing agriculture, livestock, forests, and fisheries; formulating policies at different levels of governance (local to international); and engaging in processes that require learning and adjustment over time to respond to a changing environment. A critical gender issue here is that very few women are in management or leadership positions in agricultural value chains and food systems, so they are not participating in high-level discussions. Even at the local and community levels, targeted strategies are needed to allow women to attend and actively engage in key meetings, training, and processes.

Successful landscape approaches involve inclusive stakeholder consultations with the communities, government, private sector, and other actors that will maintain and enhance landscapes and the services they provide over the long term. Experience shows that involving multiple sectors and stakeholders from the outset will enhance the diagnosis of problems, the assessment of alternatives for managing resource use, and the evaluation of performance and results (World Bank 2014). One example of inclusive consultation is participatory landscape mapping, which is used to communicate qualitative local knowledge related to the landscape, transmitted from multiple perspectives, including those of different socioeconomic groups (IFAD 2009).

The involvement and coordination of various ministries—land, water, agriculture, environment, finance, and climate change focal points and so on—poses a governance challenge. Local governments (district and municipal) are playing an increasingly important role in planning and implementing landscape approaches (World Bank 2014). Yet in policy and planning debates—where whoever has the strongest voice typically sets the agenda—women are often underrepresented, and their viewpoints are not included. Knowing what aspects of the landscape women are responsible for, including non–income generating aspects, is therefore critical.

The types of structural transformation involved in adapting to climate change will require long-term approaches conceived in terms of generations rather than short-term project cycles. A long-term perspective usually entails continuous political and financial commitments, which might use public funds, either from national sources or development cooperation. These funds can be used to support approaches such as covering transaction and initial costs to adopt a specific technology, or to support the use of a variety of approaches that are designed at the grassroots level and are already known to work. A common element of these approaches is that they acknowledge that rural people manage landscapes through their activities (Rosendahl et al. 2015). Box 18.10 outlines the steps involved in implementing a gender-responsive landscape approach in projects.

LANDSCAPE APPROACHES WITH POSITIVE GENDER IMPACTS

The sections that follow present examples of landscape approaches that are known to have produced positive gender impacts. They include sustainable land management in several East African countries and watershed restoration in India.

Vi Agroforestry and Sustainable Landscape Management in East Africa

Vi Agroforestry[16] is a Swedish NGO that promotes sustainable land management practices intended to improve farm productivity and livelihoods and sequester carbon across landscapes.[17] This NGO also supports village savings and

[16] See viagroforestry.org.

[17] This section draws on information in Shames et al. (2012) unless otherwise noted.

Box 18.10 Steps in Implementing a Gender-Responsive Landscape Approach in Projects

1. Define the boundaries of the landscape, considering the strength of interlinkages between land uses and livelihoods in the geographical area of interest, and also the existence of relevant institutions to deal with problems at the scale being considered. Involve women and young and marginalized people in defining these boundaries, as their needs and opportunities can easily be overlooked.
2. Explore how climate affects socioecological processes on the landscape. Landscape approaches spanning one or more watersheds require spatial tools to understand landscape structure and climate variation; distribution of water as governed by landscape pattern and climate; biodiversity pattern as controlled by drainage basin attributes; and agricultural and forest productivity as determined by landscape structure, water, and land use practices.
3. Consider the institutional and policy framework, identify key decision makers at different levels, and identify strategies that can promote inclusiveness and transparency.
4. Develop a long-term, shared vision for the landscape through an inclusive and participatory process aimed at generating knowledge that is salient, credible, and reliable to all stakeholders. Share data and communicate plans widely, via ICTs where feasible, and taking into consideration the information channels and literacy levels of men and women. Pursue strategies that empower women and others to share their viewpoints and innovations.
5. Set specific goals and expected outcomes for the short and medium term that are linked to this vision.
6. Devise a framework for inclusive monitoring and evaluation of landscape interventions to ensure that the implementation of the vision is on the right track. The framework should allow for periodic adaptation to changing conditions within or outside the landscape.

Source: Based on World Bank 2014.

loan associations (VSLAs), farmer enterprises, and the development of demonstration and learning sites (Shames et al. 2013). To reach large numbers of farmers, the NGO trains community facilitators (men and women), who in turn train farmers to use improved and sustainable land management practices.

In western Kenya, with support from the World Bank BioCarbon Fund, Vi Agroforestry has been implementing the Kenya Agricultural Carbon Project (KACP) since 2009, involving over 60,000 smallholder farmers, roughly one-half women (World Bank 2010; Vi Agroforestry 2015). Carbon payments are made to community groups, not individuals. These groups are required to have strategies to engage women fully as participants and beneficiaries. Key benefits of this initiative, along with sequestered carbon, include higher yields of staple food crops, enhanced technical skills in implementing improved and more sustainable agricultural land management practices, and improved food and nutrition security, among others (Shames et al. 2013).

This landscape initiative faces gender disparities related to land and tree tenure, labor, knowledge, benefit sharing, participation, and leadership. A review found that in projects where contracts were signed at the household level, and women were not the official owners of land or of the trees planted, women were prevented from being full participants and beneficiaries (Shames et al. 2012). In response, KACP designed contracts that could be signed by groups, and the project does not require women to own land to participate actively and claim benefits. Contracts require the names of both female and male household heads and stipulate that decisions and payments be authorized by both.

In its work at the landscape level, Vi Agroforestry has also found (as discussed in the Overview) that careful attention must be given to those whose labor is increased by new practices. Often it is the woman's workload that increases, and strategies may be needed to prevent or remedy this problem. In other cases, however, practices such as planting trees and improving water management can reduce the substantial amount of time that women spend gathering fuelwood and carrying water.

Studies also indicate that in many communities the relative lack of education, information, and services for women relative to men restricts women's ability to adopt new practices and take advantage of new opportunities such as carbon payment schemes (Shames et al. 2012). Strategies to address these issues include investments in training designed to reach out to women—hiring female community facilitators; timing visits, seminars, and training to ensure women's participation (in the afternoon, for example); and ensuring that women receive information directly. Another innovation is to provide seedlings of "women's trees"—the species that provide fuelwood, fodder, shade, and fruit rather than species that provide just poles and timber (desired by men).

Participation and leadership in small groups and umbrella groups are also critical for women, and here, rotating leadership systems and rules can help, along with targeting a certain number of women leadership positions within groups. Communication efforts can also highlight the important role of women in these kinds of initiatives. Efforts that enhance women's access to loans and insurance have also been found to be good opportunities for increasing women's benefits from landscape initiatives.

Watershed Restoration in India

In Maharashtra, work with small-scale producers to restore watersheds has given attention to equity and gender issues, with the result that natural resources have been improved and conserved, and livelihoods have improved. Projects funded by the Indo-German Watershed Development Program (IGWDP), and implemented by an independent, statewide NGO, the Watershed Organization Trust (WOTR), in partnership with the Indian government's National Bank for Agriculture and Rural Development, have been regenerating land by planting trees and engaging in other water and soil conservation efforts (WOTR 2002; D'Souza and Lobo 2004; WRI 2005).

These landscape-focused watershed development projects have devised several strategies to ensure that poor families and women participate and benefit. Participating villages limit tree cutting and ban grazing on land designated for regeneration. Community members contribute their unpaid labor. There is a focus on capacity building: Local men and women learn techniques for planting trees and grassland and for conserving water and soil, such as the construction of simple water harvesting and irrigation systems, all of which assist them to become more climate-smart managers of their resources.

To increase women's involvement in decision making, WOTR works with landowning couples wherever possible.

In the village of Darewadi, after five years, the increased availability of wells, subsistence crops, and fodder had reduced women's household labor significantly. Women also earned cash as project laborers and benefited from drudgery-reducing assets made possible by increased incomes, such as kitchen gardens and household toilets (Lobo and D'Souza 2003:16). Another strategy aimed at empowering women has been to urge village assemblies to elect women to the Village Watershed Committees.

To encourage greater self-confidence and independence, WOTR has also trained village women in record-keeping and organizational skills, helped them to form savings and credit groups, and provided microfinance to women's groups. The IGWDP has taken an approach of consensus-based decision making in participating villages, enhancing the likelihood that poor minorities will benefit from watershed development programs in areas of highly skewed land ownership.

In seven drought-prone districts of northern Karnataka, a watershed development project known as *Sujala* increased water availability (World Bank 2014) and raised household incomes significantly, especially among poorer groups (World Bank 2014). The project addressed gender issues by taking an inclusive approach (facilitated by an NGO) based on participatory watershed planning, which involved communities and technical teams. The resulting Sujala Watershed Action Plans reflected a vision shared by all stakeholders that guided subsequent soil and water conservation investments. Treatments on the upper and lower reaches of watersheds raised water tables, brought degraded land under cultivation, enabled farmers to diversify into higher-value crops (including horticultural crops), and raised agricultural productivity. Remote sensing and geographic information systems helped to monitor project performance and impacts. The project also integrated a livelihood component to improve equity between farmers with land, the landless, and women.

POLICIES AND INSTITUTIONS TO ENABLE GENDER-RESPONSIVE LANDSCAPE ACTIONS

A range of potential policy and institutional options can catalyze and support new interventions at the landscape level (table 18.3).[18] Although these options do not have a "climate-smart" or gender focus per se, they reflect principles that lend themselves to adding the important considerations of climate and gender and making them more explicit.

CONCLUSIONS

The realization of gender-responsive, climate-smart landscapes will require a concerted effort at multiple levels and scales, characterized by innovation in devising, implementing, and administering the corresponding policy and institutional arrangements. This note suggests that a theory of change for making climate-smart landscape approaches more gender responsive involves the following:

1. Knowing what men and women want from their individual plots of land and from collective land—which requires methods to research and capture women's needs.
2. Identifying the coordination required across institutions in the community, and among institutions across a landscape, to meet women's interests and the constraints to carrying out the necessary coordination.
3. Delivering the type of coordination that is needed. This effort requires an understanding of how the constraints identified in (2) could be addressed and an understanding of how coordination works. For instance, does it come about only through ensuring women's representation in the various groups involved? Or are incentives needed to establish the type of coordination that can respond to women's needs (compared to the response provided by the type of coordination currently in place)?

This theory of change implies, as shown in the examples, that the type of research undertaken and how it is carried out—for example, as action research or through participatory approaches (such as the use of focus groups) or long-term studies—is critical. The goal is to have a good understanding of the gender sensitivity of the current coordination and planning mechanisms, to make it possible to assess how well they respond to women's needs. For example, how suitable are the tree-based landscape approaches that have been identified? What level of coordination is needed in efforts to harmonize policies? How gender-sensitive are current planning approaches?

Based on that understanding, the next challenge is to establish institutional arrangements to make climate-smart landscape approaches more responsive to gender concerns. For example, if participation is considered the best means of achieving gender-responsiveness, it may be necessary to strengthen the capacity of women

[18] Proposed by Shames, Clarvis, and Kissinger (2014) and Gray et al. (2015).

Table 18.3 Major Intervention Areas and Associated Options for Policy and Institutions to Catalyze Gender-Responsive, Climate-Smart Landscape Actions

Intervention Area	Possible Policy Options
1. Clarify land rights and responsibilities, especially women's land rights.	• Reform land-use planning and land tenure policies to increase community ownership over resources and create greater security of access to and use of natural resources. • Decentralize policies for natural resource management and provide more authority to community resource organizations to empower them to make decisions (enabling women's full participation and leadership).
2. Encourage equitable multistakeholder involvement and collective action.	• Create or invest in incentive schemes to involve women (including in leadership roles), and compensate losers and encourage their participation (for example, payments for ecosystem services) in integrated landscape management initiatives. • Encourage policies that enable collective action and equitable stakeholder engagement, such as the formation and legal standing of common interest groups that include and empower both men and women.
3. Overcome institutional barriers to integrated landscape management.	• Conduct a thorough review of current landscape and restoration programs and policies to identify social/gender and institutional barriers to implementing integrated landscape management principles, to identify gaps in capacity, knowledge, and investments. • Create a common set of guidelines for integrated and inclusive landscape management, with endorsement from relevant government agencies.
4. Create conditions for adaptive climate-smart landscape planning and management.	• Encourage spatial aspects in local development planning and strengthen participatory land-use planning approaches that include women and marginalized people. • Create incentives for more coordinated and systematic planning and linking government budgets and planning.
5. Create mechanisms and supporting policies for sustainable and long-term financing of integrated and climate-smart landscape management.	• Work with ministries of finance, donors, and other financiers to increase financing for gender-responsive, climate-smart landscape management in landscapes where rural households are particularly vulnerable to climate change, and where significant opportunities exist for scaling up agroforestry and other improved land and water management practices that benefit both women and men. Bottom-up approaches like Negotiated Green Territorial Development[a] create a basis for successful mechanisms and policies. • Create incentives for, and reduce perceived risks of, integrated and climate-smart landscape management to encourage public and private investments through risk reduction guarantees and other risk reduction mechanisms.
6. Invest in a solid gender-disaggregated evidence base and knowledge-sharing platforms for gender-responsive, climate-smart landscape management.	• Invest in, and ensure projects have created incentives for, women and men in research institutes, academic extension programs, and NGOs to establish and track important landscape-level restoration as well as gender-related indicators, create knowledge-sharing platforms, and establish monitoring and evaluation systems that support long-term analysis and adaptive management (and link to existing drought monitoring and early warning systems). • Identify female and male champions and leaders of integrated landscape management who can play a critical role in raising awareness and promoting this approach and represent different cultural and resource groups and sectors. These champions can be assisted by investing in opportunities to take the lead in documenting climate-smart landscape management successes.

Source: Adapted from Shames, Clarvis, and Kissinger 2014 and Gray et al. 2015.
Note: This table adds gender and climate considerations to table 2 in Gray et al. (2015).
[a] See "Technical Meeting on Negotiation Environment and Territorial Development—Green NEGOTIATED TERRITORIAL DEVELOPMENT (GreeNTD)," at http://www.fao.org/nr/land/lr-home/technical-meeting-on-negotiation-environment-and-territorial-development-green-negotiated-territorial-development-greentd-the-technical-meeting-on-negotiation-environment-and-territorial-development-green-n/en/.

(individually or in groups) to speak about their collective issues, negotiate for their interests, understand the consequences of their actions in terms of their household's food situation and overall well-being, track their situation over time, and bring that evidence to bear in discussions. If gender-responsiveness is to be achieved through policy change, it is vital to identify women and men who can act as champions in the policy arena and raise their awareness of the issue, and then invest in approaches to build a cadre of champions to support policy change over the longer run.

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THEMATIC NOTE 3

Monitoring and Evaluating Gender Through the CSA Project Cycle

This Thematic Note provides concrete examples of how to improve the monitoring and evaluation (M&E) of gender in CSA projects throughout the project cycle at the field level. The note offers guidance for making M&E an effective management tool to (i) track and assess gender-responsiveness and progress in CSA activities; (ii) identify bottlenecks and enabling and disabling factors that both men and women encounter in adopting and benefiting from CSA; (iii) evaluate the quantity, quality, and sustainability of benefits from CSA interventions for men and women farmers; and (iv) monitor and evaluate the outcomes and impacts of CSA activities on women and men farmers. Monitoring and evaluation of integration of gender in CSA projects can be complicated due to the different dimensions (productivity, adaptation, mitigation) of CSA, which involve cooperation among a number of stakeholders with diverse backgrounds at different levels.

M&E SYSTEM FOR GENDER IN CSA

A robust M&E system is a diversified system that employs a broad mix of instruments, methods, and information sources that capture different perspectives from various sources, enhance the triangulation of data, and provide a more complete picture of a project's issues, progress, outcomes, and impacts. A mix of internal and external sources increases the reliability and validity of data. The use of a diverse set of tools is particularly relevant for gender in CSA, as it is critical to have a complete quantitative and qualitative picture of gender progress and achievements while a project is implemented and after it has been completed.

Gender should be mainstreamed within the overall M&E system, including the theory of change[19] or logical framework/results chain. To that end, the project design must include (and be informed by) significant analysis of gender issues. The key gender issues to be examined in CSA projects are (i) access to and control over productive resources and inputs; (ii) access to information and the use of existing knowledge; (iii) division of labor and time use between men and women; (iv) existing skills, capacity needs, and priorities in the uptake of CSA practices; and (v) participation in decision making and sharing of expected benefits from the project, and how these aspects are determined by gender and power relations. These issues both inform and need to be addressed in project design and project implementation documents such as manuals, capacity building plans, etc.

Analytical Work for Project Design at Identification Phase

To ensure that women and men benefit equally from CSA activities, the collection of gender-related information and its analysis will inform a project's design and ultimately its implementation. Table 18.4 describes three types of analyses and offers specific guidance on the objectives and information needs for each type: gender-responsive stakeholder analysis, gender-responsive problem analysis, and gender analysis more generally.[20] An assessment of the role of youth also should be kept in mind.

[19] There is no consensus on a standard definition of theory of change. It is commonly understood as a tool or methodology to map the logical sequence of an initiative from inputs to outcomes, providing an articulation of the underlying rationales, assumptions, and theories of how the initiative's strategies lead to intended outcomes (see UNDP 2011; Stein and Valters 2012; and Vogel 2012).

[20] Two examples can help the reader to understand how some of these guidelines are followed in practice. The first is from a pilot project in Kenya to integrate CSA into a livestock system; the work emphasized female-headed households and the analysis looked at men's and women's decision making (FAO 2012b). The second comes from a project to enhance climate change mitigation in a hillside conservation agriculture project in Tanzania; the analysis includes a discussion of the gender-based division of labor (FAO 2012a).

Table 18.4 Objectives and Information Needs for Three Types of Analyses Pertinent to Designing Gender-Responsive CSA Projects

Type of Analysis	Goals, Elements, Guidance
1. Gender-responsive stakeholder analysis	a. Identify and assess the gender-mainstreaming capacity of the key organizations that may be involved in the project, which could represent the interests of men and women from different socioeconomic groups. Consider partnering with a women's organization to ensure that **women's knowledge** of climate and agriculture is incorporated into the project, and also to secure **women's participation in decision making** about CSA practices. Identify men's and women's specific **needs** for adopting CSA practices. b. Describe how information is shared between organizations and determine whether these channels will be sufficient for facilitating the work of the project. Identify **who has access to the information** available to the target community. c. Pay attention to **who participates** (include young people and households headed by women as well as men) and **who has a say in decision making**, because it will affect **who benefits from project activities**. Highlight men's and women's potential roles in the project, because this will help to clarify how women's participation will be guaranteed.
2. Gender-responsive problem analysis	a. Identify the specific risks associated with the impacts of climate change in the context of the project, identifying which risks are considered most serious by men and women, respectively. Discuss possibilities for reducing GHGs and any negative impacts on women. On the basis of the **roles and responsibilities of men and women** in different groups, identify who bears the risks of both climate-related impacts as well as climate change related activities. Identify the opportunities for reducing risks and whose livelihood activities are involved. b. Document men's and women's **roles in relation to food security**, including roles in producing and processing food and in managing agricultural activities. Document the strategies used by men, women, and youths to cope with food insecurity, especially in relation to the climate risks identified in the analysis. c. Describe which resources are present for coping with climate risks and which resources are needed. Investigate whether there are differences in **access to or control over these resources and practices** for men and women and how those differences may affect proposed solutions.
3. General gender analysis	a. Document **what men and women do**—their income-generating activities as well as their caregiving and household management work. An understanding of men's and women's **division of labor and time use** will be crucial for evaluating how CSA practices may change what people do and how they spend their time, which is crucial for ensuring that no single group of participants is overburdened. b. Describe **what men and women know**—which can include information on men's and women's relative literacy levels and the specific knowledge they call upon in times of climatic or food stress (such as opting to produce different varieties or species of crops and animals, or changing their food preservation and storage practices). c. Verify men's and women's **capacity gaps** that will need to be filled for successful CSA.

