

# MODULE 13:

## MAINSTREAMING CSA INTO NATIONAL POLICIES AND PROGRAMMES

### Overview

Greater coherence, coordination and integration between various sectors dealing with climate change, agricultural development and food security is a key requirement for creating an enabling policy environment to promote the transformation to climate-smart agriculture (CSA). CSA policies and support measures need to be mainstreamed into broader public policy, expenditure and planning frameworks at the national, subnational and local level. Coordination is also necessary between concerned agencies across sectors at the national and local level. Policy priority needs to be given to CSA practices that bring productivity gains, enhance resilience and reduce emissions.

The first part of this module describes CSA within larger economic and policy frameworks and stresses its key role as a major driver of green economy. The second part examines ways to improve market accessibility through appropriate policy and financial instruments. It then looks at cross-sectoral coordination and the integration of CSA with disaster risk management and social safety net programmes. The last section highlights the role of implementing actors and how to improve their access to knowledge and monitoring.

### Key messages

- CSA needs to be mainstreamed into core government policies and programmes, including policy, expenditure and planning frameworks. Priority needs to be given to CSA practices that bring productivity gains, enhance resilience and reduce emissions.
- CSA and CSA policies must contribute to broader economic growth, poverty reduction and sustainable development goals. They should also provide an enabling environment for the adoption of CSA by the private and public sectors.
- CSA requires coordination, between concerned agencies across different sectors at central and local levels. Partnerships with non-state stakeholders play a key role in CSA. A wider landscape approach is needed for the better management of agricultural production and ecosystem services.
- An integrated approach to providing incentives for CSA, such as payments for environmental services, is needed. Public support that focus on research, the development of human capital, the sustainable management of soil and land, social protection and safety nets, and the development of technology and value chains are conducive to CSA adoption.
- Secure land rights provide the enabling environment for investments in sustainable land and water management, which are key elements of CSA.
- The successful design and implementation of CSA approaches require integration with disaster risk management strategies and actions, and social safety net programmes.



## Contents

Overview	353
Key messages	353
<b>13.1 Climate-smart agriculture within larger economic and policy frameworks</b>	<b>357</b>
Identification of supporting policies and programs	357
Providing an enabling legal and policy environment	360
<b>13.2 Improve market accessibility: policy and financial instruments</b>	<b>361</b>
Role of prices and subsidies	362
Regulations for adoption of CSA	363
Incentives for CSA investments	364
<b>13.3 Improving access to knowledge and monitoring: the role of implementing actors</b>	<b>364</b>
Role of local institutions and participatory approaches	364
Policies to mobilize non-state actors	365
Monitoring and assessment framework	366
<b>13.4 Conclusions</b>	<b>369</b>
Notes	369
Acronyms	370
References	371
Additional Resources	373

## List of Tables

<b>Table 13.1 Brazil: four decades of focusing support on public goods</b>	<b>368</b>
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## List of Boxes

<b>Box 13.1 Brazil: four decades of focusing support on public goods</b>	<b>358</b>
<b>Box 13.2 Economic and Policy Innovations for Climate Smart Agriculture (EPIC) Programme</b>	<b>359</b>
<b>Box 13.3 Increasing output, damaging the ecosystem: the use and misuse of input subsidies in India</b>	<b>362</b>
<b>Box 13.4 CSA incentives in Colombia and Zambia</b>	<b>365</b>
<b>Box 13.5 Linking productivity, adaptation and mitigation through incentive measures: the case of Karnataka, India</b>	<b>365</b>
<b>Box 13.6 Improving climate resilience through participatory pastoral development in Ethiopia</b>	<b>366</b>
<b>Box 13.7 Producing a climate resilient backyard chicken in India</b>	<b>367</b>



## 13.1 Climate-smart agriculture within larger economic and policy frameworks

Agriculture is an essential driver of economic growth, particularly in rural areas and least developed countries. At the national level, boosting agricultural production stimulates overall economic growth and development, particularly in countries with high economic dependence on agriculture (FAO, 2012a). At the same time, agriculture is a major user of natural capital and has a considerable impact on the environment. The 2012 United Nations Conference on Sustainable Development in Rio considered the green economy<sup>1</sup> as one of the essential tools for achieving sustainable development. It called for economically viable sustainable agriculture (crops, livestock, forestry, fisheries and aquaculture) to eradicate hunger. At the same time, the move to more sustainable agriculture must also help conserve land, water, plant and animal genetic resources, biodiversity and ecosystems, and enhance resilience to climate change and natural disasters (UN, 2012).