Checklist for M&E at the Project Formulation Phase

The analyses conducted in the identification phase provide the information for developing the gender-related objectives in relation to CSA for the overall project and each component. They also pave the way for developing a gender-responsive results chain for the project (an example of gender in a CSA results chain is provided in the final section of this note). The issues that require attention when a project is first being formulated are listed in table 18.5.

Checklist for M&E at the Project Implementation Phase

The gender-related information collected and analyzed in the previous phases is the basis for gender-responsive, results-based management of the project. The project team will need to watch for any new gender-related issues that arise during implementation, including widening gender disparities or negative impacts such as an unsustainable increase in labor for women when undertaking some CSA activities, or a tendency for men to take control of women's activities that have proven successful. Table 18.6 provides a checklist of gender considerations to be used during implementation.

Checklists for M&E at Mid-term and End Evaluation Phase of the Project

The evaluation examines progress toward project objectives and specific CSA outcomes and suboutcomes, including gender-related outcomes. A gender-responsive evaluation should be inclusive and participatory and assess how gender and power relations and their driving factors have changed

Table 18.5 Checklist for Setting Up a Monitoring and Evaluation System at the Formulation Phase
Define clear, gender-responsive objectives in relation to CSA for the overall project and for each component. Defining objectives for gender in CSA supports the design of a set of indicators to track results that will be included in the M&E guidelines/manual.
Develop a results chain for the project that includes gender-responsive indicators for CSA along the results chain (see "Examples of Gender-Responsive Indicators," later in this note).[a]
Collect baseline data for outcome indicators related to gender in CSA, and **set performance targets** for gender-responsive indicators.
Identify specific evaluations and other M&E tools to assess progress on gender in CSA and the quality of implementation for gender-responsive activities.
Ensure that a distinct budget is allocated for gender-responsive activities (for example, funds for gender expertise, gender analysis, gender training of staff).
Mainstream gender in the M&E guidelines, implementation manual, and other relevant documents used to implement the CSA project. The mainstreaming of gender in the M&E guidelines includes the following: • Developing a results chain for the project, which includes gender-responsive indicators for CSA. • Identifying the specific evaluations or the component(s) of larger evaluations or studies to be conducted in the course of the project that can inform on progress in gender in CSA. • Identifying the information flow/feedback and responsibilities for reporting on progress. • Identifying project staff and staff from implementing agencies that will report, analyze, assess, and use sex-disaggregated data in CSA for decision making. • Developing reporting formats for project staff and implementing agencies that specifically require information on gender in CSA.
Ensure that the project staffing and project capacity development plan reflects M&E, gender, and CSA needs.[b] Effective M&E for gender in CSA relies on a strong collaboration between project gender specialists, M&E officers, and other project staff and implementing agencies. Ensure that the terms of reference for the project staffing and project capacity development plan include gender and CSA issues.
Budget for the overall M&E system, including any capacity development needed to capture gender-related data in CSA.

[a] For an example, see the section in this note, "Example of Gender in a CSA Results Chain."
[b] For an example of a capacity needs assessment, see FAO (2010); for an example of a capacity-building guide, see CCAFS and FAO (2012).

Table 18.6 Checklist for Monitoring and Evaluation at the Implementation Phase
Ensure that men, women, boys, and girls affected by the project receive information on planned activities and can express themselves (have voice and agency) during implementation. Be aware of power relations between men and women within the household and how they may affect participation or the acceptance of changes in the agricultural activities people perform.
Ensure gender-responsive CSA activities are included in quarterly and annual plans, monitored, and reported. In this way, gender in CSA activities will be identified in the project's plans; otherwise little progress will materialize in CSA outputs and outcome for men and women farmers. When planning, ensure that the target for the number of beneficiaries of a CSA activity is disaggregated by sex.
Monitor progress of gender in CSA through quarterly and annual plans and reports. Quarterly and annual reports will also include outputs and outcome results based on an agreed format that is informed by the understanding and mainstreaming of gender in CSA.
Conduct data auditing and supportive supervision to ensure the quality of the data reported at all levels of the project and build the capacity of staff involved in M&E. These actions will improve the quality, reliability, and regularity of data collection.
Ensure that implementing agencies are committed to reporting on gender in CSA by supporting continuous sensitizing (including training and refresher training) on gender and M&E in the context of CSA. Develop mechanisms to hold M&E implementing agencies accountable.
Integrate gender in the supervision of CSA projects. If needed, provide further technical assistance on gender, CSA, and M&E. Include gender in reviews of progress, issues, and recommendations. Provide technical assistance in gender and/or M&E based on the issues identified through supervision.

as a consequence of the intervention. UN Women (2015) provides guidance on how to manage gender-responsive evaluation, and IFPRI and ILRI (2014) on how to collect gender and assets data in evaluations. This examination is based on the gender-responsive indicators developed for the project, available sex-disaggregated data, and targeted evaluations that have been undertaken. An additional important output of the evaluation phase is the sharing of findings on gender dimensions of CSA so that others can learn from the knowledge acquired during the project. Table 18.7 lists the important steps during this part of the project lifecycle.

Table 18.7 Checklist for Monitoring and Evaluation at Mid-term and during the Final Evaluation Phase

Assess if the priorities identified by men and women in the planning phase have been met. Ensure that all groups have an opportunity to voice their views on the CSA practices that have been implemented (and whether those practices respond to their priorities).
Conduct qualitative and quantitative evaluations to assess progress and results. Identify bottlenecks and draw lessons learned for gender in CSA. Areas of focus include who has benefited from the CSA project, the quality of the benefits from CSA for both women and men, which barriers may have arisen to the uptake of CSA practices and how men's and women's time-use has changed. Ensure that final evaluation reports highlight *the findings* of the various gender evaluations, the sex-disaggregated and gender-responsive indicators. Important areas to highlight may include the gender-based division of labor, changes in capacity of men and women as a result of the project, and equitable distribution of benefits.
Disseminate lessons learned, materials, and results on gender in CSA within the project and to *external* stakeholders. The dissemination of lessons learned can be under various formats, including women and men farmers' storytelling, case studies on women farmers and CSA crop and/or livestock technologies, research papers on CSA extension services and innovation and subsequent impact on women and men, fliers or radio programs targeted to different groups of farmers on lessons learned, and other formats.

EXAMPLES OF GENDER-RESPONSIVE INDICATORS

Gender mainstreaming demands the development of *gender-responsive indicators along the entire results chain*. It is important that all implementers have a common understanding of each indicator. Box 18.11 presents analytical considerations found to be relevant and useful while developing indicators related to gender dynamics in agriculture.

Because gender-responsive indicators measure the status and roles of women and men, along with changes in gender relations in the household and in communities over time, they point out whether gender equality and equity are achieved—for example, if the number of women in community decision-making bodies has increased (CIDA 1997). Gender-responsive indicators can be divided into three groups based on the information source. The first group includes indicators with a sex disaggregation based on female-headed households (FHHs)—for example, the number of female heads of household who received training in best practices for CSA. The second group consists of indicators that disaggregate and analyze data by sex or combine information on women in both female- and male-headed households—for example, the number of women farmers trained in CSA best practices. Going beyond FHH disaggregation and including women in all households is critical to provide a more truthful picture of women farmers in CSA (see box 18.12). The third group consists of indicators tailored explicitly to a particular activity—for example, the number of gender-responsive technologies for CSA demonstrated in the project area. In addition, indicators can also consider disaggregation by age groups or other vulnerable groups, where appropriate.

Table 18.8 presents an example of a tailored indicator for gender in CSA developed for a component of an agricultural productivity project.

SETTING PERFORMANCE TARGETS FOR INDICATORS

Typically, performance targets are set for all indicators along the results chain. Targets are particularly difficult to set at the outcome level as opposed to the output level. One of the main challenges is to be pragmatic about what is feasible to achieve, particularly over the short life of a project, versus the ambitions of the project investors and government. To set reasonable targets at the outcome level, several methods can be used in a complementary manner:

- Define targets based on previous experiences, also from other organizations working in the sector. Past performance analysis and/or historical trend analysis can be used if a project is in its second phase or if similar project/component interventions have been undertaken in the past.
- Conduct a strategy analysis and review the theory of change and take into account the level of budget allocation, the implementation plan, the level and sequencing of project activities, and the implementation capacity of the project staff to set targets and plan impact assessments.
- Review research, evaluations, expert opinions and impact assessments as well as sector-specific analysis to define targets.

Targets do not provide information on why a project fails or succeeds, however, and they do not give a complete picture of progress on gender equality and equity and achievements in terms of CSA. They can trigger the following questions:

- Why were some gender-related CSA targets not met, and how can the program address these issues?
- Are the results chain (theory of change) and the planning and sequencing of activities and outputs adequate

Box 18.11 Analytical Consideration for Developing Indicators

To understand gender dynamics in agriculture, it is essential to go beyond a comparison of male and female farmers or of male- and female-headed households. Understanding the different situations of women in both male- and female-headed households in terms of their access to and control of productive resources, services, and employment opportunities is critical for solving the complex challenges smallholders face (see box 18.12).

Differences in farmers' levels of adoption of improved practices are affected by many factors, which may confound the estimated effects of CSA. For example, many studies highlight productivity differentials between male and female farmers, yet the farmers who adopt certain practices may also be the ones who are more likely to have higher efficiency in production due to unobserved factors such as their ability or openness to innovation.[a] Climate adaptation patterns are also heterogeneous across gender lines, and if this selection effect is not accounted for, it can also cause the benefits of climate adaptation to be overestimated.

Experience shows that women typically face different constraints than men, and that the feasible options open to women differ from those open to men. In certain contexts, social norms or barriers increase the complexity of the challenge for women to diversify their agricultural and nonagricultural livelihood strategies in ways that will help them adapt to climate change. For example, social norms may prevent women from pursuing off-farm activities to diversify their sources of income—and consequently influence women's level of vulnerability, incomes, and ability to pay for the cost of diversifying their farming practices.[b] In some countries, only men have the right to cultivate certain crops or to access markets when production shocks occur.[c] Another consideration is that many CSA practices require a high investment in time or labor (to build stone bunds and terraces, for example) and thus are costly for households with few working-age adults or with more working-age women than men.[d] If these prevailing differences across gender lines are not taken into account when establishing indicators and targets relating to climate change adaptation, the potential for women to benefit from adaptation could be overestimated, and the potential for men to benefit could be underestimated—providing a misleading indication of what the project can achieve in terms of adaptation.

Source: Solomon Asfaw and Giuseppe Maggio (FAO).
[a] Quisumbing and Pandolfelli 2010.
[b] Hallward-Driemeier and Hasan 2012.
[c] Erenstein et al. 2012.
[d] As discussed in Beuchelt and Badstue 2013.

Box 18.12 Moving Beyond Sex-Disaggregated Data at the Household Level: Measuring Plot Managers' Agricultural Productivity

The report *Levelling the Field: Improving Opportunities for Women Farmers in Africa* provides insights into good practice for examining gender differences in agricultural productivity by going beyond the use of sex-disaggregated data at the household and head of household level. An approach that looks at specific plot managers to determine how levels of agricultural productivity differ between women and men takes into account the fact that in many African countries, men and women manage their own plots. This approach demonstrates that data disaggregated at the individual and farm plot levels can inform gender analyses with respect to a wide variety of issues. It is particularly revealing because it moves away from the assumption that all household members have similar access to inputs and use them at the same level of effectiveness, with matching levels of productivity. Based on this new and robust data, the report presents clear evidence attesting to the breadth and depth of the gender gap in African agriculture.

Source: Based on World Bank and ONE 2014.

Table 18.8 Indicator Index Card: Example of a Tailored Indicator for Gender in CSA for a Research Component of an Agricultural Productivity Project

Indicator:	***Number of Gender-Responsive CSA Technologies Developed by Research***
Definition	*Technologies developed* are defined as technologies that have successfully been validated and tested by research and are ready to be promoted via extension services. The technologies developed include both new and improved technologies. Only technologies financed/supported by the project funds are accounted for. *CSA technologies* are defined (in this specific project context) as technologies that contribute to an increase in agricultural productivity and technologies that contribute to the efficient and sustainable use of land and water resources. *Gender-responsive technologies* are defined as: (i) technologies based on needs and interest of female farmers; (ii) technologies that reduce time and labor for women farmers; (iii) and technologies that are accessible and affordable by women farmers. Technologies reducing women's farm labor and the time that female farmers need to perform household duties could enable them to devote more time to productive farm activities (Definition from the World Bank Project "Ethiopia: Agricultural Growth Project II Gender Working Group"). Technologies will be disaggregated by major type: (i) agricultural productivity; (ii) land management; and (iii) water management.
Justification	This indicator allows for the tracking of the number of CSA technologies developed that are gender responsive. If a CSA technology that is developed is gender responsive, it is assumed that it will contribute to an increase in the adoption of CSA technologies by women farmers. Depending on the project context/results chain, this indicator can be used in the results framework (component level) in the Monitoring, Evaluation, and Learning manual of the project.
Unit	Number
Frequency	The indicator will be reported on once a year on July 15th of each year. Data will be available at the level of the National Agricultural Research Center/Coordination Unit. The indicator is measured yearly starting year 2013.
Data source	Data will be collected from the regional research centers and national research center by the research component project expert based on a list of technologies validated, provided by the centers, and using the reporting formats developed by the project.
Calculation and collection methodology	The expert of the coordination unit at the National Research Institute in charge of the research component of the project will be responsible for cross-checking the quality of data coming from the regional research centers, collecting data from the National Research Institute, aggregating and calculating the indicator. The regional research centers reporting data are only the research centers supported by the project to develop technologies under the project.

Year	**2011**	**2012**	**2013**	**2014**	**2015**
Baseline	0				
Target value		—	15	30	35
Current value		—			
Comments:					

Note: — = not available.
Source: World Bank–funded "Ethiopia: Agricultural Growth Project II."

to reach the current targets for men and women producers in terms of CSA?

- Why were some targets missed or surpassed? Have other parts of the project been affected because targets were missed or surpassed? Is there a relationship between missed or surpassed targets and the quality of planning undertaken for the project?
- Do targets for men and women producers in terms of CSA need to be adjusted?
- What lessons emerge from this experience? What corresponding recommendations can be made to achieve the project's goals?

It is also particularly important to conduct a contextual analysis to identify factors that may affect progress in achieving targets, such as specific policies, current government sector strategies and reforms, and potential synergies with other government and/or donor projects. Finally, it is important to acknowledge that M&E is a dynamic process, in which targets for indicators along the results chain can be readjusted during the project cycle based on changing conditions, issues in implementation, and other factors.

EXAMPLE OF GENDER IN A CSA RESULTS CHAIN

An example of a results chain is shown in table 18.9. It highlights a potential pathway toward strengthening the benefits for men and women farmers from CSA as a consequence

Table 18.9 Example of a Results Chain for an Agricultural Project with a Focus on Gender in CSA

Inputs	Activities	Outputs
• Budget for research and development of gender-responsive CSA technologies. • Budget for identification of existing gender-responsive CSA practices and dissemination of gender-responsive CSA practices in general. • Budget allocated for gender training for all implementing agencies and for follow-up and corrective action. • Budget for development of gender-responsive good practices and solutions in CSA extension materials. • Budget for supporting land certification reforms with land rights for women. • Project staff with skills and knowledge on gender issues and analysis.	• Train Ministry of Agriculture as well as federal and regional staff on gender equality in CSA. • Conduct participatory research on CSA technologies and the socioeconomic challenges for women to adopt CSA. • Conduct value-chain analysis to understand different roles of women and men and women's preferred value chains. • Support land right policy drafting and implementation of land certification programs. Identify and address conflicts between customary and civil law regarding women's rights. • Identify and disseminate good practices and extension packages for gender-responsive CSA. • Train/hire women extension workers. Raise awareness and train extension workers on gender-responsive CSA practices. • Organize on-farm demonstrations for CSA technologies and practices as well as visits, farmer innovation fairs, videos, and so on, for both men and women. • Work with women's associations and women leaders. • Network with gender experts in grassroots organizations. • Improve women famers' access to meteorological information and price and marketing information.	• Increased participation of women beneficiaries in project or programs. • New gender-responsive CSA technologies in crop and livestock production developed through participatory research and transferred to extension services. • Extension packages on good practices in gender-responsive CSA developed by extension services. • Land certification/titling policy enacted and approved by parliament and implemented. • Policy support to facilitate access to production inputs and financial services in place. • Men and women farmers trained in identified gender-responsive value chains. • Training for men and women farmers conducted on gender-responsive CSA technologies on-farm or at functional farmer training centers (with demonstration plots, trained extension officers in gender and CSA, appropriate equipment and inputs, use of meteorological data, and other resources). • Training conducted for men and women farmers in business development and marketing and selected value chains
Medium-Term Outcome	**Outcome**	**Impacts and Long-Term Goals**
• Men and women farmers adopt gender-responsive CSA technologies and practices for crop and livestock production. • Men and women farmers with land title/certificate. • Men and women farmers linked to cooperatives and traders in selected value chains. • Men and women farmers have access to production inputs (for example, labor, credit, seed, fertilizer, pesticides).	• Crop and livestock productivity of men and women farmers increased. • Proportion of women farmers' production sold in selected value chains increased. • Farmers' capacity increased.	• Men and women farmers with increased resilience. • Men and women farmers with improved livelihood and food and nutrition security. • Reductions of GHG emissions and/or increase in carbon sequestration. • Sustainability of environment and natural resource use increased.

of activities related to research, extension services, and land rights. Table 18.10 offers examples of indicators for measuring results.

To develop a robust results chain like that in table 18.9, it is critical to define an outcome statement for each component and subcomponent for a project (objective tree). The *theory of change* or results chain describes the process to achieve *the project outcome* of a CSA intervention. Combined with government policies, investments, and other donors' interventions, the CSA intervention contributes to the *impacts/long-term goals* for women in terms of CSA (see bottom-right box of table 18.9). Typically, the desired impacts are for men and women farmers to (i) become more resilient with improved livelihoods; (ii) achieve food and nutrition security; and (iii) contribute to reducing GHG emissions from agriculture while sustainably using natural resources, thereby ensuring that the principals of gender equality and equity, related to the equal access to resources and equal participation and fairness of treatment respectively, are considered in the design and implementation of the intervention and visible in the project's outcomes and impacts.

Table 18.10 Sample Indicators for Measuring Results in an Agricultural Project with a Focus on Gender in CSA
Medium-Term Outcome Indicators
Number of farmers who adopted CSA practices (sex-disaggregated and by specific CSA practice)
Land area where gender-responsive CSA practices have been adopted as a result of the project
Number of improved irrigation systems adopted by farmers (disaggregated by sex)
Number of farmers provided with new and improved irrigation and drainage services (disaggregated by sex)
Number of livestock units subject to CSA practices as result of the project
Number of small- and medium-scale agribusinesses with production and/or supply contracts with women farmers
Number of farmers engaged in an outgrower scheme/contract farming scheme (disaggregated by sex)
The average time of men and women to reach the nearest market
Number of functional associations (for example, market cooperatives, producer associations) created in the project area (disaggregated by type of association)
Number of farmers part of functional associations (disaggregated by sex and by type of association, for example, market cooperative, producer association)
Number of farmers with use or ownership rights recorded (disaggregated by sex)
Number of farmers who purchased and applied the recommended package of inputs last season, share of which women (disaggregated by sex and input)
Hectares of cropland planted under improved or certified seed (disaggregated by sex)[a]
Number of farmers who have attended the training and are adopting CSA technology as a consequence (disaggregated by sex)
Number of farmers who use (a) weather and climate information services; (b) price information on a regular basis (disaggregated by sex)
Subsidies and incentives for promoting and mechanisms for conducting GHG accounting in the agricultural sector in place (yes/no; disaggregated by type of subsidy)
Social safety nets (cash transfer, food distribution, seeds and tools, and conditional cash transfer) identified in agricultural policies and national strategies as resilience/coping mechanism) (yes/no)
Agricultural policy in place which explicitly states an intention to reduce GHG emission (yes/no)
Outcome Indicators
Percentage change in crop yield per hectare and year as result of the CSA intervention (disaggregated by male-/female-headed households and household members)
Percentage change in yield per livestock unit and year as result of project (on household level, disaggregated by male-/female-headed households, household members, and by yield type, for example, yield may refer to milk, honey, or livestock)
Percentage of production sold in selected value chains per year (at household level, disaggregated by male-/female-headed households and household members)
Social safety nets available to the target population (yes/no)
Impacts/Long-Term Goals Indicators
Farmers who consider themselves better off (for example, livelihood, income, nutrition) now than before the CSA intervention (disaggregated by sex)
Income from agricultural and nonagricultural sources (disaggregated by male-/female-headed households)
Percentage change in proportion of rural population below $1 (Purchasing Power Parity) per day or below national poverty line
Net carbon balance (GHG emission in tons of CO_2-equivalent emission/ha/year) of project (for example, disaggregated by emission source or activity)
Land area affected by medium to very strong/severe soil erosion in the project area
Annual total volume of groundwater and surface water withdrawal for agricultural use, expressed as a percentage of the total actual renewable water resources (in the project area)
Area restored, or re/afforested as result of the project; land area under forest cover/land area under other relevant land cover

[a] Use or ownership rights covers land tenure situations, customary or statutory, individual or collective on private or public lands and can accommodate all ownership systems. "Recorded" should be interpreted as a means to unambiguously record land tenure information in the land administration system that reflects the current situation whether graphically, textually, or numerically. It covers a wide range of mechanisms, including mapping, surveying, titling, registering, or computerizing land tenure rights. It is not restricted solely to registration/recording of land property rights (World Bank Core Sector Indicator).

Medium-term project outcomes (table 18.9) should reflect farmers' behavioral change as a consequence of project outputs and activities. The example in table 18.9 focuses on behavioral changes as a consequence of activities related to research, extension services, and land rights. More broadly, such outcomes include the adoption of CSA practices and links to cooperatives and traders in selected value chains. Smallholder producers' access to markets generates income and investments in their own businesses and often increases farmers' ability and incentives to adopt new technologies. Medium-term outcomes should further reflect access to, and control over, land and other productive assets, which are key for women farmers to improve productivity and livelihoods, and to contribute to household food security. There is a need for a sound institutional, legal, and policy environment and for a sound project design that facilitates access to inputs, supports women's financial inclusion, and supports CSA practices—for example, by providing financing, enhancing women's use of tools and equipment that reduce the labor input on the farm, providing support for women to hire labor, or providing women with community-based childcare centers.

To achieve the outcomes, a range of *outputs* of a project (goods and services) are provided. Indicators typically measure the number of goods and number of farmers or extension workers trained by the intervention, disaggregated by sex.

Project *activities* typically translate the *project inputs*—the amount of human, financial, and material resources devoted to the project—into *outputs*. In the example of a results chain given in table TN3.6, the outputs, activities, and inputs can be categorized as follows:

- Extension services and farmer training centers strengthened (through the provision of human resources and equipment) to deliver gender-responsive CSA training and training for selected value chains.
- Agricultural research, which produces gender-responsive CSA technology.
- A land rights policy that establishes rights for women is enacted and approved by parliament and implemented.

Table 18.10 presents examples of indicators for medium-term outcomes and the achievement of long-term goals for a CSA intervention with a focus on gender. The indicators measure results at the project level and include relevant indicators at the institutional level.

CONCLUSION

A robust and diversified M&E system enables the project teams to track and assess gender-responsiveness and progress in CSA activities, identify challenges and bottlenecks, and evaluate the benefits, outcomes, and impacts of the intervention for men and women farmers throughout the project cycle. The design of M&E system requires several steps. In the identification stage, practitioners conduct analytical work and collect gender-related information based on comprehensive gender analysis; the purpose is to derive an understanding of the challenges and requirements of men and women farmers in relation to climate change and CSA and use that understanding to inform the project design. In the formulation stage, practitioners develop the project objectives related to gender and CSA; design a results chain, alongside a theory of change as well as gender-responsive indicators and performance targets for each indicator; and determine the budget for gender-responsive activities. In the implementation stage, progress in gender-responsive activities and CSA is monitored, and precautions are taken to avoid widening gender disparities or negative impacts and further gender-related challenges. In the project evaluation stage, practitioners examine progress toward project objectives and specific CSA outcomes and suboutcomes, including gender-related outcomes, and disseminate the findings.

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Household and Community-Driven Development

Although national and international policy responses to climate change typically receive the most attention, evidence of the importance and potential of community-level adaptation is growing (Bryan and Behrman 2013). Climate impacts and vulnerability are highly context specific, varying by country, region, community, household, and individual. Gender affects the vulnerability of individuals to climate change, the risks to which they are exposed, and their ability to participate in adaptation (Bryan and Behrman 2013).

By engaging at the level of the community and household, practitioners can develop a more accurate understanding of the vulnerability context, potential climate impacts, and their linkages to gender issues and then plan more appropriate responses. A range of household and community-driven development methodologies are relevant to addressing gender issues in CSA and can be adopted by and incorporated in a wide range of development projects and in public service delivery.

WHAT IS COMMUNITY-DRIVEN DEVELOPMENT?

Community-driven development (CDD)[21] is a way to design and implement development policy and projects that facilitates access to social, human, and physical capital assets for the rural poor by creating the conditions for the following:

- Transforming rural development agents from top-down planners into client-oriented service providers
- Empowering rural communities to take responsibility for their own socioeconomic development (specifically, by building on community assets)
- Enabling community-level organizations—especially those of the rural poor—to play a role in designing and implementing policies and programs that affect their livelihoods
- Enhancing the impact of public expenditure on the local economy at the community level.

To understand and contextualize CDD, it is important to differentiate the multiple roles that men and women play at the community level. Box 18.13 reviews the terminology used in describing those roles.

CDD is often concerned with placing decision making and resources for local development goals directly in the hands of concerned communities. It typically refers to the way in which a policy or a project is designed and implemented, not to the content of a policy or project component. CDD has usually been applied as part of efforts to reduce rural poverty through an emphasis on human and social factors, broad-based participation and empowerment, participatory governance and accountability, and demand-driven approaches. CDD bottom-up approaches leverage social networks and social capital, support autonomous adaptation at the community and household level, and strengthen community institutions (because generally they are more responsive to learning and feedback from their own communities than from government institutions) (World Bank 2014). Box 18.14 describes how the World Bank used CDD methods following the tsunami in Southeast Asia to improve resilience for women displaced from their homes and farms.

CDD approaches can be powerful tools to build climate resilience and adaptive capacity that is specific to the local social, cultural, ecological, and agricultural context and that also factors in gender differentials with a CSA perspective (World Bank 2014). These community-driven approaches provide opportunities to build on local or indigenous knowledge of food systems, landscapes, and weather patterns, to learn from local institutions, and to engage and leverage local networks. Importantly, they have proven effective

[21] See IFAD (2009).

Box 18.13 Describing and Classifying Men's and Women's Multiple Roles in the Community

Community managing role. Activities undertaken primarily by women at the community level, as an extension of their reproductive role, to ensure the provision and maintenance of scarce resources of collective consumption, such as water, energy sources, health care, and education. This work is unpaid, undertaken in "free" time.

Community politics role. Activities undertaken primarily by men at the community level, organizing at the formal political level, often within the framework of national politics. This work is usually paid, either directly or indirectly, through status or power.

Women community leaders' politics role. Activities undertaken by individual women and groups of women who have become leaders through ownership of property, wealth, and inheritance, family backgrounds, and leadership training. This work may be unpaid or paid and is usually linked to women's empowerment.

Source: FAO 2012; Spring and Swallow 2015.

in addressing many of the underlying causes of climate vulnerability by reducing poverty, improving natural resource management, strengthening institutions, and addressing issues of gender equality and women's empowerment (IFAD 2009).

Even in CDD, purposive arrangements may be required to mainstream gender. For example, in the Philippines, a Millennium Challenge Corporation (MCC) assessment of CDD projects found that it was primarily men who received paid positions while women had the volunteer positions. The assessment also found that without specific efforts to consult and empower women as decision makers, the selection of community development projects reflected men's interests. MCC's approach to resolving these gender issues in CDD included a review of all training material; training for gender-inclusive approaches; the establishment of a competitive gender project fund; and the establishment of project targets for women as decision makers and paid employees, with performance incentives. The approach has been adopted across the Philippines government.

Box 18.14 Community-Driven Development, Resilience, and Gender in Land Rights

The 2004 Indian Ocean earthquake and tsunami affected 2.5 million people and caused $11 billion damage in 14 countries. In Indonesia, the World Bank and Multi-Donor Trust Fund supported a project—the Reconstruction of Aceh Land Administration System (RALAS)—to empower women through land titling to address the loss of housing and agricultural land, make land tenure more secure, and provide a family safety net. Dispute resolution and social protection for women and vulnerable groups were anchored in the local interpretation of Islamic law and traditional (*adat*) practices.

RALAS included a Community-Driven Adjudication process to land titling that involved community land mapping. The aim was to increase women's access to land, going beyond procedures to understand the sociocultural constraints to obtaining land. Various multiple land tenure regimes, traditional and formal, were noted. Some systems were gender neutral, and some assigned equal rights to women and men. Men were regarded as the heads of households and as land owners. The disaster had created opportunities for social and physical reorganization, however, and women showed dynamism in the recovery and reconstruction process when they assumed primary responsibility for income generation, managing household resources, and nurturing the family. They also played a significant role in translating the individual grievances associated with the recovery of land and property rights and in strengthening the social agenda for property ownership.

RALAS required dedicated advocacy and policy dissemination to promote women's land rights because women lacked information about their legal rights, and men mostly retained land titles. The absence of sex-disaggregated data also limited the government's capacity to address women's concerns. But women took great interest in community-level land mapping exercises and had higher levels of participation in community-based activities under RALAS than in other programs.

Source: Spring's adaptation from World Bank 2011.

WHAT ARE HOUSEHOLD METHODOLOGIES FOR GENDER EQUALITY AND SOCIAL INCLUSION?

In contrast with community-driven approaches, household methodologies (HHMs) focus on empowering members of individual households to realize their development potential to create stronger, more resilient, and sustainable livelihood systems and to improve food, nutrition, and income security (IFAD 2014a). The use of HHMs by IFAD and others builds on a growing understanding that, in many regions, households are not always cohesive units with shared needs, resources, benefits, and goals. Often women and men within the same household pursue separate livelihoods. Women usually have fewer productive assets than men and are less able to make independent decisions. Women are commonly overburdened with productive work and domestic tasks. These inequalities hinder the general motivation and productivity of household members and are often a significant factor contributing to climate vulnerability.

The purpose of HHMs is to strengthen the overall well-being of the household and all of its members by enabling them to work together to improve relations and decision making and to achieve more equitable workloads. CDD is often used to identify and address common problems at the community level, often resulting in community-led implementation of small-scale infrastructure projects or the delivery of services, whereas HHMs focus less on assets (physical, financial, natural) and more on people—especially on who they want to be and what they want to do. Household members' ability to understand the causes of their current situation—and their willingness to act upon the findings, overcome obstacles, and make the most of the options available to improve their lives—are crucial for unlocking the household's potential and taking advantage of adaptation opportunities such as CSA.

The particular contribution of HHMs is that the "black box" of the household is unpacked—in other words, broken into its units based on gender, age, and family roles. Many interventions in past decades used the Unitary Household Model, which regarded the household as a single unit (black box). Assets and needs assessments, interventions, and adoption were done by the male household head with no differentiation among household members in terms of objectives, constraints, costs of adoption, decision-making control, or access to the benefits. The Unitary Household Model does not recognize and support the culturally defined, gendered domains of independent and/or joint control over resources within households that affect the costs women bear in climate disasters and the benefits they obtain from mitigation. It does not support consideration of cultural restrictions that make it difficult for women to negotiate their needs, or take into account the gender issues that relate to specific needs and interventions.

Rather than addressing the symptoms of gender inequality, HHMs tackle the underlying social norms, attitudes, behaviors, and system with household members. Working through these issues with the household helps to build awareness of how inequalities in gender roles and relations can have a strong influence on the household's climate resilience and ability to adapt. Tools to ascertain women's and men's activities, resources, and risks in CSA have been developed through IFPRI's Gender, Agriculture, and Assets Project (GAAP), funded by the Bill and Melinda Gates Foundation (box 18.15).

Box 18.15 A Toolkit for Analyzing Differences in Men's and Women's Assets in Relation to Individual Rights and Household Roles

The International Food Policy Research Institute's Gender, Agriculture, and Assets Project (GAAP) details the nature of asset differentials between women and men as a way to pinpoint gender differentials in assets and resources. GAAP's toolkit for researchers and practitioners provides clear definitions of various types of rights to assets (for example, access entitlements, decision-making control over use, rights to make claims on output, rights to transfer assets to others, and rights to exclude others from access or use). GAAP surveys in various countries such as South Africa and Uganda delineate categories of women (wives, female household heads, and widows) having different resources and vulnerabilities and distinguish between individual ownership, joint ownership with spouses and others, and collective group ownership. Some findings suggest that assets of women heads of household (most of whom are widows, divorced, separated, or cohabiting without marriage) have more control over assets than those of married women or adult daughters who live in male-headed households.

Source: Behrman et al. 2014; ICRW, "Measuring Property Rights: Gender, Land, and Asset Survey" (http://www.icrw.org/where-we-work/measuring-property-rights-gender-land-and-asset-survey).

COMMUNITY-DRIVEN APPROACHES AND HOUSEHOLD METHODOLOGIES FOR CSA

Community-driven and household approaches are particularly valuable with regard to climate change adaptation and the shift to CSA. Both CDD and HHMs identify agricultural and livelihood practices as well as coping strategies that cause or exacerbate vulnerability but persist due to local custom or tradition (CARE International 2011). Both approaches identify costs and benefits of CSA practices at the community and household levels, make communities and household members aware of them, and ensure that steps are taken to spread costs and benefits fairly, in a manner acceptable to all community or household members (Bryan and Behrman 2013). Facilitating adaptation and introducing CSA require continuous learning, planning, feedback, and adjustment, based on climate information and forecasts as well as local experience of climate impacts and the effectiveness of CSA practices in addressing them. For these processes to work, effective channels of communication must be established between governments and institutions and the people they serve in households and communities to share their experiences and ideas (CARE International 2011). CDD and HHMs also ensure that projects are responsive to the needs, priorities, and aspirations of those individuals who are most vulnerable to climate change by involving them in planning and implementing policies and projects and promoting empowerment, transparency, and accountability (CARE International 2011).

BENEFITS OF COMBINING COMMUNITY-DRIVEN DEVELOPMENT AND HOUSEHOLD METHODOLOGIES

Though generally successful, CDD has a number of shortcomings. For example, the most marginalized households in a community may not be able to participate in community activities because they lack access to resources such as land, labor, money, or even time, or because they are excluded for social or cultural reasons. In addition, CDD efforts may support women's empowerment by strengthening their economic opportunities and decision-making capacities in community groups or organizations, but such efforts may not necessarily address gender disparities within the household. As women become more empowered in the community, tensions can increase between male and female household members, and females may continue to be disempowered within the home.

Box 18.16 Community-Driven Development and Household Methodologies in India's National Rural Livelihoods Mission

India's Ministry of Rural Development established the National Rural Livelihoods Mission to reduce rural poverty, using community and household methods. Through participation in self-help groups, households get access to government support and microfinance, based on household livelihood plans that are appraised by the other members of the self-help group and then submitted jointly as the group's Micro-Investment Plan. Climate change adaptation is being mainstreamed into these plans by training community facilitators in climate issues. The project, which is financed by the Government of India with additional support from the World Bank and the Global Environment Facility, aims to reach all poor rural households in India. The World Bank's contribution of $1 billion through the National Rural Livelihoods Programme targets some 4.8 million rural households at a cost of around $200 per household.

Source: IFAD.

HHMs can overcome these limitations by targeting the most marginalized households with the greatest risk of being excluded from traditional CDD initiatives and by addressing gender dynamics within the household. Note that using HHMs alone while failing to address issues at the community level will also have shortcomings—particularly with regard to promoting climate resilience and CSA, which typically involve improving the management of the natural resources on which the whole community relies. Another risk is that adaptation strategies may be harmful or unsustainable if pursued by many households in the community. In sum, to build resilience successfully, action and coordination are needed at multiple scales (Bryan and Behrman 2013). Box 18.16 presents an example from India in which CDD and HHMs formed the basis of a project focusing on rural livelihoods and climate change adaptation.

Some resistance is likely to accompany the promotion of new behaviors that lie outside a community's cultural norms, and it is likely to continue until a critical mass of households begin changing their behavior. To create an environment that

supports positive change, it is essential to engage with community leaders and men. Gaining the support of traditional leaders, who are often the gateway to rural communities, can be crucial to ensure that the community accepts new ideas. Specific efforts also need to be made to engage with men, who may be reluctant to accept changes in the gender division of labor within the household, or who may feel threatened or humiliated by it. Like traditional leaders, however, men can become strong advocates for change if supported appropriately to free themselves and their households from cultural norms that perpetuate gender inequalities. At the community level, men using HHMs can find it helpful to form groups to support each other. Informal groups can also be useful to reach potential participants.

EXAMPLES OF COMMUNITY-DRIVEN DEVELOPMENT AND HOUSEHOLD METHODOLOGIES

The sections that follow illustrate some CDD and HHM approaches that are amenable to CSA activities. They include participatory vulnerability assessments, Junior Farmer Field and Life Schools, HHMs for envisioning change, the Gender Action Learning System, the Transformative Household Methodology, and engaging with men and traditional leaders.

Participatory Vulnerability Assessment

As discussed, it can be a challenge to design projects and programs that address issues related to climate change and are also gender responsive. Holistic approaches should be adopted to ensure that tackling one problem does not lead to another. Participatory vulnerability assessments are an effective tool for understanding the dynamics of climate change, gender, vulnerability, and adaptive capacity within a rural community in a holistic way.