CSA meets these expectations by improving productivity, enhancing resilience and reducing greenhouse gas (GHG) emissions. CSA and green economy are thus complementary concepts, and greening the economy with CSA is a concrete way to operationalize sustainable development (FAO, 2012a).

CSA policies must facilitate “using natural capital without using it up”. Agriculture is crucial to climate-smart development and overall green growth because of the key contribution it makes to food security and human welfare and because of its role as a principle ‘user’ of natural capital. Agriculture accounts for 70 percent of water extracted; covers 40 percent of land area; and, together with land use change, forest degradation and deforestation, produces 30 percent of global GHG emissions. CSA is about meeting the needs of people for food, fuel, timber and fibre. It also contributes to economic development and poverty reduction; maintains and enhances the resilience of the natural ecosystem functions on which green economic growth depends; and addresses the new challenge of climate change. CSA is resource-efficient, resilient, and low-carbon emitting.

### Identification of supporting policies and programs

The key to developing appropriate policies, strategies and actions to enhance CSA adoption is to understand the barriers to adoption of CSA practices, including the trade-offs between short-term costs and longer-term benefits, the mix of private and public benefits, institutional and financial barriers and lack of access to inputs or markets (FAO, 2012b). The main requirements for a policy environment capable of promoting CSA are greater coherence, coordination and integration between climate change, agricultural development and food security policy processes (FAO, 2010).

CSA needs to be mainstreamed into core government programmes with appropriate priority given to public support of CSA. This process should be developed consistently with ongoing national climate-resilient long-term visions, such as the National Adaptation Programmes of Action (NAPAs), National Appropriate Mitigation Actions (NAMAs) and United Nations Framework Convention on Climate Change (UNFCCC) National Communications. It should include vulnerable economic sectors and ecosystems.

A gender-sensitive approach is also crucial to achieving CSA. The roles, responsibilities and capabilities of men and women need to be well understood to ensure that both men and women have access to and benefit from CSA practices and policies.

<sup>1</sup> Agencies have similar definitions for green economy and inclusive green growth. UNEP defines a green economy as “one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities” (UNEP, 2011). OECD (2011) defines green growth as “fostering economic growth and development, while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies.” The World Bank (2012) defines green growth as economic growth that is environmentally sustainable: green in that it is efficient in use of natural resources; clean, in that it minimizes pollution and environmental impacts; and resilient in accounting for natural hazards and the role of environmental management and natural capital in preventing physical disasters. For FAO the green economy embraces a vision that tries to steer economic development in the direction of sustainability, of which there are five key pillars: renewable energy and energy efficiency, waste management and minimization, sustainable use of natural resources, and green job creation.

National CSA policies are affected by developments at the international level, particularly in terms global agreements and mechanisms to support climate change adaptation and mitigation. Despite the current limited recognition of agriculture in the major global climate financing mechanisms, the interest in agriculture in the international climate change policy forums has been increasing (FAO, 2012b).

The lack of progress on agriculture within the UNFCCC context contrasts with the growing concern and interest many developing countries have shown for the implementation of agriculture adaptation and mitigation actions. Their interest is focused on how these actions might best be taken within subnational contexts and through nationally-owned policies and strategies. The national interest to pursue CSA provides an opportunity for shaping both domestic policies and international instruments for meeting the challenges of ensuring global food security and addressing climate change (FAO, 2012b).

### CSA's public good element

CSA provides public goods (e.g. erosion control measures in an upper watershed may help to control flooding in a lower watershed; or control of field nutrient run-off will help maintain adequate water downstream), and for this reason public support is justified.<sup>2</sup> CSA may also have negative consequences (e.g. when an individual, firm, or country takes an action but does not receive all its benefits or bear all costs) or deliver benefits in other areas. CSA may also generate private goods. Most CSA options either bring both environmental and economic benefits (e.g. improved water use efficiency, enhanced fertility, enhanced resilience to drought) or reduce negative externalities (e.g. floods, pollution, GHG emissions, soil erosion, deforestation) and generate non-market public goods (e.g. climate resilience, enriched soil with carbon).