Vulnerability assessments are often conducted nationally or regionally. They focus on climate and environment variables and macrolevel data on poverty and economic activities. Vulnerability is also determined at the community, household, and individual levels by socioeconomic factors, livelihoods, and individual capacity and access to knowledge, information, services, and support. National and regional vulnerability analyses risk overlooking some of the most vulnerable people and groups and missing the underlying causes of their vulnerability (CARE International 2011).

A participatory approach to vulnerability assessments generates a richer understanding of these issues by using the local knowledge of women and men to identify and plan appropriate activities to reduce the vulnerability of the entire community. The approach is also effective in raising awareness of adaptive capacities and vulnerabilities within the community, in terms of the complex interactions of climate change and gender. It also can accelerate the momentum to address the issues identified.

The assessment needs to consider the different livelihood assets of the communities, such as human capital (education, health, knowledge, and skills), social capital (such as social networks, formal and informal groups, common rules, and sanctions), economic capital (such as savings, credit, and tools), and natural capital (land and water resources, trees, wildlife, and biodiversity). Women and men have different amounts and combinations of livelihood assets and participate in different activities (farming, raising livestock, collecting firewood, and so on), each of which will influence their vulnerability to climate change.

One approach, often used by IFAD and developed by the World Agroforestry Centre (Boureima et al. 2012) to assess the vulnerability of the livelihoods of four groups (adult men and women; young men and women), has been applied to develop strategies for adaptation to climate change in three countries in the Sahel (Burkina Faso, Mali, and Niger). The breakdown by age group is important, because the knowledge and capacities of young women and men are likely to differ from those of the older generation. The World Agroforestry Centre's approach builds on the community's knowledge of local conditions and involves four main steps: (i) assessing the situation and vulnerability of village-level threats; (ii) undertaking vulnerability analysis by specific groups of people; (iii) developing a plan for adaptation to climate change; and (iv) monitoring activities by communities.

As with many participatory vulnerability and capacity analysis tools, this approach allows communities to analyze their exposure to risks, threats, and shocks and then develop adaptation strategies. This approach not only develops action plans but builds communities' capacity to work together to respond to adaptation risks and opportunities. In other words, the process is as important as the resulting adaptation actions. Gender-responsive adaptation planning can lead to better livelihood options and incomes, improved yields, more food and nutrition security, and improved management of natural resources, as well as reduced workloads for women and their families.

Junior Farmer Field and Life Schools

Initiated by FAO in Asia over 20 years ago to promote integrated pest management, Farmer Field Schools (FFSs) employ participatory learning processes to enhance rural communities' capacity to improve food production and livelihoods in ways that are tailored to their specific needs. Field schools have spread across the globe and evolved well beyond integrated pest management to encompass objectives in education, community development, and the empowerment of women and young people.

Junior Farmer Field and Life Schools (JFFLSs), which specifically support the acquisition of agricultural, business, and life skills by young people, simultaneously promote business development, access to markets, and group cooperation (through inclusion in producer organizations). The approach has been designed in recognition of the fact that young people in rural areas, particularly young women, require support to overcome significant challenges in accessing credit, markets, and opportunities for decent employment. To date, JFFLS are estimated to have trained more than 30,000 young women and men, although the exact number of beneficiaries is difficult to monitor because civil society groups and communities themselves have pursued the approach on their own. Piloted in 2003–04 in Mozambique and Kenya, specifically in communities ravaged by HIV/AIDS, JFFLSs have expanded to approximately 20 countries in Africa, Asia, and the Middle East, consistently achieving positive results on the ground.

Climate change is one of the latest topics introduced to JFFLS training. In the climate change sessions, participants learn about the causes of climate change as well as options to improve the resilience and adaptive capacity of crop and livestock production, forestry, and fisheries in the context of a changing climate. Many of the practices discussed in JFFLSs not only help agriculture adapt to climate change but enhance productivity and food and nutrition security as well as generate mitigation benefits.

Household Methodologies for Envisioning Change

Household visioning, starting from individual visions of betterment and building up to household visions, lies at the heart of HHMs, together with other participatory tools to reveal intrahousehold gender dynamics (IFAD 2014a). HHMs are not about empowering women and disempowering men. Rather, both women and men see that they benefit economically and personally from a more equal relationship with each other and with their children in terms of accessing more resources, benefits, and social capital.

The process at the household level has four main steps:

1. ***Creating a household vision of where the household would like to be in two to three years' time.*** Household members need to understand one another's different aspirations, negotiate for common goals, respect their differences, and identify how each household member will contribute to the overall vision. It is important to identify the different priorities of men and women, boys and girls. Key questions include the following: Where are we now and why? What strengths and opportunities can we build on? What challenges and obstacles might we encounter, and how can we overcome them? The men and women in the household then consolidate their visions based on the overall household priorities and set objectives and milestones. The visioning process can also enable young people to gain a voice at the household level by identifying their own visions and sharing them with other household members.
2. ***Preparing an action plan, which entails identifying the opportunities available to help household members realize their vision, identifying the challenges they may encounter, and breaking the vision journey into achievable, time-bound steps.*** Creating pathways to change with steps on the way is a central element of the change process, both to ensure that it is realistic and to monitor progress and make adjustments if needed, ensuring that opportunities are equally provided to both men and women.
3. ***Implementing the action plan and monitoring its progress.***
4. ***Graduating from the need for external support for implementing HHMs and ensuring sustainability.***

The two main entry points for implementing HHMs are groups and individual households. In group-based approaches, groups formed for savings and credit, natural resource management, or FFSs are the means of reaching individuals with HHM tools. A group may also use the visioning and planning tools to achieve its own goals. Individual household mentoring focuses specifically on (and is especially effective for) reaching the poorer, marginalized households that often are excluded from mainstream development initiatives, including membership in groups. Over time, mentoring by trained mentors empowers these households and enables them to join groups.

To date, more than 100,000 people have benefited from HHMs in IFAD-supported programs in Malawi, Nigeria, Rwanda, Sierra Leone, and Uganda (IFAD 2014a). Participants report impacts across the full range of livelihood assets and on household members' influence over and access to those assets, enhancing the sustainability and resilience of their livelihoods to climate change and other shocks. Participatory decision making and shared workloads increase agricultural productivity, and both male and female household members are able to engage in value chains. Men participate more in household tasks, women have a greater voice in decision making in the household, and there is more transparency in how resources and benefits are used. Food and nutrition security and incomes are improved, joint investments in land and businesses are undertaken, and the capacities of household members are strengthened. More girls and boys attend school and go on to tertiary education. Individuals are happier with themselves and other household members, including co-wives. And, as indicators of profound behavioral change, a reduction in gender-based violence and excessive alcohol consumption has been reported by many participants.

Gender Action Learning System (GALS)

The Gender Action Learning System (GALS)—developed by the Women's Empowerment Mainstreaming and Networking (WEMAN) Programme of Oxfam Novib—has been rolled out in Nigeria, Rwanda, Uganda, and other countries since 2008 with the support of IFAD and other donors. [22] The methodology aims at addressing unequal gender and social relations and enhancing ownership of project activities by the target groups. Applied at the household, group, or community level, GALS can be used in many thematic areas, including CSA. It can be implemented by national and local CSOs, project management staff, or extension or community development services. Women and men from participating groups or communities can also "emerge" as facilitators for others and over time build up their own network of peer facilitators.

GALS is implemented in three main steps or stages. Stage 1 (1 month) consists of preparatory work as GALS activities are introduced and adapted incrementally as part of a community-led design process. Stage 2 (6 months) focuses on gender action learning for individuals, households, and groups as participants establish a long-term vision and time-bound milestones by analyzing past achievements; mapping opportunities and challenges; examining relationships, resources, and power in the household and community; and sharing strategies and identifying possible solutions. Stage 3 (1–3 years) features gender mainstreaming in economic interventions (in this instance, CSA) based on mapping of activities, stakeholders, and gender inequalities and participatory action research. Box 18.17 presents an application of GALS in Sierra Leone.

Box 18.17 GALS in the Rehabilitation and Community-Based Poverty Reduction Project, Sierra Leone

The Gender Action Learning System (GALS) methodology has been implemented in the IFAD-supported Rehabilitation and Community-Based Poverty Reduction Project in Sierra Leone, where it has played an important role in ensuring that female farmers and female household members have benefitted from the project's investments in rehabilitating swampland to grow rice, groundnuts, and vegetables and rehabilitating tree crops such as cocoa, coffee, and oil palm. The project is cofinanced by the Global Environment Facility. Its activities have made farming more resilient to climate change by emphasizing the development of rainwater harvesting infrastructure and improved drainage and irrigation systems, as well as the introduction of improved seed and agronomic practices, through Farmer Field Schools. The GALS method has increased women's confidence to speak in public, engage in planning for climate-resilient development, and participate in educating other community members about climate change adaptation. By the end of 2015, 4,500 households will have participated in the project's GALS activities.

Source: IFAD.

Transformative Household Methodology

The Transformative Household Methodology (developed by Send a Cow Ethiopia) supports household members to identify their different roles and responsibilities as well as their access to and control over resources and related benefits, using the Harvard Gender Analytical Tools and

[22] IFAD (2014b) and Oxfam Novib. See also the Gender Action Learning website ("What Is GALS at Scale?"), http://www.galsatscale.net/.

participatory rural appraisal tools (IFAD 2014c). Community development workers or volunteer facilitators from within the community lead the process of identifying households and organizing them into self-help groups. Four households from each group are selected to be trained to teach other group members to perform household and gender analysis. The visual methods that are used to show the responsibilities of each household member help to press home the imbalances within the household and make visible the often hidden work of women and girls. Households then create action plans, which are followed up regularly over a period of one month to one year. Regular meetings are held between members of the self-help groups to share their experiences. Most households have shown significant changes in gender relations, with women's role in decision making increasing and traditional gender roles weakening.

Engaging with Men and Traditional Leaders

The following two approaches have been used in Zambia to create a supportive, enabling environment for engaging with men and traditional leaders to foster positive behavior change:

- ***Men's Campfire Conferences.*** Men's Campfire Conferences (IFAD 2014d) were initiated in Zambia in 2009 and have since spread to Malawi and Tanzania. The purpose is to create a space where men can talk about gender issues and women's equality and to develop a critical mass of gender-responsive men within communities to exert positive pressure on their peers. In an environment that replicates what men traditionally do (sit around a fire to chat, drink beer, and discuss things they would not talk about with their wives), trained facilitators lead the discussions to focus on the problems the participants face and possible solutions. Initially used to address gender-based violence, the methodology is suitable for addressing any issue that requires men to challenge traditional beliefs about their role in the household and the role of women.
- ***Chiefs and traditional leaders.*** Traditional leaders (IFAD 2014e). can be powerful agents of change in rural areas. Their approval can give legitimacy to new ideas and approaches, and they face no language or other sociocultural barriers. They can also perpetuate negative aspects of the culture that hinder the rights of women and men, so engaging with them in gender sensitization activities gives a sense of ownership of development programs and increases the likelihood of success. A Zambian NGO, Women for Change, has developed a methodology for targeting chiefs and traditional leaders that uses a training of trainers' approach that builds their awareness and enables them to better support their own communities. By acting as coaches and mentors for community members, the chiefs and traditional leaders enable positive behavioral changes to take place.

POLICY AND SOCIAL/CULTURAL ISSUES AND LESSONS LEARNED

The issues and lessons that are especially pertinent here include the scope for sustaining and scaling up community-driven and household approaches; the capacity for linking these local knowledge and bottom-up approaches to national policies and climate science; and policy and CDD in climate change disaster management.

Sustainability and Scaling Up

HHMs and CDD tend to be sustainable if well facilitated and structured, and if they move away from considering the household as a male preserve. FAO, IFAD, and the World Bank have produced a variety of toolkits for ascertaining gender access to assets and resources (for an example from FAO, see box 18.18). They have successfully paired these tools with technical and interpersonal interventions to mitigate the effects of climate change, for which the benefits are clear and the target groups are keen to maintain and scale up their achievements, even without external support. In communities that have used GALS, groups may even pay allowances to community facilitators, once the benefits have been demonstrated. Households that have experienced the benefits of HHMs often become advocates and share the methodology with others. When household or community-driven approaches are implemented through services such as agricultural extension (for example, FFSs) or community development, they can be integrated into those services and scaled up regionally or nationally. CDD and HHMs typically cost little and are highly scalable, which is part of their appeal, enabling national programs to reach the scale required for climate change resilience.

Box 18.18 FAO's Socio-economic and Gender Analysis Approach

Under FAO's Socio-economic and Gender Analysis (SEAGA) approach, a series of manuals and technical guides were developed to assist development agents and humanitarian staff, governments, farmers' organizations, research institutions; and policy makers to formulate projects, programs, and policies for sustainable and equitable development. SEAGA's Rural Households and Resources: A Guide for Extension Workers, helps extension and community workers to highlight major issues affecting rural households and provides users with resources and tools for collecting, analyzing, and sharing information about the constraints, opportunities, and priorities faced by communities, households, and individual household members with regard to basic resources such as water, land, credit/savings, and time. The guide assists extension and community workers to apply a participatory and gender-sensitive approach to their planning and work with rural households and people, and it provides examples of ways to move toward improved management of household resources, better information collection and analysis, and the development of gender-responsive projects.

Source: FAO 2004.

Box 18.19 Using Climate Science and Community-Based Approaches to Enhance Women's Yields and Land Holdings

A project in northern Ghana introducing conservation agriculture (no tillage with mulch and cover crops) to women and to male landowners increased soil carbon content and doubled women's incomes and the size of their land holdings. The local headman and husbands initially provided land to the women to use the new conservation agriculture techniques promoted by the project, which increased yields and reduced the agricultural workload, but the women had to drop out of the project the following year when the men took the land back for their own production.

Two years later, project staff remedied this problem through interventions that used local gendered norms to work with organizations of women farmers. Some women adopted conservation agriculture on family land, while others purchased land outright using revenues from increased yields. Gender-responsive strategies and leadership promoted through community-driven development were keys to the successful turnaround. A similar successful project in Cambodia helped women and men to adopt conservation agriculture. With increased yields and sales, some women purchased land and farm machinery. They gained more time for their women's organization; some became leaders.

Managed in this way, targeting both sexes or women only and taking different assets, needs, preferences, goals, and priorities of men and women into account, CSA interventions expand women's independent and joint domains of control and benefits.

Source: Spring and Swallow 2015.

Linking Local Knowledge and Bottom-Up Approaches to National Policies and Climate Science

To develop an accurate picture of climate vulnerability and impacts, local knowledge must be combined with climate science (for an example, see box 18.19). Community methodologies are effective in raising awareness of climate science at the community level, incorporating local knowledge to understand how expected changes in the climate will specifically affect people's livelihoods, and planning appropriate strategies for adaptation. Actions at the community and household levels need to be linked to higher-level national and subnational planning, and they can play an important role in downscaling these plans to local and household levels.

Policy and CDD in Climate Change Disaster Management

Most government policies are gender neutral. They seldom distinguish between groups of men and women that are marginalized or vulnerable and groups that are relatively protected. Yet the effects of policies can differ greatly across these groups. Taking gender-related factors into account in policies related to increasing sustainably agricultural productivity and incomes, building resilience to climate change,

and increasing carbon sequestration in soils while reducing GHGs (the three pillars of CSA) (FAO 2013) can diffuse tensions over status and power that may threaten household and community security related to climate change and climate disaster management. For example, a government freeze on land transactions and transfers can prevent land-grabbing and dispossession following a climate-induced disaster and prevent women's disenfranchisement. Government-coordinated and community-based approaches designed to restore resilience in terms of property rights, agricultural production, and marketing benefit from women's inclusion in the process. These efforts are more successful when carried out by both women and men at the field and decision-making levels. CDD and community land mapping allow communities to move ahead, but women require basic awareness of land and property rights to succeed. A valuable method is to foster community ownership of the gender agenda by building on local ideas and customs that are favorable to women.

CONCLUSIONS

The examples provided here show how practitioners, by engaging in participatory processes at both the community and household levels, gain a clearer understanding of the different roles and the different vulnerabilities of men and women. Based on that understanding, practitioners can plan more appropriate responses. In summary, it is important that all CSA projects require the following:

- Make integrated use of HHMs and CDD tools to address issues at both the household and community levels. This approach not only prevents issues at the household level from being marginalized but prevents an overly narrow focus on natural resources managed by the household and not by the entire community.
- Involve national services when possible from the beginning in implementing CDD and HHMs to ensure ownership of the approaches and scalability.
- Consider also using HHMs and CDD as knowledge management tools and communication channels to inform households and communities about both scientific knowledge on climate change and existing national climate change planning.
- Chose the HHMs and CDD approaches that are most appropriate to the local context and the project's needs—depending on local capacity, engagement of national services, availability of budget and time, and similar variables.

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THEMATIC NOTE 5

The Role of Institutions for Gender-Responsive CSA

This Thematic Note examines the central role of institutions and policies in gender-responsive CSA, focusing on their roles in promoting inclusiveness, providing information and training, enabling innovation at the local level, encouraging investment, and targeting women and poor resource-dependent communities to adopt and benefit from CSA. The note reviews the roles of the state, collective action, and market institutions at multiple levels, giving particular attention to local institutions and institutional linkages across all administrative levels. It draws on experiences from agricultural development, natural resource management, participatory community-led development, sustainable livelihoods, and resilience to identify the key aspects that must be considered by gender-responsive CSA programs and the various stakeholders involved in them.

BACKGROUND AND CHALLENGES

Although the *technical components* of CSA often receive the most attention, the *institutional* and *policy aspects* of CSA are absolutely vital for programs to achieve sustainable and equitable results. Financial, physical, human, and natural capital; social networks; institutions; and legal and policy frameworks are all critical for ensuring asset entitlements, coping resources, and social capital (Kasperson, Kasperson, and Turner 1995; Adger 2003).

Institutions are "the rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction," (North 1990) and they consist of a wide range of stakeholders. Institutions can also be understood as settled, widely prevalent, and standardized habits and conventions defining social practices and—more formally—as constitutional and operational rules governing different kinds of organizations.[23]

Institutions are not the same as organizations. Institutions are the "rules and norms that constrain human behavior," whereas organizations are "the players" (North 1993). In this respect, agents/players such as households and firms have *preferences* and *agendas*, whereas institutions *govern* how resources are allocated (Khalil 1995).[24]

This note groups institutions according the following main categories:

- Public sector institutions, including institutions responsible for local governance
- Collective action institutions, such as farmers' unions, cooperatives, local groups, and civil society
- Research institutions
- The private sector (industrial and financial)

This set of actors therefore includes not only markets and state institutions but local, informal, and customary institutions, all of which have the potential to influence the adoption and use of CSA.[25] For example, customary institutions can include the traditional role played by local chiefs in allocating land to community members, or the local sociocultural norms that dictate which activities are appropriate for males and females to pursue. If appropriate and supportive

[23] Ostrom, in IFAD (2014).

[24] Confusion sometimes arises over the distinction between organizations and institutions because the two concepts tend to overlap. Some organizations, such as governments, embody and represent the "rules of the game" through the laws, norms, and standards that the government promulgates and works by. At the same time, if an analysis concerns the capacity of a ministry to implement a project, *organizational* aspects are considered, such as structure, staffing, and resources.

[25] In this respect, Kabeer's (1994) Social Analysis Framework provides an ideal analytical framework and structure to examine gender issues related to CSA in the institutional realms of the state, market, community, and family/household.

institutional structures are not in place, the need for a local knowledge base, as well as the innovations required to implement CSA, may be overwhelming to smallholder women and men.

Although state and market-related stakeholders must certainly play an important role in operationalizing CSA, climate change will require innovative thinking at all scales and levels (Ostrom 2009, 2010). In addition to these traditional state and market actors, it is essential to consider the role of civil society, including community-based organizations such as land rights groups, landless minorities, membership organizations such as cooperatives and producer groups, and other organizations, especially those involved in agriculture or development assistance.

All of these stakeholders will need to recognize the relevance of gender relations. Specifically, they will need to recognize that individual institutions and organizations are gendered and can produce and reproduce inequalities in the distribution of resources and power; in this way, they create disadvantages for some groups that affect their vulnerability, resilience, and ability to adapt, take risks, or try new technologies. Conversely, if designed with care, institutions and organizations can create positive gendered impacts through their interventions.

Understanding the complexities and criteria for an enabling environment for gender-responsive CSA requires a thorough examination of the institutions and policies currently linked to agriculture, climate change, and gender, taking the perspectives of the main stakeholders into account and focusing on identifying strategic as well as practical gender needs. The nexus of gender, climate change, and agriculture is complex, however. Interventions in these three domains are not always well aligned because of a failure to recognize and manage the trade-offs that may result in policy contradictions. As climate shocks and climate variability become more extreme and unpredictable, these aspects of institutions and institutional arrangements and the policy environment will become even more important.

KEY FUNCTIONS OF INSTITUTIONS RELATED TO CSA AND THEIR GENDERED IMPLICATIONS

To ensure that institutional arrangements enable smallholders to produce food, adapt to climate change, reduce and/or remove GHG emissions, and build resilience in a gender-equitable manner, it is fundamental to have a thorough understanding of the diverse realities of both men and women smallholder farmers in different environments. In this effort, it is equally important to examine a host of gendered factors that apply to the ability to adopt certain production practices. Such factors can include perceptions of women's abilities, literacy, mobility, and competing household tasks. They can also include gender-within-institution frameworks and arrangements, which are often implicit, as in extension services or higher-level agricultural policies that are biased toward male-oriented or cash crops and large-scale farmers.

For that reason, inclusiveness is an obvious and crucial criterion for evaluating whether institutional arrangements and policies ensure that both women and men can benefit from CSA in an equitable manner. The following sections describe critical additional gender considerations related to the key functions of institutions in the context of CSA—information, investment, innovation, and insurance (Meinzen-Dick, Bernier, and Haglund 2013).

Information

Because CSA is a knowledge-intensive approach, institutions must facilitate access to this knowledge if they are to support the development and uptake of good practices.[26] Recent research by CCAFS in Kenya, for example, demonstrates that traditional channels of information in agricultural development programs—extension services, farmer organizations, and agri-service providers—do not consistently show a strong positive effect on women's awareness of CSA.

Institutions need to be better equipped and tailored to reach out to and direct CSA-related information to beneficiaries (women in particular) through the most suitable technologies and information channels. Improved approaches for delivering targeted messages can include mobile phones, radio, and television or providing information at specific venues where prospective beneficiaries gather (markets, places of worship, and so on). The choice of delivery method should recognize that the quality and quantity of information available to women is often influenced by their capacity to access ICT; for example, in certain contexts women are less likely than their male counterparts to own a mobile phone (23 percent less likely in Africa, 24

[26] According to baseline studies conducted by CARE International in India, less than 25 percent of women farmers reported having access to agricultural extension services in the previous 12 months, less than 40 percent had access to agricultural inputs, less than 15 percent had access to output markets, and just over 43 percent said they had received no market information (CARE International 2013).

percent in the Middle East, and 37 percent in South Asia) (GSMA Development Fund 2010). FFS approaches that directly engage men and women during all stages of the cropping, marketing, and farm decision-making cycles may have potential for explicitly addressing gender inequalities in access to information.

An additional consideration is that complex institutional arrangements often govern the extent to which climate knowledge can become an action resource. Small-scale female producers, for example, will need to develop management skills to use climate information (provided through new services and products) effectively (Hansen et al. 2011). One approach to building such management skills (and adaptive capacity, the neglected "middle pillar" of CSA) is through Participatory Scenario Planning (PSP). PSP is a multistakeholder forum for accessing seasonal climate forecasts and "translating" them into information related to local livelihoods and development, which can then be used to guide decision making and seasonal planning. By targeting women and men it enables equitable access to climate information by smallholders, agricultural extension, and support services. Impact assessments in Kenya, Ghana, and Niger demonstrate positive impacts from this approach. Farmers have adjusted planting times, diversified seed and crop choices, and moved livestock and assets away from flood-prone areas. Having gained trust in climate information, they now actively listen for it. PSP multiplies its impact by institutionalizing climate communication at scale while serving as a forum that gives voice to and supports participants, including marginalized groups, in adapting to climate change (CARE International 2012).

Investment

The investment required to pursue CSA is one of the most pervasive constraints restricting small-scale producers, especially poor and female producers, from adopting promising practices. As research has shown in various regions of Africa, shortages of cash to hire labor, sponsor communal labor parties, or purchase inputs may critically reduce the ability of female-headed households to sustainably intensify production (Pender and Gebremedhin 2006), gain access to labor-saving technologies (von Braun and Webb 1989), or access capital to repay credit (Chipande 1987).

Millions of small-scale producers, often working in isolation, have little power or influence. Many live and work in remote areas disconnected from support systems. Demand for their produce is extremely low or nil. Their credit needs are relatively low because of this absence of demand. Although credit can ease the cash constraints on investments in CSA, formal credit institutions may not be available in rural areas; if they are, they may be unwilling to lend to smallholder women. Often the larger loans required for some agricultural investments remain unobtainable, as women do not own assets (like land) that are accepted as collateral by banks or moneylenders.

Microfinance institutions and rotating savings and credit groups provide a viable alternative for many. According to CARE International's Pathways for Empowerment Program in India, just 2.5 percent of women farmers reported that formal agricultural cooperatives met their requirements for agricultural finance, whereas 89 percent said that their source of agricultural finance was their own savings as well as their self-help group (Njuki, Kruger, and Starr 2013). VSLAs—village savings and loan associations—are one successful model.[27] These groups ("collectives"), which are complementary to microfinance institutions, serve people who live in remote places, have low and irregular incomes, and need to save cash in small amounts. Significant benefits can accrue from linking VSLAs to CSA programming. VSLAs offer a way to reach large numbers of smallholders with a financial service (based on the capacity to tap their own financial resources), while at the same time enabling them to learn from each other and to use their numbers to access inputs, aggregate their produce for sale, negotiate better prices for inputs and produce, and eventually influence service providers and policy makers. There is potential for the group to join an external agricultural production or marketing entity and, because of better cash flows, maximize profits from their products by selling at an opportune time.

In many cases, several years will elapse from the time that producers adopt a climate-smart approach and realize its benefits, so they will need targeted income support/financing over extended periods. Given that the financing needs[28] for climate change adaptation, mitigation, and agricultural development span many sectors to meet the interrelated objectives of CSA, the funds deployed by public institutions or development partners for these purposes will need to be used as efficiently and synergistically as possible. The adoption of CSA improves the prospects of accessing climate finance for adaptation and mitigation, but local communities, and women in particular, are still disconnected from

[27] See Allen and Staehle (2008).

[28] Adaptation to climate change within the agricultural sector is expected to entail a cumulative cost of $225 billion to 2050 (Lobell, Baldos, and Hertel 2013). Note that *only 0.01 percent of all global grants* address climate change and women's rights together.

these new sources of financing, making it essential to ensure equality in *access* to these resources.

Where critical assets are required for investment, some form of external assistance by the state or development partners may be necessary to enable women to engage in CSA. Financial resources apply to productive inputs (knowledge and technologies) as well as incentives to adapt more integrated approaches. Consequently, access to financing and different local to national investment schemes for implementing gender-responsive CSA continue to be needed and developed in parallel with appropriate institutional capacity.

Innovation

The state and strength of local institutions and infrastructure often directly shape farmers' access to and use of new technologies. Often, the most binding constraints occur at the adoption stage and impede access to and use of new technologies by poor women and men farmers. They can include static, unfair, poorly functioning or poorly integrated input or output markets; weak or local institutions and infrastructure; inadequate or ineffective extension systems; and missing credit and insurance markets. Local institutional arrangements, such as property rights, cultural views of innovation, and gender norms may hinder the development of vibrant, local innovation systems (Meinzen-Dick, Bernier, and Haglund 2013). These constraints all have distinct gender considerations.

In the same vein, the potential trade-offs in promoting CSA technologies may also be significant from a gender perspective and must be analyzed with care. Women farmers often lose control over the resources, products, and market niches they traditionally manage once they become lucrative; men will often take over production and marketing, even of women's traditional crops.[29] What appears as progress from one perspective may, when considered from another perspective, actually reveal negative side effects, such as women's increasing dependence and diminishing income opportunities,[30] power, and traditional status. Trade-offs such as these underline the need to promote gender-responsive programming and implementation for CSA initiatives.

Many training and technology-promotion programs are designed to intervene at the level of community groups or cooperatives, and they often require or encourage a level of cooperation between individuals and groups, as well as with government programs and market agents. Some programs explicitly acknowledge and identify differences in the technology needs of male and female farmers (Swaziland's Ministry of Agriculture takes this approach) (Perch and Byrd 2015).

Policies and institutions related to market structure, intellectual property rights, and investments in education, training, and research capacity directly shape both the creation and diffusion of new agricultural technologies, including those that can help farmers mitigate or adapt to climate change. Almost all CSA activities assume that individuals or groups can make decisions about how to use land, forests, water, and other resources (property rights) impinging on the use of agricultural technology, which often is not the case. A detailed understanding of the institutions concerned can help ensure that CSA programs are truly inclusive and gender equitable when it comes to developing and diffusing technology for CSA.

Insurance

The role of informal insurance institutions, such as social and familial networks, in cushioning against shocks has been widely documented.[31] These social institutions are capable of dealing with some idiosyncratic shocks like illness, yet complex shocks arising from climate change are expected to overwhelm these more traditional insurance systems. For climate shocks that affect a whole community, a local group or network probably cannot provide adequate insurance, because all members will be affected. Another consideration is that climatic and nonclimatic stressors and changing trends can disrupt social networks and informal "insurance schemes," especially among certain members of society (the poorest, the elderly, women, and female-headed households).[32]

In these scenarios in which complex climatic and other shocks are at work, public programs (disaster risk

[29] See, for example, Doss (2001); Berti, Krasevec, and FitzGerald (2004); World Bank (2009); and Momsen (2010).

[30] For example, a project promoting maize-bean intercropping in Zambia found that women were reluctant to adopt the intercropping system because they feared losing control over bean cropping and their entitlements to the beans. They worried that household food consumption and nutrition would suffer if their husbands sold the beans for cash and used the income either for themselves or to purchase nonfood items.

[31] For examples from the Philippines, see Quisumbing, McNiven, and Godquin (2012).

[32] For a detailed analysis from Mozambique, see Osbahr et al. (2008).

reduction and social protection programs, as well as insurance programs; see the examples in boxes 18.20 and 18.21) will become increasingly important, especially for groups considered to be vulnerable or marginalized. Insurance packages will need to be tailored to different groups of clients (men and women, with or without a guarantee). Hybrid models and innovative institutional arrangements to provide financing and insurance will also be needed. Experimental models, for example in Ethiopia,[33] are attempting to link insurance and credit providers, and the state is playing an active role in encouraging private sector involvement. In the future, it seems likely that such hybrid institutions will need to be involved to deliver financing and insurance products catering to the specific needs of small-scale producers, including women.

KEY INSTITUTIONS IN CSA AND THEIR ROLES

Increasing evidence shows that fundamental constraints to, and opportunities for, women's livelihood strategies and adaptive capacity are linked to the assets they possess and their degree of access to income, common property resources, and social capital (including networks and institutions), mediated by their socially defined rights and responsibilities (Quisumbing et al. 2015). Gender and social differences are dynamic and nuanced within communities; a greater understanding of these differences is critical for climate-smart smallholder agriculture programming. Understanding how these differences affect risk perceptions, weather and climate information needs, and the communication and investment strategies pursued by women and men in their interactions with a wide array of institutions is therefore critical to reaching the most marginalized groups.

For all of these reasons, CSA cannot be the purview of ministries of agriculture or environment alone but should engage gender bureaus and other ministries, as well as other actors and groups that are more likely to have the infrastructure for engaging with women farmers and producers and to address issues of gender in general. In parallel, it will be vital to understand the different levels of trust and engagement exhibited by men and women with respect to the public and private institutions they turn to for support and guidance. The sections that follow review the key institutions that are likely to be involved and their respective roles. The Climate Change and Gender Action Plan for Bangladesh, described in box 18.22, provides a good example of a comprehensive framework incorporating all stakeholders and key functions required for gender-responsive CSA.

Public Sector Institutions

Crucial governmental actions that support CSA include the enactment and enforcement of conducive agricultural policies; the improvement of relevant infrastructure and the distribution of incentivizing agricultural subsidies; and the provision of pertinent weather-related information, as well as weather, climate, and extension services (Reid et al. 2010; Swanson and Rajalahti 2010). In this context, pro-poor governance and tenure of natural resources are essential, given that access to, and management of, natural resources play key roles in climate adaptation strategies. Promoting tenure, access, and control rights, often through the mediation of development agencies or NGOs,[34] is crucial for communities that depend on natural resources to adapt climate-smart approaches to agriculture successfully.

A comprehensive review of the national policy mix[35] can disentangle whether the existing national frameworks:

- Address climate change as a threat multiplier (including the threat of gender inequalities).

[33] See the Agricultural Technology Adoption Initiative website, "Interlinking Weather Index Insurance with Credit to Alleviate Market Failures and Improve Agricultural Productivity in Ethiopia," http://www.atai-research.org/projects/interlinking-eather-index-insurance-credit-alleviate-market-failures-and-improve-agricultu.

[34] See the CARE Pathways website, "Ensuring Women's Access to Land and Forest Resources: Stories from CARE's Pathways Program in India," http://www.carepathwaystoempowerment.org/country-focus-update-pathways-india/.

[35] For example, a comprehensive review could include national plans/acts related to agriculture, livestock, environment, energy, wildlife, forestry, the national strategy for climate change (to be implemented, for example, through a National Adaptation Program of Action, National Action Program, Nationally Appropriate Mitigation Actions, and National Agricultural Innovation Projects, and so forth), national REDD+ strategy, land policy, family law, and others (see Perch and Byrd 2015). For example, a review of National Adaptation Programs of Action (NAPAs) highlights that while all African NAPAs mentioned and gave priority to poverty, the treatment of gender inequalities as a key factor in adaptation capacity was treated less consistently and often assigned less priority. The same study also noted the limited attention given to gender in mitigation activities, particularly those focused on rapidly reducing carbon emissions (Perch, 2011).

Box 18.20 The R4 Rural Resilience Initiative–Impacts on Gender

The R4 Rural Resilience Initiative (R4), a strategic partnership between the World Food Programme and Oxfam America, is a comprehensive risk management approach to help communities become more resilient to climate variability and shocks. R4 currently reaches over 31,000 smallholder farmers in Ethiopia and Senegal through a combination of four risk management strategies: **improved resource management** through asset creation (risk reduction), insurance (risk transfer), livelihoods diversification and microcredit (prudent risk taking), and savings (risk reserves). Often women and women-headed households are the most vulnerable groups in rural communities. Recent studies have highlighted the impact of R4 on their food and income security.[a]

In *Ethiopia,* an impact evaluation showed that insured female-headed households increased their agricultural investments, spending more on hired labor and oxen compared to other insured farmers and the uninsured. These households decreased the amount of land that they sharecrop out. "Sharecropping out" land is a significant obstacle to improving livelihoods, as the person who farms the land retains one-half or two-thirds of the yields. Sharecropping out land is more common among female-headed households, which are more likely to lack the oxen and labor needed to cultivate their own land. Across all districts, and more than all other groups, insured female-headed households increased the amount of improved seed planted and the total amount of compost applied. They also took out an increasing number of loans.

In Senegal, a study conducted by the Institute of Development Studies found that R4 benefits women farmers by contributing to their access to productive assets, as well as by supporting women's savings groups through the Saving for Change program, a cornerstone of the R4 initiative in Senegal. Women claimed that they felt empowered: In addition to having increased access to land, seed, and water for irrigation and drinking, they benefited from training in numeracy, literacy, and business. Having more food and water available also meant that they no longer had to travel far from home to fetch water, with consequent gains in terms of time dedicated to their children or small businesses. The study found a reduction in stress as women became more confident about their ability to feed their families, as well as pay school fees and other expenses through small financial gains from selling their surplus crops.

Some of the best practices developed through the R4 initiative include the following:

- Equal participation of men and women in Community-based Participatory Planning and management committees at the village level, leading to better targeting and more accurate identification of needs
- Inclusion of activities that explicitly target women and improve their economic opportunities, such as the development of vegetable gardens, the expansion and improvement of rice cultivation, and the creation of savings groups
- Inclusion of men in activities traditionally reserved for women, such as the savings groups, which can increase and stabilize a household's resources

Source: Azzurra Massimino (WFP).

[a] WFP and Oxfam America, R4 quarterly report (July–September 2014). https://www.wfp.org/content/r4-rural-resilience-initiative-quarterly-report-jul-sept-2014.

- Reflect socioecological intersections (taking into account both biophysical and human aspects, including gender relations).
- Identify cross-linkages and encourage convergence and coherence across policies.

The limited ability of macrolevel policies in isolation to translate into tangible benefits on the ground suggests that greater government attention to gender and CSA is necessary. Yet government-provided advisory services and climate information—which often advocate technologies that are unaffordable or offer significant barriers to entry (Warburton et al. 2011), particularly for women smallholders—can be ill-suited to local agro-ecological conditions and ignore the processes through which local people evaluate and make decisions (Newsham and Thomas 2011). The complementary roles of other actors and multistakeholder partnerships in general need further exploration as part of the strategy for integrating CSA and gender considerations into public policies.

Policy frameworks that enable coherence and convergence across gender, climate, and agriculture should be

Box 18.21 Gender-Sensitive Social Protection and Climate-Smart Agriculture

Social protection programs are critical elements of poverty alleviation strategies. They include social assistance (for example, in the form of cash transfers, school feeding, food-for-work) and social insurance (such as old age and disability pensions and unemployment insurance). Evidence from Latin America and emerging from sub-Saharan Africa[a] shows that such programs have clear, positive impacts on food security, human capital, and the economic and productive capacity of labor-constrained communities (The Transfer Project 2014).

Access to social protection has proved to be effective in protecting the poor from the effects of shocks, including the adverse effects of climate change. Social protection programs can reduce the need to resort to negative coping strategies, such as selling of productive assets, reducing the amount and quality of food consumed, dropping out of school, avoiding productive investments, and overexploiting lands and forests. These programs can also help build capacity.

Social protection approaches are good ways to promote women's economic empowerment and reduce inequalities. Evidence shows that social protection schemes can facilitate women's access to resources and promote their role as decision makers in the household, as well as in natural resource management. These outcomes do not happen automatically, however (De la O Campos 2015 [Forthcoming]). Asset transfer schemes and public works programs must include an analysis of women's capacities and needs with respect to resources and skills development. Integrating social protection approaches with other livelihood-focused programs, including CSA initiatives, has even greater potential than any of these approaches on their own (FAO 2015).