At a general level, the key challenge is to alter policies and remove public subsidies that act as disincentives for adopting CSA, and reallocate resources to programmes that provide incentives for the adoption of CSA practices. Policymakers have a set of tools and instruments (e.g. rural credit programmes, input and output pricing policies, including subsidies, support for investments with public good benefits, property rights, research and extension services as well as safety net programs) that they can apply to change the incentives and build the capacity of farmers to modify their production systems (FAO, 2012b).

#### Box 13.1

#### Brazil: four decades of focusing support on public goods

In Brazil, the overall level of public support to agriculture is less than 6 percent of agricultural gross domestic product (GDP), compared with 25 percent in OECD countries and 18 percent in India. However, public support has focused on public goods, including funding research in crops, livestock breeds and farm systems that adapted to Brazil's tropical ecosystems, and investments in enriching soil fertility. Over half of Brazil's soybean crop is now farmed using conservation tillage. There has also been support for mixed crop and livestock systems, and rotating pastures with crops to supplying additional nutrients. In its lending conditions, the Brazilian National Development Bank (BDNES) now includes criteria for sustainable land, water and forest management. Brazil has also launched programmes on agricultural water management and rural development that are targeted to the specific conditions in each region of the country. In the north east, for example, sustainable land, water and nutrient management is a priority of the regional programme; in the south, the focus is on livelihoods; and in the western Amazon, forest management is emphasized. It has been a leader in piloting the use of renewable resources for fuel, including ethanol from sugar, and the sustainable cultivation of charcoal for iron production. In the last decade, Brazil has made impressive progress in reducing deforestation.

Source: World Bank, 2011a

A guiding FAO principle with respect to CSA is the 'no-regrets' approach. It emphasizes measures that should be taken even in the absence of climate change because they improve the efficiency of agricultural, forestry and fishery practices. At the same time, these measures put farmers, foresters or fishers in a better position

<sup>2</sup> A good with benefits for the broader economy and society, or which generate benefits in a different location from where the activity takes place

to adapt to or mitigate the effects of climate change. A CSA practice will often contribute to both adaptation and mitigation. For example, minimum tillage stores moisture and organic matter in the soil, which increases adaptive capacity, and supports climate change mitigation by sequestering carbon. By following an integrated approach, these practices increase long-term productivity, create synergies between adaptation and mitigation initiatives and reduce tradeoffs.

### Sustainable intensification and productivity enhancement policies

Policies for intensifying sustainable production and enhancing productivity are vital for the development of CSA. However, these policies need to be combined with broader landscape restoration measures. Included in these measures are: improved technologies and innovations; the efficient use of land, water, energy and other inputs; improved access to information and infrastructure; and efficient markets and risk management tools (see also Module 2 on the landscape approach). Programmes that support reduced food loss and waste, enhance value chains (see Module 11 on sustainable and inclusive food value chains), improve rural infrastructure and increase access to improved weather and climate services are also climate-smart. The challenge is to tailor these policies to the national political situation and climatic context in a way that builds on existing environmental strategies and ad-hoc programmes.

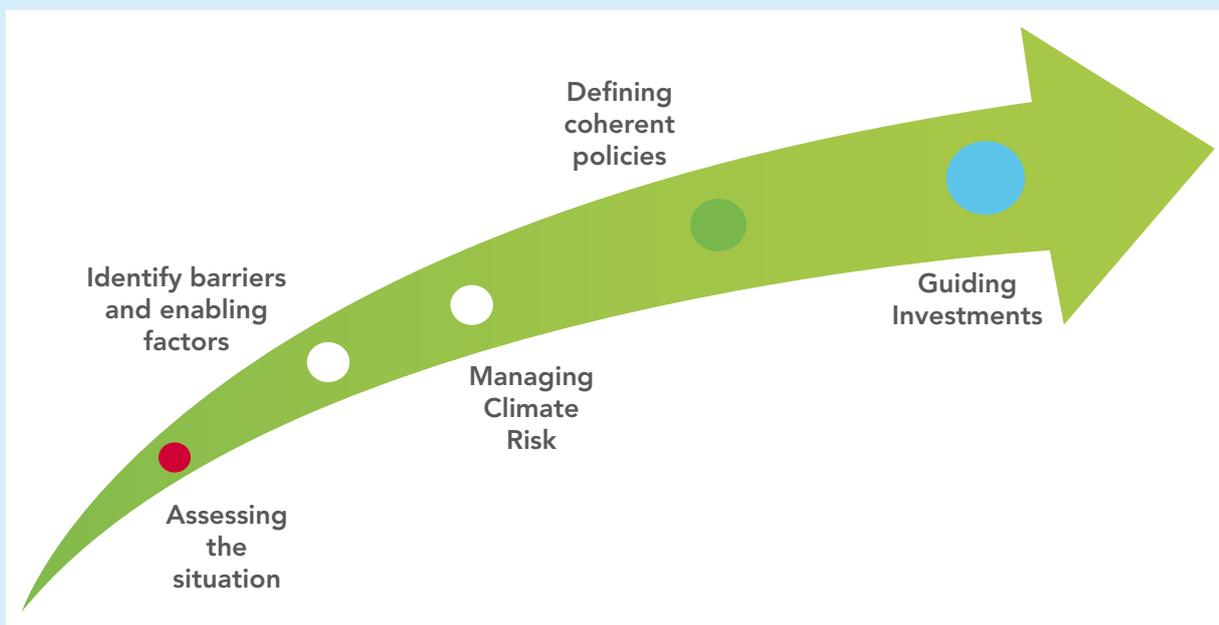
#### Box 13.2

#### Economic and Policy Innovations for Climate Smart Agriculture (EPIC) Programme

The EPIC programme, housed in the Agricultural Development Economics Division of FAO, was initiated in 2011, shortly after the CSA concept was introduced in preparation for the 2010 Hague Conference on agriculture, food security and climate change. The programme is supported by the European Community to work with three partner countries (Malawi, Zambia and Viet Nam), in developing CSA policies, strategies and investment proposals. The programme supports work in five main areas:

- identifying and prioritizing locally viable CSA practices through the development of an evidence base on the food security, adaptation and mitigation benefits of a range of feasible changes in agricultural technologies and practices;
- assessing barriers to adoption of CSA practices and identifying institutional and policy strategies to overcome them;
- analysing the impacts of climate risks on policy and investment priorities;
- strengthening country efforts to build a coherent and enabling policy environment for CSA implementation at the country level and;
- building with country partners investment proposals for scaled up CSA activities that link to both agricultural and climate financing sources.

Figure 1 gives an indication of the sequencing of these five building blocks of CSA implementation in country level.



The CSA project explicitly assesses how climate change may alter the effectiveness of existing agricultural policy and investment frameworks in supporting food security and economic growth in partner countries; and policy options to overcome barriers to adoption of CSA practices. The experience from the project indicates that operationalizing CSA at the country level requires greater coordination between agriculture, climate change and food security policies, as well as better links between research and policy. Partnering with the CGIAR Research Program on Climate Change, Agriculture and Food Security to launch participatory scenario building is an approach the programme is employing to facilitate the needed dialogue and coordination. With this tool, stakeholders from government, the private sector, researchers and civil society explore key socio-economic uncertainties for future food security, environments and livelihoods. Multiple socio-economic scenarios are developed by stakeholders, which can be used for 'back-casting' from future desired outcomes to current policy and investment needs across a range of possible conditions. By linking to quantitative models, the process can explicitly explore the potential costs and benefits of alternative development paths. Since policy-makers and researchers from agricultural, food security and climate change are all involved in the scenario development process, the process inherently generates greater coordination and dialogue across these different groups.

### Interlinkages with existing strategies

The most effective way of supporting resilient agricultural systems and rural communities is to incorporate adaptation into other policies (IISD, 2006). This has been the principle behind the Pilot Programme for Climate Resilience (PPCR), one of the programmes supported through the Climate Investment Funds (CIF). PPCR has approved US\$ 1 billion of grant and concessional finance for mainstreaming resilience into core programmes. Agriculture and water management feature strongly in all participating countries. The PPCR may provide a useful model that countries can follow to access climate finance for adaptation in a development context under a future Green Climate Fund. Countries can building on the lessons from ongoing PPCR's programmes and follow their implementation arrangements.