The design of social protection policies and programs with links to CSA creates opportunities to have greater impact, including the following:

- **Reaching out to rural women** to enhance their role as natural resource managers and as mothers and caretakers
- Enhancing **financial and human capacity to invest in adaptation measures** and more effective natural resource management
- **Multidimensional targeting** to include economic, social, and environmental risks and vulnerabilities as criteria, such as overlapping income poverty, food security, and climate-risk maps
- Linking social protection **management and information systems** with climate-related early warning systems, to promote timely and flexible responses when severe weather events strike
- Designing public works programs aimed at increasing incomes, while generating **"green jobs"** in waste management, reforestation, and soil erosion prevention
- Linking social protection to **key financial services** such as credit and weather insurance to reduce uncertainty and impacts related to climate variability

Source: Natalia Winder Rossi (FAO).

[a] For information on the impact of national social cash transfers in Sub-Saharan Africa, see the website for the FAO-UNICEF From Protection to Production Project, http://www.fao.org/economic/ptop/home/en/.

widely encouraged.[36] Some already exist, such as Mozambique's Gender, Environment, and Climate Strategy, which identifies linkages, trade-offs, and risks as well as synergies that could deliver a one-stop package of services for beneficiaries (Perch and Byrd 2014). Another example is the Climate Change and Gender Action Plan (CCGAP) for Bangladesh, described in box 18.22.

Future work should aim to strengthen planning at the country level, ensuring that it is in line with national initiatives and building on existing structures at the national and county level. In addition, harmonization among investors and development partners is needed to mainstream gender-responsive CSA into national programming, budgetary processes, and prioritization of investments with adequate governance mechanisms in place.

Collective Action Institutions: Farmers' Unions, Cooperatives, Local Groups, and Civil Society

Research shows that women producers see farmers' organizations and groups as important support structures for adopting practices and approaches to CSA, particularly when such groups build understanding, foster dialogue, and support

[36] As successfully promoted by IUCN; see http://genderandenvironment.org/works/climate-change-gender-acton-plans-ccgaps/.

Box 18.22 The Climate Change and Gender Action Plan for Bangladesh

The Climate Change and Gender Action Plan for Bangladesh (CCGAP), developed jointly by the International Union for Conservation of Nature (IUCN) and the Government of Bangladesh, provides a comprehensive framework for policies and initiatives for the full range of relevant government structures, development partners, NGOs, research institutions, and the private sector to address climate change in a gender-responsive manner. The CCGAP is aligned to four key pillars of Bangladesh's Climate Change Strategy and Action Plan (2009): (i) Food Security, Social Protection, and Health; (ii) Comprehensive Disaster Management; (iii) Infrastructure; and (iv) Mitigation and Low Carbon Development. The table lists CSA-specific interventions of the CCGAP.

CSA-specific interventions of the CCGAP	
By public institutions, development partners, and the private sector	• Making agricultural extension services more gender-responsive, working in collaboration with government, NGOs and the private sector • Leasing land/water bodies to women, providing crop insurance and/or other safety nets for female farmers, and access to financial instruments
By research institutions	• Promoting research on different agricultural products and their impact on the livelihoods of women, research on climate-resilient crops, cropping patterns, and varieties responsive to the needs of women • Establishing a "Climate Field School" for women farmers and incorporating gender considerations in the development of new agricultural technologies and promotion of CSA practices, such as alternative fodder/food for livestock (for example, paddy/grass varieties that tolerate saline soils); new poultry and cattle genotypes; introduction of mulching practices; wet resources utilization; and homestead plant nurseries • Documenting, disseminating, and promoting indigenous knowledge and practices applied by women
By local community groups and NGOs	• Developing financial literacy of women and linking women to markets through ICT-based approaches • Establishing ICT centers at the community level (information hubs), solar powered radio/TV with special programs aimed at easy access for women

Source: Based on MoEF (2013).

negotiation to help mitigate exclusionary pressures.[37] These collective action institutions are important partners for promoting the adoption of CSA-related practices by

- Actively leading their members to embrace CSA principles and practices
- Being strong information and service providers, and serving as "CSA platforms"
- Serving as policy advocacy groups to influence national CSA-related decision making and policies, and ensuring that the priorities of smallholders are adequately represented in research and agricultural extension agendas
- Taking a role as value-chain actors and developing partnerships with private companies or establishing specific support mechanisms, often with external funding

Empirical evidence highlights the importance of collective action not only in facilitating the adoption of many agricultural technologies or natural resource management practices (Meinzen-Dick et al. 2002) but in facilitating risk pooling (McCarthy et al. 2000, 2004) and enabling people to build resilience by accumulating assets that help them withstand shocks (Di Gregorio et al. 2008). Particularly for women, participation in a group may be one mechanism for protecting or enhancing assets. Research consistently shows that groups and community-based institutions represent a key strategy for adapting to climate change, primarily as a tool to facilitate asset development through group purchases of large farm appliances (physical capital), group loans (financial capital), or capacity development (human capital). These results also underscore the degree to which women's and men's adaptive approaches are intertwined as interdependent members of a household. Effective partnerships and collaboration with local groups and institutions, applying a participatory community-led development

[37] See Ratner, Halpern, and Kosal (2011); German et al. (2012); and Komarudin, Siagian, and Colfer (2012).

approach (Thematic Note 4), can therefore generate substantial synergy to accelerate men's and women's adoption of the promoted CSA practices.[38]

FFSs are another approach for catalyzing farmer innovation and experimentation and boosting adoption, while ensuring input quality improvement and profitable output marketing. By their very nature, FFSs are inclusive and participatory. When done effectively, farmer led demonstrations and field schools institutionalize the process of experiential learning in the community.

It is important to highlight that women's livelihood strategies and adaptive capacity are related to the extent to which they interact with and benefit from social support institutions, including those provided by NGOs. Formally registered organizations that work beyond the local context, rather than solely within the village, often provide support primarily to men (Perez et al. 2014). Research also indicates that men and women commonly depend on different kinds of social relations or networks: men tend to rely more on formal relationships, while women rely more on informal relations, often forming stronger kinship and friendship relations than men (More 1990; Agarwal 2000; Riddell, Wilson, and Baron 2001; Molyneux 2002).

CSOs offer the potential for smallholders to join together to gain economies of scale and bargaining power, but they often exclude certain actors through such mechanisms as culturally rooted gender biases, unaffordable financial requirements for participation (monetary or in-kind), and differentials in power and social links (Mwangi, Markelova, and Meinzen-Dick 2012). Collaborative work between NGOs and CSOs has considerable potential to exercise influence by using their collective political voice to express local climate concerns to higher authorities and demand the provision of specific measures or services. For example, Swaziland's Gender Consortium, operating since 1995 and managed by the Co-ordinating Assembly of Non-Governmental Organisations, involves several CSOs—the Gender and Family Unit linked with the UN Thematic Group—and has facilitated coordination at the project level and sharing of experiences and good practice across a number of actors.[39]

Research Institutions

National agricultural research and extension services, along with universities and other research institutes, are critical for producing information and technology that improves smallholders' livelihoods and practices (Swanson and Rajalahti 2010). When research and innovation in agriculture and natural resource management ignore gender relations, they have a limited impact and heighten the risk that poor rural women and men and their families will experience worsening poverty, workloads, and well-being. In contrast, when institutions apply a gender lens to the development of technological innovations,[40] they can design and scale out agricultural innovations that deliver equitable benefits to poor women and men.

It is necessary to generate solid, locally appropriate evidence that is connected to the body of international climate science that can show how and why gender in climate change is a problem, requiring integration into development and investment decisions. In practice, this process may follow a linear sequence of stages, starting with raising awareness, developing scientific capacity, generating evidence, and conducting pilot studies to inform and engage decision makers in policy and investment planning. The process may also involve more back-and-forth exchanges, with practice identifying research gaps in gender and CSA. The point is that research, practice, and policy must be fully integrated so that knowledge attained through "learning by doing" is consistently communicated across the various communities of practice dealing with CSA.

The role of the research community (global and national) is therefore to meet the information needs of the policy community so that evidence from research can be transmuted into policy. For example, by supplying empirical evidence on the socioeconomic costs and benefits of CSA, the research community may help policy makers to devise ways of encouraging various stakeholders (including farmers) to take action in favor of CSA. Research on the socioeconomic costs and benefits of CSA implies the collection and analysis of sex-disaggregated data on vulnerability to the multifaceted impacts of climate change, as well as on the gender-differentiated impacts and share of benefits from employing CSA approaches.

Regional entities (for instance, the Food, Agriculture, and Natural Resources Policy Analysis Network)[41] work across countries with national research systems and other institutions. They can also succeed in creating links and fostering dialogue between researchers and policy makers through

[38] See also Shames et al. (2012).

[39] See https://cangoswaziland.wordpress.com/gender/.

[40] As discussed in Malhotra et al. (2009).

[41] See http://www.fanrpan.org.

annual policy dialogues as well as through a community of practice involving all stakeholders.

Female scientists are an important element of the research community and may require support. For example, the AWARD program (http://www.awardfellowships.org/) equips top women agricultural scientists across sub-Saharan Africa to accelerate agricultural gains by strengthening their research and leadership skills, through fellowships designed to meet their specific needs and research goals.

The Private Sector and the Role of Markets

Because much of the climate-related information and many services linked to CSA can be considered a public good and common pool resource, the private sector may not have an immediate interest in providing them. Even so, a growing number of private extension services are offering advice on agricultural or livestock inputs and marketing, and these stakeholders are becoming increasingly important in facilitating options for CSA.

Private firms become involved in crop, livestock, and agroforestry production where private benefits can be captured (for example, through sales of improved seed, machinery, or inputs). Because a certain amount of capital is often needed to transition to new, climate-smart practices, private institutions providing equitable access to microfinance for small-scale producers (including women) can also be a promising entry point for private participation in facilitating CSA.

Markets can play a coordination function for CSA, ranging from local to global. For example, seed of new varieties can be privately distributed through markets, and carbon markets and other mechanisms can provide payments for environmental services. The answer to the question of when market institutions (rather than state or collective action institutions) are appropriate depends not so much on the scale of the market but on issues of transaction costs, as markets tend to favor large-scale producers over small-scale producers.

Innovative extension models, like the network of agri-kiosks promoted by CARE International in India,[42] are designed to close the gap between agricultural input supply and demand in remote villages, and they also serve as information hubs. The agri-kiosks, run by local entrepreneurs, seek to ensure access to inputs of acceptable quality at affordable prices and in a timely manner, particularly for collectives of female farmers. The agri-kiosks are accountable to the collectives and allow farmers to make purchases on credit, to be repaid after the harvest.

Programs that support CSA interventions can develop a wider enabling environment for CSA by supporting links with business leaders and taking into account the market situation within relevant areas and landscapes. Such programs should focus on aligning the incentives for farmers and supporting linkages between consumers and producers at different scales. Systems-level thinking needs to be applied, taking into account farm and landscape CSA, value chain assessments, and actions that enable climate-smart development, more gender-equitable transactions, and markets that support these CSA efforts (Chesterman and Neely 2015).

CONCLUSIONS

It is critical to assess the institutional and organizational context in which CSA interventions will operate,[43] to include the entire range of stakeholders, and to strengthen their capacity. When relationships and linkages between people and organizations that form the institutional context are properly understood, opportunities for scaling up impacts and lessons are more likely to arise. The "Intermediate Level Handbook" produced by FAO's SEAGA Programme provides a strong framework and tools for socioeconomic and gender analysis, with an emphasis on the institutional and organizational context (FAO 2001). Similarly, the CCAFS "Gender and Inclusion Toolbox" provides a wide range of participatory strategies and tools to guide the planning of CSA interventions and gender-responsive and socially inclusive climate change programs.[44] For transitioning to CSA at all levels, an evidence-based approach may be useful, in which scenarios are developed to make gender trade-offs explicit.

To align the various goals of CSA and mainstream gender-responsive CSA in overarching national plans, appropriate

[42] See http://www.carepathwaystoempowerment.org/portfolio-view/india/.

[43] See IFAD (2014) for guidance.

[44] Jost, Ferdous, and Spicer (2014). The Toolbox builds on the Local Adaptive Capacity framework developed by the Africa Climate Change Resilience Alliance (http://community.eldis.org/accra/), exploring how existing disaster risk reduction, social protection, and sustainable livelihood interventions affect adaptive capacity at the local (household and community) level, through five characteristics of adaptive capacity: the asset base; knowledge and information; institutions and entitlement; innovation; and flexible, forward-looking decision making.

institutions with effective and transparent governance structures are needed to coordinate the division of sectoral responsibilities and collaborate with the national and local institutions described in this Thematic Note. Such efforts must go beyond gender sensitivity and practical gender needs to include innovation and comprehensive legal and policy reform to tackle such issues as women's lack of tenure security, decision-making power, and control over resources. To change behavior and provide incentives for the adoption of gender-responsive CSA, national regulations must be tailored to each country's particular environmental conditions and accompanied by other supporting incentives.

Local institutions are central to the scaling up and sustainability of interventions in the long term. CSA must be developed in full consideration of local dynamics, within existing social and cultural norms. Targeted efforts must be undertaken to ensure better understanding of the socioeconomic and biophysical context and constraints that inform men and women farmers' decisions, with their authentic engagement, keeping in mind the trade-offs and potential conflicts occasioned by climate change and CSA adoption (Chesterman and Neely 2015). An important goal is to understand the extent to which social institutions are inclusive, because not all collective action institutions promote gender equity. Policy makers and program designers should make particular efforts to include the voices, interests, and needs of all segments of the affected population to inform project design and implementation. Persistent institutional and gender-related gaps can be addressed through mechanisms and processes for policy dialogue.

Finally, the complementary roles of government and community-level institutions, civil society, research and academia, the private sector, as well multistakeholder partnerships in general need to be explored further to identify opportunities to mainstream gender into CSA policies. To promote the adoption of gender-responsive CSA practices, local institutions will probably need to take on new roles and responsibilities as network brokers, facilitating access to resources and information (Meinzen-Dick, Bernier, and Haglund 2013).

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Harnessing Information and Communication Technology for Gender-Responsive CSA

Information and communication technology (ICT) can support efforts to cope with an increasingly uncertain climate, including more frequent extreme weather events and more variable rainfall patterns, and the resulting effects on agriculture. Aside from providing historical climate pattern information, ICT can deliver updated and timely information on weather and on recommended agricultural practices and technologies through services such as enhanced early warning systems, improved forecasting, and wider options for adapting to weather changes (CCAFS 2015; Coffey et al. 2015).

Despite these opportunities, in general, access to, ownership of, and control and use of ICTs remain much lower for women than men in developing countries (Huyer 2012). Reasons for this disparity include a lack of financial resources to secure the use of ICTs, higher levels of technological and language illiteracy among women and girls, and norms that discourage women and girls from using technology (World Bank 2011). Patterns of unequal access to climate information and agricultural advisory services exist within communities, depending on who can or cannot use services to manage climate risks and improve resilience to the changing climate at the farm level. In South Asia, the farmers with the greatest exposure to climate change stresses are resource-poor, female, and lower caste, marginalized by community sociocultural norms, and invisible to many outsiders (Tall et al. 2014a).

Historically most countries have relied on public extension services to deliver agricultural information to small-scale farmers, but often these services (especially in Africa and Asia over the past two decades) have lacked the human and financial resources to effectively support millions of farmers, and female farmers have been particularly neglected (Manfre et al. 2013). Smallholder farmers and agricultural development stakeholders increasingly rely on ICTs to disseminate and access information. ICT-based approaches offer great potential for disseminating information about agricultural development opportunities and facilitating women's increased engagement in each of the following areas: (i) decisions about agricultural production; (ii) access to and decision-making power over productive resources; (iii) control over use of income; (iv) leadership in the community; and (v) time use (Huyer 2012). These areas correspond to the five domains in the Women's Empowerment in Agriculture Index (WEAI), which measures women's empowerment and status in agriculture and tracks changes in empowerment over time (Alkire et al. 2013).

To reach women in agriculture, ICTs need to address gender constraints and priorities. For example, women's information networks are often smaller than men's, so they offer fewer opportunities for learning about new productive and commercial opportunities (Sebstad and Manfre 2011). Gender-specific climate services will need to take into account women's agricultural tasks. Climate information and advisory services needed by women farmers in Senegal, for example, include forecasts of rainfall cessation (rather than onset) and dry periods. The communication channels required to reach the most marginalized groups will differ depending on sociocultural differences. In Senegal the communications channels useful to women farmers were SMS messages in the local language, forecasting blackboards, information broadcasting at public places where women gather (boreholes) or at the mosque where their husbands meet every day, and through community radio and chatterboxes (Tall et al. 2014b).

A study of the use of ICT by women and men farmers in Kenya found clear gender differences in access to information. Women were more likely to have stronger relationships with people who were accessible in places they frequented the most: the farm, house, and local market. They consulted with local extension officers, neighboring farmers, input dealers and buyers, and also their husbands. The extension agent was reached by phone. Radio and TV were convenient

because they could be listened to while doing household chores.

These findings, along with research in other regions, indicate that mobile phones may not be the best way of reaching female farmers (GSMA mWomen Programme 2012). More men than women tend to own mobile phones, whereas women tend to "borrow" mobile phone access from friends and family. A range of community information strategies, such as radio and community organizations, may be more effective in reaching women directly.[45]

In Kenya, men's sources of information included and went beyond women's information sources, reflecting their greater mobility and interaction with a wider range of agricultural actors. Men farmers attended seminars and field days and interacted with vendors at agricultural shows. They consulted literature such as magazines and brochures, while a few consulted the Internet. For men, lack of access to information was not an issue. Instead, several hinted at a greater challenge—sifting through the vast quantity of information to find what is useful (Manfre and Nordehn 2013).

ICTs can bring together private communication and agricultural technology companies, meteorological agencies/climate services, civil society, farmer organizations, researchers, and nongovernment and government services. Impact—particularly in the context of a changing climate—will occur when the information being disseminated responds to the rapidly evolving needs of all farmers: young, old, female, male. Information on improved technologies and practices, weather forecasts, and a better understanding of long-run climate trends will be most valuable when it is easy to understand and promotes climate-smart technologies that are available and affordable to local communities (see box 18.23). This presumes an information environment where one piece of information is embedded in a web of supporting information, including, for example, how to access inputs and equipment. To form the basis of coping and adaptation strategies to climate-induced change, new information must also fit into smallholders' existing decision-making frameworks (in other words, it must take advantage of men's and women's knowledge and past experience, such as their familiarity with local rainfall patterns and soil types) (Agrawal 2002; Lambrou and Nelson 2010). Farmers use these frameworks to evaluate information and incorporate it into their production practices at levels appropriate to the perceived risks and benefits. The greatest success is achieved when a two-way flow of information is established, and farmers can interact using different formats, asking questions and progressively increasing their understanding through practice (McOmber et al. 2013). To be really successful it is essential that the specific needs of, and strategies to reach, a large proportion of farmers—women—are adequately addressed.

This Innovative Activity Profile summarizes the experience with several ICT-based and gender-responsive CSA investments.[46] These initiatives can be considered for scaling up or replication, and interested task managers and technical experts might want to further explore and adopt some of the lessons learned in their own project designs.