### Providing an enabling legal and policy environment

To secure an enabling environment for the development and mainstreaming of CSA in overarching national plans, appropriate institutions with effective and transparent governance structures are needed to coordinate the division of sectoral responsibilities and the work done by national and local institutions (more on institutions in Module 12). An enabling environment also requires capacity development of for all relevant stakeholders (more on capacity development in Module 17).

Landscape approaches and incentives are needed for a coordinated management of various land-based ecosystem services. These approaches may require trade-offs, which would need to be explicitly quantified and addressed through negotiated solutions among various stakeholders. The scaling up of landscape approaches requires knowledge management and institutional capacity and must be backed up by an enabling policy and market environment. Coordinating sectoral policies is key to aligning the different goals (see also Module 2 on landscape approach).

### CSA expenditure and planning

There is a strong need for coordination for expenditure and planning between concerned agencies at the national and local levels. In addition, cross-sectoral CSA strategies need to take account of current legislation and regulations and be incorporated into legal and regulatory frameworks if they are to be implemented. There are many areas where synergies can be created with CSA, including social safety nets (see Module 16 on safety nets); energy (see Module 5 on energy); land-use regulations; and disaster risk management (see Module 15 on disaster risk reduction).

Annual budget laws in which public expenditure planning is transposed into the budget allocation for the responsible line agencies, are a core legal and regulatory instrument for implementing CSA policies. In this regard, aligning capacity and financing with responsibility is critical. Operations and maintenance, as well as investment budgets, need to be considered. Raising new sources of revenue for implementing CSA strategies

may also be possible by establishing an integrated investment framework to attract national and international climate funds from different public and private sources (see also Module 14 on financing).

Where decentralized government organizations have responsibility for certain elements of strategy implementation, it is important that financial flows from the central government or local revenue-raising capacity are sufficient to allow decentralized authorities to carry out their responsibilities in ways that are consistent with the law. In countries where prices are regulated, price support regimes and options for sharing public support between price support and other supporting mechanisms should be reviewed.

### Land tenure regimes

Secure land rights are part of the enabling environment for investments in sustainable land and water management, which are crucial elements of CSA. Many CSA strategies have a strong land tenure dimension because tenure security promotes and generates incentives for long-term investment. Unclear land tenure may lead to difficulties in establishing benefit distribution mechanisms for payments for ecosystem services (Runsten and Tapio-Bistrom, 2011).

Land tenure is a complex issue. It covers a mix of rights, rules and institutions that vary from highly individualistic to communal systems. CSA systems need to be adapted to a country's particular tenure systems. Those working to implement CSA need to work together with land tenure specialists to understand tenure systems and work within them. Some examples include: simple land registrations systems in Ethiopia that facilitated investment in sustainable land management; the provision of land-users rights to trees that promoted 're-greening' in Niger; and the transference of long-term land use rights to users in China, which played a key role in broader watershed restoration and CSA. Since land rights are a key part of the enabling environment for investing in sustainable intensification, landscape restoration and sustainable woodland and forest management, land tenure regimes create the link between sound agricultural and forest land-use planning.

Land management regulations also play a role in CSA. For example, protecting stream beds or erosion control mechanisms can be done by requiring controlled grazing of animals. However, such measures only work where they can be implemented and enforced and where there is public acceptance of them and an understanding of why they are needed. Voluntary mechanisms and incentives are equally important.

### Private Sector Investments

Regulations governing private sector investment must also play a part in creating an enabling environment for CSA. By taking into account the importance of improving the overall business environment through simple, transparent regulations and tax structures, finance regulations can incorporate climate-smart requirements into lending conditions. The example of the BNDES is illustrative. Using screening guidelines to determine whether loans are consistent with the Equator Principles (a credit risk management framework for determining, assessing and managing environmental and social risk in project finance transactions), the BNDES has improved its environmental and social screening process, developed specific guidelines for sustainable agriculture, livestock and forest management, heightened the attractiveness of green lines of business, increased the focus on social inclusion and decreased its carbon footprint (see also Box 13.1).

## 13.2 Improve market accessibility: policy and financial instruments

Market failures in rural areas often are the result of asymmetric information, high transaction costs and imperfectly specified property rights. Addressing these constraints requires innovative institutional arrangements and partnerships that improve effective market linkages and offer more stable and better prices to producers. Realizing the potential of CSA depends on the ability to convey market information, coordinate production and marketing, define and enforce property rights, and mobilize farmers to participate in markets and enhance the competitiveness of agro-enterprises (FAO, 2012b).

## Role of prices and subsidies

Most governments intervene actively in the operation of their agricultural markets. Governments intervene to support farm prices because these prices are often volatile. Climatic conditions, over which farmers have no control, determine to a large degree how much a farmer produces in a given year. The most common approach to supporting the price of an exportable agricultural product is to create a government agency to buy a quantity of a product offered by the country's farmers at the guaranteed 'support price'. Price support certainly has a role to play in countries affected by climate change. However, often there are other forms of support (e.g. regulations, incentives, investments in technology, infrastructure, connectivity or the broader enabling environment, social marketing and use of social capital) that are more effective in addressing market failures.

Price support is most often channelled through subsidies for inputs (e.g. fertilizer, energy, water, and seeds).<sup>3</sup> With the exception of countries where input use is currently low, price support and energy subsidies should be redirected towards policies that recognize and reward CSA practices, and provide an enabling environment for value addition, commercialisation and trade. For example, input subsidy programmes designed to support a more efficient and timely use of fertilizers, rather than simply to increase their use, are important policy measures for implementing CSA (FAO, 2012b).

In countries with low-input and low-output systems, a fertilizer subsidy may initially be justified to increase yields and enhance plant growth and soil carbon. Analysis suggests that the fertilizer subsidy (up to 50 kilograms per hectare) adopted in the United Republic of Tanzania as part of its agricultural productivity project is climate-smart in that it has increased productivity and helped increase biomass. This has enhanced resilience and carbon sequestration. However, to ensure correct and timely fertilizer application, the price support needs to be accompanied by advice delivered through extension services and improved access to reasonable information on rainfall.

In countries where fertilizer use is already high, price support may not be climate-smart. In land-scarce, intensely farmed agricultural systems with high levels of inputs, the subsidization of inorganic fertilizer encourages overuse, which limits long-term productivity and harms the environment. In densely populated, land-scarce countries with high rates of intensification, different policies may be needed, such as the above-mentioned policies promoting more precise and timely use of inputs. For example Viet Nam has adopted the "five reductions, one must" policy. Farmers are encouraged to use rice varieties with clear origin, pure breed and guaranteed quality ("one must"). The "five reductions" are the reduction of the number of seeds planted, the reduction of the amount of water used (at certain times), the reduction of amount of the amount of fertilizer applied, the reduction of the amount of pesticides applied, and the reduction of post-harvest losses. Under this policy, the amount of rice seeds planted has declined by nearly 50 percent and the use of chemical fertilizers, pesticides and water declined by 20 to 30 percent from earlier levels, while productivity has increased from 15 to 20 percent.

Subsidizing energy may lead to unsustainable practices. For example, energy subsidies have contributed to aquifer depletion in water-scarce countries, such as Yemen. Inadequate water regulation and pricing regimes, which leads to a lack of incentive to conserve water, have contributed to widespread drainage and salinity problems in a number of irrigation-dependent economies (e.g. India, Pakistan and Uzbekistan). Addressing these problems demands a range of both price and non-price interventions to ensure reliable water delivery that farmers will be willing to pay for, as well as proper drainage.

With the demand for energy growing, oil prices increasing and the urgency to reduce GHG emissions becoming more acute, bioenergy has become an important energy source. Bioenergy is part of a mix of options for addressing energy concerns and climate change, which includes increased energy efficiency, more renewable energy,

<sup>3</sup> This section will not discuss price volatility in detail; but it recognizes its importance. Volatility is shaped by a mix of short-term and long-term factors, including weather variations and export restrictions that are sometimes imposed as a result of drought or flood, rising demand for food, and for some commodities (especially maize and soybean) the growing role of biofuels.