Box 18.23 Principles for Successfully Delivering Information to Farmers

Studies by CCAFS[a] suggest that for knowledge to lead to changes in farmers' practices, such as the adoption of CSA, it should be as follows:

- ***Salient.*** Tailoring content, scale, format, and lead time to farm-level decision making.
- ***Legitimate.*** Giving an effective voice to both men and women farmers in the design and delivery of climate and agricultural services and through continuous interactivity (being able to call in or text their questions).
- ***Equitable.*** Engagement, capacity, and communication strategies are needed to ensure that women and poor and socially marginalized groups of men and women, boys and girls, have access to and can use available climate and agricultural services.
- ***Integrative.*** Agricultural and climate information should be delivered as part of a larger package of agricultural support and development assistance, enabling farmers to act on received information.

Source: Tall et al. 2014.
[a] The CGIAR program on Climate Change, Agriculture, and Food Security.

[45] See GSMA Development Fund (2010); Okello (2010); and Manfre and Nordehn (2013).

[46] See Huyer (2012) and Steinfeld and Wyche (2013) for other examples of gender-responsive ICT-based approaches to agricultural development across a range of countries.

SHAMBA SHAPE-UP, I-SHAMBA, AND AFRICA KNOWLEDGE ZONE

Since 2012, many partners[47] have been working with Mediae, makers of the farm reality ("edu-tainment") television program call Shamba Shape-Up (*shamba* is Swahili for "farm") to test the idea that information on improved and climate-smart agricultural practices can be disseminated widely using a popular ICT-based format. By 2014, Mediae had produced four series, each composed of thirteen 30-minute episodes (in English and Swahili). An increasing amount of content on climate-smart agricultural practices has been included, sourced directly from scientists in the CGIAR, in collaboration with their partners in government and private research and extension.

As well as the weekly TV broadcasts in Kenya, Tanzania, and Uganda, each episode can be viewed (in English and Swahili) on the Shamba Shape-up website,[48] and clips are featured on Africa Knowledge Zone.[49] Viewers can send an SMS for a leaflet that includes pictures and simple instructions on the farming techniques highlighted. The show's Facebook site, where farmers share experiences with different practices, is the biggest and most rapidly growing farming social media site in East Africa, with thousands of followers. Of the 26 episodes in 2013, 16 (62 percent) featured climate-related content, reaching more than 3 million viewers per episode and generating over 30,000 requests for more information by mail.

A recent impact evaluation of Shamba Shape-Up by the University of Reading's Statistical Services Unit found that most viewers reported that the program has helped them improve the profitability of their enterprises, with a positive effect on their families' food situation. They found that over 200,000 households were making changes in their maize farming practices and over 65,000 in their dairy practices as a result of watching the program. They estimated the overall net economic impact at $25 million, mostly from dairy enterprises (in which women are actively involved).

Each show features female farmers, their needs, and priorities (each segment is available online as a short video clip as well). The program is timed to broadcast on Sundays, when women are typically home with their families. Female "experts" are featured as often as male ones. The program's use of cellphones and social media is intended to reach young people and strengthen their engagement in agriculture to stem the high flow of young people to cities where jobs are scarce.

It is proving challenging to move toward a system in which both men and women farmers can ask questions and thus drive the content of the shows, including practices and technologies described in different environments for specific target groups, cultures, and agricultural systems. Mediae has set up a call service for the show's sponsors (private suppliers of agricultural inputs, or representatives of the national agricultural research system) to respond to viewers' requests for information on particular technologies or management strategies. Interactive radio, backed up by ICT services, may be a good option (box 18.24). Another option is to empower government agricultural extension officers with smartphones to connect to a broad agricultural knowledge system from which they can share video clips and request leaflets for their client farmers.

Gender-Responsive Agricultural Advisory Services

Regardless of the specific combination of technologies used to convey information on CSA, attention must be paid to gender issues to ensure that women participate fully at all levels. A serious stumbling block is that so few women are extension agents. Better incentives are still needed for governments to train and hire more female extension officers. The Community Knowledge Worker initiative in Uganda illustrates other barriers faced by women in agricultural advisory services. The project trained local people to act as agricultural information mediaries ("infomediaries") in their communities and wanted to include women, but it proved difficult to identify women who met the minimum educational, language, and literacy requirements to perform that function. The project could have adjusted its requirements to enable women who already had knowledge and communication skills to participate, but it would also have to overcome another barrier: the limits on women's time. Women's higher labor demands in the field and household left little time for training and infomediary activities (World Bank 2011). More encouragingly, other farmer-to-farmer extension approaches have been both gender-responsive and more successful. They include "volunteer farmer trainers" in Kenya, Uganda, and Tanzania in agricultural development projects (such as the East African Dairy Development Project) and approaches used by the African Forum for Agricultural Advisory Services (Kiptot and Franzel 2013). Box 18.25 describes how tablets are used to provide advice to women on plant health.

[47] Including CCAFS, the U.S. Agency for International Development (USAID), and IFAD.

[48] See http://www.shambashapeup.com/.

[49] See http://www.africaknowledgezone.org/.

Box 18.24 Interactive Radio for Delivering Climate Services

In Tanzania and Malawi, Farm Radio International and Farm Radio Trust, together with CCAFS,[a] interviewed over 1,280 male and female farmers and pastoralists to assess the potential for interactive radio to deliver climate services. Farmers and pastoralists rated radio and mobile phones, commonly used in both countries, as having great potential to be effective, trusted channels for climate information. They preferred radio programs, backed by ICT services, and the information they valued the most was information on rainfall patterns and temperature, as well as forecasting services. Women and men had different habits with respect to the amount of time spent listening to radio and in mobile phone airtime purchased—women were more interested in radio listening clubs than men. With some local exceptions, more men owned cellphones than women, while women borrowed cellphone time from friends and family. The gender differences in preferences about information content, delivery channels, or expectations about use and benefits were not as large as expected, however. Farm Radio International and Farm Radio are now developing interactive radio programming for climate services that will respond to farmers' ongoing climate information needs. Engaging male and female farmers and local radio stations in program design, broadcast, monitoring, and evaluation is key. Short weekly radio programs will be broadcast, with the option of daily forecasts or interpretations, together with ICT services via mobile phone.

Source: Hampson et al. 2015.
[a] The CGIAR program on Climate Change, Agriculture, and Food Security.

Box 18.25 Using Tablets to Reach Women with Plant Health Advice

Plantwise, an initiative led by CABI, works with extension services in 34 countries around the world to give smallholder farmers access to high-quality advice on plant health issues. The program is piloting the use of tablets as an information resource for female and male extension workers wherever they are. The tablets enable extension workers to collect gender-disaggregated data in real time so that authorities can respond rapidly to emerging plant health problems. The tablets and data collected also make it possible to monitor numbers of male and female plant doctors trained, to understand the different needs of male and female farmers in accessing plant health information, to evaluate the effectiveness of Plantwise in reaching different types of farmers, and to analyze gender differences in access to plant health clinics, changes in farming practices, and livelihood impacts.

The geographic spread of plant pests and diseases is altered by climate change, and farmers and extension services face plant health problems they have never encountered. By providing extension workers with trustworthy information to advise farmers, the Plantwise Knowledge Bank enables communities to respond to new and unexpected threats and improve their climate resilience. This information can be especially important for female farmers, who generally have less access to information than their male counterparts and, in many countries, are often more vulnerable to climate change. The sex-disaggregated data collected by extension workers can strengthen adaptive capacity at a national level and permit the monitoring of differences in plant health issues experienced by female or male farmers. These data feed into national surveillance systems and allow governments to monitor new and emerging threats and respond quickly when a new pest appears. Data are also monitored to find out whether advice offered by female and male extension officers differs.

Source: Plantwise (http://www.plantwise.org).

Using ICT-based approaches that address gender inequality in access to ICT is challenging. The following steps have been suggested for developing and implementing ICT tools useful for women:[50]

- Define the target groups and subgroups.
- Identify the specific needs of men and women within these different groups/subgroups.
- Conduct a value-chain analysis and/or describe use case scenarios.
- Select or develop the ICT platform/tool.
- Consult and involve the target group(s) in designing the ICT platforms/tools.

[50] Based on an approach discussed in the *ICT in Agriculture e-Sourcebook* (World Bank 2011).

- Develop a business model for developing, promoting, and running the ICT platform.
- Develop a plan that ensures the continuity/sustainability of the tool/platform (World Bank 2015).

DIMITRA CLUBS: A GENDER-EQUITY APPROACH TO PROMOTE RESILIENCE TO CLIMATE CHANGE

FAO's efforts to improve rural populations' resilience to climate change include support for Dimitra Clubs, a gender-responsive, participatory communication approach. Implemented in Burundi, the Democratic Republic of Congo, Ghana, Niger, and Senegal, this approach improves access to information and encourages individual and collective action. Dimitra Clubs are mixed or separate groups organized by women, men, boys, and girls to bring about changes in their communities. The clubs facilitate an empowering process whereby rural populations, with a focus on women and young people, actively participate in community life. Aside from fostering social mobilization, the clubs raise women's and men's self-esteem, foster behavioral changes, and spur collective action to address local challenges and improve local livelihoods and food and nutrition security.

Dimitra Clubs take what they term a *gender equity* approach that promotes leadership and voice among the most vulnerable people. The goal is to catalyze transformative change at the individual, organizational, and institutional levels in rural areas by enabling rural women, men, boys, and girls to take ownership of their own development. Community radio stations provide access to knowledge and raise awareness about subjects requested by the clubs, such as agricultural practices, climate change, food and nutrition security, women's unequal workload, and access to water, land, sanitation, and health. Club members interact with each other or with other clubs through solar-powered, wind-up radio sets and solar-charged cellular phones.

Niger, for example, had established over 800 Dimitra Clubs by 2014, of which 240 (in Zinder, Tillabérry, and Tahoua) specifically sought to improve resilience to risks and respond to climate change while improving food and nutrition security. Through these clubs, communities pursue adaptation initiatives that include new village sanitation systems and tree nurseries, collective construction of stone barriers and bunds to conserve and restore soil, and small, community-managed cereal banks. The 1,200 active Dimitra Clubs in sub-Saharan Africa have significantly improved rural women's access to decision making at the local level. More than 300,000 rural women and men are estimated to benefit directly from the clubs and the changes they bring to their communities.

CONCLUSIONS AND LESSONS FOR WIDER APPLICATION

ICTs, like all technologies, must be adapted to ensure that different types of smallholders and other actors in the agricultural sector fully participate in their development, use, and benefits. As highlighted in the examples, for ICT-based initiatives to help, public investments and policies need to focus on electricity and mobile network coverage, regulatory reforms (to keep cellphone calls cheap, for example), business environment reforms that encourage innovation by private firms, and education and capacity building to enhance agricultural, technical, and financial literacy among smallholder farmers, particularly women (World Bank 2011).

Women's access to and use of ICTs is still seriously constrained in most developing countries. A recent ICT feasibility study of whether and how ICTs could be used to support agro-enterprises run and managed by women in Zambia and Kenya shared the following gender-related lessons (World Bank 2015):

- Subsistence farmers—men and women who sell produce locally and occasionally, when they have a surplus or need cash for an emergency or household expenses such as school fees—see little advantage to using ICTs (to market their produce, for example).
- In general, to acquire, use, and take advantage of commercial ICTs, female and male farmers need some capital, a regular income, or access to a project or program that funds or partially subsidizes the initial acquisition and use of the tools and software (see box 18.26). Lack of capital can be a particular barrier for women, who tend to have less access to resources, including capital.
- Costs of using ICTs are often too high for female and poor farmers and often unsustainable once project support ends. The introduction and use of ICTs can potentially increase the gap between poorer (often female) farmers and those who are already better off.
- The type and approach of ICT interventions matter if the goal is to reach the poorest. For example, market information services provided for a fee through a text messaging service to a personal smartphone may be well beyond the reach of many female farmers and the poorest households.

Box 18.26 Agricultural Advice through M-Kilimo in Kenya

M-Kilimo is an agricultural advisory resource being tested with support from the GSMA Development Fund and Rockefeller Foundation to learn about the potential for providing value-added agricultural services via mobile phone. The service was made available to all Kenyan farmers with a mobile phone, irrespective of network affiliation. Farmers obtain information via voice or SMS, with SMS lending itself to more concise messages such as agricultural tips, crop calendar reminders, market prices, government alerts, and weather reports; the voice service is used for questions and advice. Farmers can call the Farmer Helpline anytime between 7 a.m. and 11 p.m., seven days a week. Service is offered in several local languages in addition to Swahili and English. Questions tended to relate to four main topics: agricultural tips and efficient farming practices; questions on plant and animal diseases and treatment; agriculture-specific weather forecasts; and market price information. A study found that men own phones in Kenya at a much higher rate than women, which is reflected in the use of M-Kilimo services (women made up 31 percent of subscribers and 19 percent of regular users). The women who used the service regularly reported substantial benefits, including less tangible benefits such as greater respect from neighbors and pride in their farms.

Source: GSMA Development Fund 2010.

- The identification of information needs and development of content should also include information such as age, type and level of enterprise, value chain, household situation (polygamous, female-headed, number of school-age children, and other variables), as well as level of operation.

At the same time, the use of ICT-based approaches and services to better meet the needs of female farmers presents opportunities for improving gender equality. Aside from their direct benefits for participants in specific ICT programs, the technologies themselves (cellphones, radios, tablets) have "spillover" livelihood benefits. If a favorable enabling environment exists, ICTs can be a powerful means of facilitated innovation for gender-responsive CSA. Strategies for taking advantage of opportunities highlighted in the examples presented here include the following:

- Undertake a gender analysis. Collect gender-disaggregated data to better understand the differing needs, goals, resources, and risk management approaches and strategies of men and women.
- Develop entertaining and educational shows (in local languages) that engage male and female farmers, and local radio and TV stations, in program design, broadcast, monitoring, and evaluation.
- Work with the private sector and women's producer groups to develop technology and services that meet the needs and priorities of female farmers. Address resource constraints and poor incentives, and keep down the costs of using ICTs for female farmers.[51]
- Partially subsidize initial acquisition costs and use of any tools and software (for example, through discounted air time/text messaging).
- Work with women's producer and other groups, as collective ownership and management are often more sustainable options, but also invest in educating men about the wide range of benefits associated with ICT use.

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Using Impact Investment to Promote Gender Equality and CSA

The private sector's increasing involvement in sustainable development presents opportunities for investments that promote gender equality in CSA. *Impact investments* are made into companies and organizations to generate positive social and environmental impacts alongside a financial return, and they may turn out to be one of the fastest-growing segments of the global impact investment market. About 70 percent of impact investments have been made in emerging markets. This innovative investing mechanism is not exclusive to the private sector. Pension funds, foundations, publicly owned companies, and NGOs, among others, are also including impact investments in their actionable portfolio.

Investments within the context of "smallholder agriculture," "sustainable agriculture," or "CSA" face obstacles such as high risk and low returns, insufficient capacity and resources among farmers and agribusinesses, inadequate physical infrastructure, and fragmented value chains. An additional barrier to financing CSA is the time lag between investments and returns in terms of enhanced productivity and income. Innovative partnerships and financing models that combine diverse sources of funds could therefore be effective in tackling these challenges.

This profile describes the impact investment sector's potential for promoting gender and CSA. It introduces the basic features of impact investment and presents examples of investments geared toward climate change and/or gender equality. Note that the focus is on the potential of impact investment; the profile does not specifically discuss social enterprises.

CONTEXT

Impact investment can intentionally target enterprises focused on CSA, including social enterprises directly related to climate change adaptation (examples include weather forecasting, sustainable water and soil management, agroforestry, integrated pest management, and energy-saving stoves), as well as business models committed to the mitigation of GHG emissions.

The environmental impact of products is increasingly important to consumers. Compared to men, women tend to favor more environmentally friendly products and investments. According to the Morgan Stanley Institute for Sustainable Investing, female investors are more interested in sustainable investing than male investors (76 percent versus 62 percent). Female investors are also more likely than male investors to consider the impact of their investment in addition to the rate of return when making an investment decision. The majority of individual investors (65 percent) expect sustainable investing to increase in the future.

Enterprises addressing gender disparities as part of their core strategy offer enormous potential for financially sound and socially responsible investments. Using a gender lens to advance the CSA agenda can improve the financial and social outcomes of the investments in different ways. Evidence shows that approaches promoting gender equality can (i) support entrepreneurship by giving access to capital to both women investors and investees; (ii) promote greater gender equality in the workplace by investing in private companies that include women in leadership positions, their corporate board, their workforce, and their value chains; (iii) develop and offer products, services, and technologies to level the playing field and provide equal opportunities for all; and (iv) support social enterprises that are led and/or majority owned by women.

IMPACT INVESTMENT OBJECTIVES, CHARACTERISTICS, AND INNOVATIVE FEATURES

Similar to traditional types of investments, impact investments can be made into both emerging and developed markets, with a wide range of financial return expectations and

asset classes. Their main innovative feature is the *expressed intent to generate social and/or environmental impact*. Additionally, the impact is required to be measured to justify the existence of social investment.

Impact investments target social enterprises, bringing the private sector on board to contribute to local and global sustainable development. Socially conscious investments appeal to both professional mainstream and citizen investors. The motivation for sustainable, responsible, and impact-oriented investing varies according to institutional and personal values and principles, client demands, and the constituents of a program. Investments in emerging markets can also be attractive because of the size of the market and the population's increasing purchasing power. Impact investment also offer a new alternative to learn how emerging markets function, including business models and innovations that can lead to other investments in similar markets and serve to diversify a conventional investment portfolio.

Investors' legal status determines the action framework of investments. As an emerging tool to connect private capital to social and environmental causes, impact investment is used by an increasing number of philanthropic institutions such as nonprofit organizations, which carry certain operational restrictions given their legal status. The legal considerations are related to the management of the expected financial returns as well as the investors' nationality. Examples of innovative investment platforms offered by the nonprofit sector include the ones led by organizations such as Kiva, Acumen Fund, Portafolia, and Global Greengrants Fund.

Impact investments are required to provide credible performance data on the social and environmental impact. The Global Impact Investing Network[52] has developed performance metrics for investors to measure social, environmental, and financial success. In addition to enabling effective data analysis, impact measurement promotes accountability and transparency in the impact-investing field. The Global Impact Investing Rating System[53] offers rigorous, comprehensive, and comparable ratings of a company or a fund's social and environmental impact. The Finance Alliance for Sustainable Trade[54] has developed a set of core indicators to measure the social, environmental, and economic impact of investments in small-to-medium enterprises that are active in sustainable agricultural value chains. It also includes a set of indicators that capture core aspects of the financial relationship between the financial institute and the social enterprise. Providing clear, effective, and balanced information that takes into consideration risk and expected commitments is also a useful approach for reaching out to possible investors, partners, and other programs. It is important to mention that these tools include indicators to track and measure the investment's contribution to gender equality, and although the indicator list is not exhaustive, it is a promising starting point to be included in portfolio analytics and due diligence parameters.

WOCAN[55] has created a standard for development projects, W+, to measure positive impacts to women's social and economic empowerment. Projects that obtain satisfactory results are issued a W+ certificate, which enables project developers to sell "units" (at a price based on the project's impact on women's lives) to corporations, investors, or individual buyers, and make payments to women beneficiaries.

These types of investment often provide capacity development for targeted enterprises to compensate for the general lack of investment-readiness in low-income markets. Enterprises need to develop not only financial skills but a comprehensive understanding of funding options and investors' requirements; they must be able to demonstrate their potential for scaling up and ability to achieve financial and social returns. Public-private partnerships as well as philanthropic support are important for the development of technical skills and market commercialization, and they can play an important role in providing the enabling environment that facilitates capacity building. Calvert Foundation, for example, has partnered with Global Alliance for Cookstoves, a public-private partnership launched by the United Nations, to provide capacity building to develop specific technical needs of the investees and target audiences (box 18.27).

IMPACT INVESTORS WITH A GENDER-SENSITIVE APPROACH

Several impact investors adopt at least one gender-sensitive approach. Ensuring gender diversity on their boards of directors and in leadership positions is an established priority for investment programs such as the Pax Ellevate Global Women's Index Fund, the Morgan Stanley Parity Portfolio,

[52] See http://www.thegiin.org/cgi-bin/iowa/home/index.html.

[53] See http://b-analytics.net/giirs-ratings/.

[54] See https://www.fastinternational.org/en/node/59.

[55] Women Organizing for Change in Agriculture and Natural Resource Management (http://www.wocan.org/).

Box 18.27 The Calvert Foundation and Clean Energy Technologies for Women

Calvert Foundation's WIN-WIN invests in women in developing countries by connecting them with clean energy technologies. These technologies, which benefit women's health and the environment, are considered climate-smart. Since its establishment in March 2012, the foundation has made more than $20 million in gender lens investments in various sectors. It recently committed an additional $20 million to social enterprises and financial intermediaries that provide a range of clean energy opportunities for women. For example, the foundation invested in Envirofit, a producer and distributor of clean cookstoves and solar lighting products for impoverished communities in developing countries. Envirofit has registered carbon programs in Africa, Latin America, and India to manage, monitor, and verify their programs and expand their cookstove programs in other parts of the world. Envirofit has been able to impact more than 3.5 million livelihoods, create more than 1,000 jobs, and save more than 11 million tons of CO_2. At the household level, the stoves have reduced fuel costs by more than $96 million and saved 6.3 million working weeks in fuelwood collection.

The foundation has also partnered with the Global Alliance for Clean Cookstoves to provide technical assistance to social enterprises that develop and market these technologies. The foundation also supports Global Alliance's awareness-building work, standards, testing program, and research platform, all of which contribute to enabling the market and increasing demand for quality clean cooking technologies and fuels.

Individuals in the United States or brokerages can invest in the initiative. Investments vary from $20 to more than $1,000, with a financial return that goes from 0 to 3 percent, at terms of 1–10 years. This capital is pooled and then lent to social enterprises and financial intermediaries that focus on the intersection between access to clean energy and women's empowerment. The foundation monitors social and environmental performance annually through a Social Performance Measurement Report that incorporates industry-aligned metrics and best practices. The Calvert Foundation also follows the IRIS framework developed by the Global Impact Investing Network to provide a common reporting language for impact-related terms and metrics.

Source: Calvert Foundation.

and Barclays Women in Leadership Total Return Index. Investing in women-led companies and women entrepreneurs is the strategy of Texas Women's Ventures, Golden Seeds, and Veris Wealth Partners. An International Finance Corporation (IFC) program, Banking on Women Bonds, provides finance to women entrepreneurs and advisory services to enable commercial banks to reach out and serve women clients. This particular bond program represents an opportunity that could be geared toward gender-responsive CSA. In partnership with Goldman Sachs, IFC also launched the Women Entrepreneurs Opportunity Facility, dedicated exclusively to women-owned small and medium enterprises.

Root Capital, a nonprofit social investment fund, supports rural agribusiness enterprises in Africa and Latin America by lending capital, delivering financial training, and strengthening market linkages. Through its core activities, Root Capital works at the intersection of climate change and gender. Root Capital promotes good environmental stewardship by serving businesses that promote sustainable production practices among farmer members. In 2012, Root Capital launched the Women in Agriculture Initiative specifically to understand and maximize impact on women, enhancing the capacity of agribusinesses to provide reliable economic opportunities for female producers, managers, and leaders. Through 2016, Root Capital will invest in 200 gender-sensitive businesses, build the management capacity of 100 gender-inclusive businesses, and reach 200,000 female producers.

The innovative approach of Village Capital includes intensive mentoring by experts and other entrepreneurs when selecting social enterprises to be financed, which has led to financing for many projects cofounded by women (box 18.28). The Hivos-Triodos Fund offers investment opportunities in renewable energy and sustainable agriculture with a special focus on women and innovative financial institutions. Other examples of impact investments already targeting sustainable agriculture principles include Capricorn Investment Group, Christian Super, DOEN Foundation, and LGT Venture.

Box 18.28 Village Capital's Impact Investment Model

Village Capital (VilCap) is a system to source, train, and invest in impactful enterprises that are at the seed-stage of development. The organization has supported 450 enterprises through 35 programs in 9 countries, including Brazil, China, India, Kenya, Mexico, and South Africa, as well as the Netherlands, United Kingdom, and United States. At the end of each three-month program, the top ventures are selected by program peers and given a precommitted capital investment from VilCap Investments (an affiliated fund). Village Capital regard this selection process as forming the core of its strategy for achieving its mission to "democratize entrepreneurship."

Among other sector-expert partners, VilCap has previously teamed up with Juhudi Kilimo, an organization that provides asset-based loans to more than 30,000 smallholder farmers and enterprises in Kenya, to identify game-changing agriculture, energy, and financial service innovations. The VilCap Juhudi Kilimo program featured $100,000 for precommitted investments to the top two selected enterprises. Juhudi Kilimo focuses on farmers, with specific attention to rural women and youth, and uses innovative plans to invest in solid assets rather than the traditional microfinance approach of providing cash only.

Village Capital's work is supported by a wide array of partners, sponsors, and members that help build the infrastructure for entrepreneurs to identify authentic demands from customers, build critical sales channels, and find a team of mentors and experts upon which they can rely. Some of the agricultural enterprises in which VilCap Investments has invested include EFK Group in Kenya, Wanda Organic, and Ojay Greene.

Source: Village Capital.

CONCLUSIONS AND ISSUES FOR WIDER APPLICATION

The following lessons relate to the design, characteristics, and implementation of impact investment. They include investments that have been crafted with gender considerations in mind.

Impact investments are long-term commitments; as such, they may require additional capital in subsequent financing rounds. The evidence shows that investors who exit early usually receive diluted returns or have to accept write-downs. One challenge of investing in social enterprises is that they have high due diligence costs, because most of these businesses are young and cannot absorb large amounts of capital. Although the due diligence costs are significant and often of a fixed nature, in extreme cases, an investor might spend more money on due diligence than on the actual investment. *Transaction costs thus need to be kept at a reasonable level compared to the total investment*. VilCap's training program (box 18.28) is an innovative approach for dealing with this challenge.

Most impact investments emphasize the importance of investing in capacity building for social enterprises. Technical assistance helps men and women entrepreneurs to develop the technical capacities needed by investors, allows for the creation of the appropriate financing structure, and serves as an instrument to plan and scale up entrepreneurs' business models. For this reason, impact investments should also consider the skills needed to enhance the sustainability of the business models they support. Furthermore, impact investments directed exclusively to women can tap unnoticed knowledge, talents, and capacities of women investees.

Measuring impact and retaining flexibility are essential. Investment managers are highly advised to use monitoring and impact measuring tools to quantify the financial, social, and environmental outcomes of their portfolio. The collected data should fit both the investor's impact reporting requirements and the enterprise's growth goals. Another important goal is for the institutional practices of the investment administrator and of the enterprise to be flexible and capable of quickly reflecting changes in the environment and infrastructure.

Build on available resources and tools. New and current impact investments can benefit from research, success stories, and other resources offered by development partners and institutions to identify institutions, markets, and gaps for future investments and ventures. Sharing lessons and success stories with partners and coinvestors has been shown to benefit all parties involved. The different actors along the value chain can benefit from focusing on what they do best, and they can also learn from others' expertise and know-how.

Gender is not a separate sector, and it should be part of the entire value-chain analysis. Women should be part of the whole investment design and cycle (the design should be *with* women, not *for* them). The focus on gender-specific needs within sectors offers great potential for understanding gender needs among both investors and investees, while

Box 18.29 Plan Vivo: Payment for Ecosystem Services through a Voluntary Carbon Sequestration Scheme in Uganda

Plan Vivo, a nonprofit organization, provides an example of a carbon sequestration scheme based on agroforestry in Bushenyi District, Uganda. Agricultural production is combined with carbon sequestration according to a "plan vivo," which is designed at the farm level with a strong participatory approach that brings farmers together to decide on and draw the interspersion of cultivated plots and planted trees. Women's participation can be hampered by local perceptions about gender roles and rights, but focus groups led by Plan Vivo aim to narrow this gender gap. The reduction of carbon emissions gained with this type of agricultural production is independently assessed and generates Plan Vivo Certificates, which are sold as carbon offsets for the conservation of ecosystems and poverty reduction of landholders.

Source: Adapted from Ottaviani 2013.

creating more opportunities for women's empowerment through CSA. Monitoring and impact measurement tools such as FAST and IRIS are a good starting point for incorporating gender dimensions into performance analysis.

Future impact investment opportunities are likely to include climate change mitigation. Impact investment may soon venture into social enterprises that address climate change mitigation through innovative agricultural practices such as those promoted as part of CSA. In the forestry sector, for example, the Reducing Emissions from Deforestation and Forest Degradation (REDD and REDD+) system offers financial opportunities for services such as carbon stored in forests, forest conservation, sustainable forest management, and enhancement of forest carbon stocks (for an example, see box 18.29). In agriculture, much research, capacity development, and piloting continue to identify and collect reliable data and to quantify emissions and carbon sequestration from different practices.

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CSA for Fisheries: The FAO-Thiaroye Fish Processing Technique

CONTEXT

Each year, approximately one-third of all the food produced for direct human consumption is lost or wasted. This enormous waste of resources and investments also represents a threat to food security in the face of population growth and resource scarcity. Further, the environmental impact of food loss and waste is significant, including the emissions of GHGs. FAO reports that the carbon footprint of food produced and not eaten is estimated at 3.3 billion tons of CO_2 equivalent, excluding GHG emissions from land use change (FAO 2013b). The uneaten food that ends up rotting in landfills is another large producer of a potent GHG, methane.

Food loss refers to a decrease in edible food mass to the loss of quality throughout the food supply chain, from production to postharvest handling, distribution, and consumption. In low-income countries, food is lost mostly during the early and middle stages of the chain. Climate change may exacerbate food loss because of its negative effects on the supply of raw materials, on processing and storage, and on transport due to extremely high or low temperatures. Because many smallholder farmers and fishers in developing countries live in food insecurity, a reduction in food losses could have an immediate and significant impact on their livelihoods. Reducing food loss and waste is also an important step toward developing a more climate-smart food supply chain.

In the fisheries sector in low-income countries, losses arise from limitations in production, harvesting, and postharvesting techniques, storage and cooling facilities, infrastructure, and packaging and marketing systems. Addressing bottlenecks at critical loss points can reduce losses and waste. For example, losses during fishing can be reduced through appropriate measures to curb incidental catches/by-catch, along with discard management. Improvements are also needed in postharvest handling, transportation after landing, and storage and cooling facilities. Better processing and preservation techniques will help maintain fish product quality and extend shelf-life, thus improving marketability.

In most tropical developing countries, including in Africa, smoking and drying are common fish processing and preservation techniques used in small- and medium-scale fisheries. Fish-processing efficiency is often low, partly because processors frequently must wait for the right weather conditions. Processing methods can also be detrimental to human and environmental health. Most drying and smoking techniques are deficient in food safety, especially because of contamination from the polycyclic aromatic hydrocarbons (PAHs) given off by burning wood (Martson et al. 2001), and they raise environmental concerns about deforestation and the high levels of GHG emissions from the primary fuel sources used (wood and charcoal).

A reduction of postharvest losses in fisheries would not only make more food available but improve incomes by increasing the value rather than the volume of the catch—an important contribution in a context of overfishing and climate change, where overall catches and stock health are likely to decline. Not only does climate change affect capture and aquaculture fisheries productivity through changes in water temperature, ocean currents, and other conditions, but changes in catch potential (type and volume) also have large implications for global food security. In tropical communities whose livelihoods depend on fisheries, a reduction in the access to food is expected (Cheung et al. 2009). Species distribution across oceans is also affected by climate change and may require changes in technology for harvesting, processing, and marketing fish.

THE PROJECT: DEVELOPMENT AND INTRODUCTION OF FTT-THIAROYE

Improvements in fish processing technology can address these issues and address gender inequalities at the same

Figure 18.3 An Improved Smoking Kiln: The Thiaroye Fish Smoking Technology

time, given that fish processors are predominantly women. According to the latest statistics, in most fishing communities as many as 90 percent of workers in processing activities can be female (FAO 2014). Women, therefore, bear the brunt of the drudgery and health problems related to drying and smoking fish.

The Thiaroye fish smoking technology (also known as FTT-Thiaroye) improves economic productivity and food security by reducing postharvest losses in the fish value chain. Postharvest losses (in quantity, quality, or marketability) (Diei-Ouadi and Mgawe 2011) lead to a reduction in real incomes and food available for a family. The FTT-Thiaroye was developed by FAO together with the National Training Centre for Fisheries and Aquaculture Technicians in Senegal (CNFTPA) in 2008. The equipment, costing $500–$800, can easily be built by metal workers using local materials. The technology addresses the deficiencies in smoking techniques by adding new components to the existing or improved kilns.[56]

The new smoking kiln (figure 18.3) reduces losses by consistently producing a larger quantity of safer products of superior and more uniform quality. Essentially, the FTT prevents fish quality losses that become apparent to value-chain actors at the commercialization stage but that actually occur earlier, as a result of inadequate processing technologies in small-scale fisheries.

Another advantage of the FTT-Thiaroye system is its improved energy efficiency and other potential environmental protection features. The new kiln reduces charcoal consumption and optimizes the use of biomass (plant and organic byproducts and cow dung) throughout the process. In most countries, agro-wastes are easily available. They are not only an affordable alternative fuel, but because they are available within a reasonable distance, their use reduces the labor expended by women in obtaining wood or charcoal for fuel.

The technology was recently improved to incorporate a drying function. This improvement made it possible for operators to dry as well as smoke fish with the same equipment, thereby increasing the range of species that could be processed. This important advantage should reinforce processors' adaptation to climate change and increase their resilience, given that the composition of species is projected to change with climate change. Another significant advantage of the equipment is that fish can be dried or smoked regardless of the weather. Natural drying methods entail postharvest losses ranging from 10 percent to 50 percent (they are generally higher in the rainy season or humid weather).

The FTT also contributes to food safety. Between 2006 and 2011, the European Union banned imports of processed fish from Côte d'Ivoire because of unacceptable levels of polycyclic aromatic hydrocarbons (PAHs) (carcinogens given off by burning wood). The ban caused substantial economic losses valued at around $1,700,000 per year. With the introduction of the FTT-Thiaroye and its adoption by small-scale processors, Ivorian smoked products have now met the stringent market requirements for PAH levels. The increased awareness of the Ivorian authorities of this public health and food safety issue has led them to support wider dissemination of the FTT-Thiaroye.

WOMEN AT THE CENTER STAGE OF THIS NEW TECHNOLOGY

By design, the FAO-Thiaroye system is a gender-sensitive technique that can be used and maintained easily by female fish processors. By reducing drying and smoking times, and producing a product that sells more readily and rapidly, the new technology increases the time available to women for other pursuits, including caring for the household and children. A more marketable product also fetches premium prices, meaning increased income for the woman who produce smoked and dried fish. Even where consumers have low purchasing power, the stall with a better-quality product is preferred to a poor-quality fish display. To some extent, women have also been able to increase their share in value-addition from capture to final sale. The FTT system makes it easy to collect by-products of processing, especially fat,

[56] These components are an indirect smoke generator system, a hot-air distributor, an ember furnace, and a fat-collection tray; for additional detail, see Ndiaye, Sodoke Komivi, and Diei-Ouadi (2014).

Box 18.30 The Success Story of Women Fish Processors in Côte d'Ivoire

The majority of fish smokers in Côte d'Ivoire are female, and they earn their living through this trade (the products of small-scale fisheries are mainly exported to neighboring countries). In Abobodoumé, instead of using the traditional smoking equipment consisting of mud ovens and cut-up barrels, Ivorian women fish processors adopted two prototypes of the FTT-Thiaroye. By exposing the processors to less heat, fewer burns, and less smoke, the new technology reduced the health, occupational, and safety hazards they experienced, especially the risk to their eyes and respiratory systems. The income and livelihoods of the women also improved, and consequently their capacity to enhance the food security of their family. The women have seen the time-saving advantage of the new technology as well. In African communities, this issue is particularly important, because women also engage in household chores while conducting their fish-processing activities.

which can be sold for additional income or made into soap (which also generates additional income). Such auxiliary activities add no drudgery to processors' work, because the fat is easily collected in a container placed outside the FTT furnace. In sum, the technical support by FAO for the FTT-Thiaroye has achieved economic and social dividends, particularly for women, and has contributed to food security. For an example from Côte d'Ivoire, see box 18.30.

LESSONS LEARNED AND ISSUES FOR WIDER APPLICABILITY

The FTT-Thiaroye is contributing to improving the value chain in the fisheries and aquaculture sector, increasing the competitiveness of the products from small-scale fish operators (especially but not exclusively women), contributing to food security, and strengthening fishing communities' resilience to climate change. To date, the FTT-Thiaroye is used in Côte d'Ivoire, Ghana, Senegal, Tanzania, and Togo. Some prototypes have been replicated with the inclusion of solar panels (for example, in Nigeria). Fisheries officers in other African countries such as Kenya and Uganda have received training to introduce the FTT technology to local fish processors. At the time of writing, other countries in Africa and Asia where fish smoking is common, and where women are highly involved in fish processing, have expressed interest in the technology.

Many national fisheries institutions, authorities, and international development organizations, such as the World Bank in Togo and Côte d'Ivoire, are scaling up projects with the FTT. This work aims to help small-scale fishers and processors reap additional benefits from their business in safer working conditions, while protecting the environment and adapting to the impact of the climate change. In the FTT programs that have involved FAO, at least 80 percent of the individuals trained to build, use, and maintain the FTT are women fish processors. Experience has shown that these women are more likely than male trainees to inform their peers of the positive result of this efficient new technique for fish processing. Promotion of the FTT-Thiaroye technology among fish processors throughout East and West Africa would greatly benefit from such practical knowledge sharing.

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Thematic Note 1: The Role of Innovative Technologies for Gender-Responsive CSA

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Thematic Note 2: Gender-Responsive, Climate-Smart Landscape Approaches

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Innovative Activity Profile 2: Using Impact Investment to Promote Gender Equality and CSA

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Innovative Activity Profile 3: The FAO-Thiaroye Fish Processing Technique

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This latest Module of the *Gender in Agriculture Sourcebook* entitled *Gender in Climate-Smart Agriculture* provides development agencies and practitioners, policy makers, civil society, research and academia, as well as the private sector with tested good practices and innovative approaches and technologies for gender mainstreaming in climate-smart agriculture. This module is a joint product of the World Bank Group, Food and Agriculture Organization of the United Nations (FAO), and International Fund for Agricultural Development (IFAD).

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