**Box 13.3****Increasing output, damaging the ecosystem: the use and misuse of input subsidies in India**

In India, fertilizer and other input subsidies contributed to the rapid development of irrigation and more intensive farming methods. This led to increases in yields and food security. By 2010, irrigated wheat yields in some provinces averaged 4.5 tonnes per hectare. Subsidized energy is now contributing to excess groundwater withdrawals. About 75 percent of groundwater used in Punjab and Harayana is withdrawn from overexploited aquifers. As a result, water must be to be pumped up from ever-deeper aquifers, and aquifers in some areas are becoming saline. The fertilizer subsidy, which cost the government US\$ 30 billion (2 percent of GDP) in 2008, is contributing to excessive use of nitrogen, which is contributing to nitrate pollution in rivers and aquifers. There are, however, difficult and well recognized political economic challenges in reforming the pattern of subsidies.

Source: Barley *et al.*, 2011

and new patterns of energy production and consumption (see also Module 5 on energy). In some cases, governments have subsidized production of agricultural commodities for bioenergy, for example maize in the United States (although the support measures were recently phased out) and rapeseed in Northern Europe. These subsidies are part of broader energy policies. However, life cycle analyses suggest these measures, in temperate ecosystems, cannot be considered climate-smart. On the other hand, life cycle analyses for bio-ethanol from sugar cane in tropical humid countries (e.g. Brazil) are likely to be climate-smart. The sustainable production and use of bioenergy presents a major opportunity to address climate change by reducing carbon dioxide emissions. Whether or not these are climate-smart depends on the ecosystem, the underlying enabling environment and alternative land use options. In the implementation of CSA, there is a role for sustainable bioenergy production from woody biomass, crop residues and newer sources that are currently under development.

In many countries there is poor access to long-term finance, which is often a requirement for CSA. For instance, in Ghana, where the business environment is among the best in Africa, long-term finance for small-holder agriculture is not readily available. A range of non-price interventions (e.g. incentives, regulations, extension, and market access) are likely to provide better investment incentives than subsidized interest rates. Improved access to long-term finance is important in tree crop cultivation where replacing older trees with newer, higher yielding varieties may lead to short-term revenue losses.

## Regulations for adoption of CSA

If they are successful in changing behaviour and providing incentives for adoption of CSA, national regulations need to be tailored to the country's particular environmental conditions and accompanied by other supporting incentives.

Where broader institutional capacity and governance is weak, regulations alone are unlikely to be effective. For example, in the United Republic of Tanzania, a ban on charcoal trading proved to be unenforceable since charcoal is the main source for cooking energy for urban Tanzanians. However, a system of forest and woodland management administered by local districts in line with the national decentralization law has proven to be locally acceptable and environmentally sustainable. This locally managed system has been combined with measures that promote the planting of trees.

For CSA to take hold, a mix of regulations and incentives is often needed. In the Loess Plateau watershed restoration programme in China, key elements for success included: the regulation of free grazing of small ruminants; technical support for improved fodder production for stall feeding; secure land rights for the farming population that participated in the watershed restoration programme; and technical support for restoring landscapes and enhancing agricultural productivity. For decades, in the highly populated, densely farmed areas of Central and Western Kenya, where land rights are clear, there has been a requirement to plant trees and tree crops on 10 percent of the land. Many of the farmers exceed this percentage because of the income earned from the trees and the ecosystem services they provide. However, in Ghana, the current regulatory system for revenue allocation from timber harvesting outside forest reserves, in which revenues are divided between the Forestry Department

and traditional leaders, does not provide an incentive for local communities to manage forests sustainably.

The impact of regulations on production incentives needs to be considered. For instance, the Ukraine, an upper middle-income country, is a major global wheat producer. However, during the 2010 drought, as global wheat prices rose, there was concern that there would not be enough of this key staple available at reasonable prices to meet local demands, especially those of lower income people. In response to these concerns, Ukraine imposed an export ban (a regulatory measure). The ban damaged Ukraine's reputation as a reliable supplier of good quality wheat and reduced incentives for farmers to make the investments needed to increase productivity. Since then, the Ukrainian government has reconsidered its policy and has initiated a social protection system targeted at low-income and vulnerable people, so that they have the means to buy food in times of high prices, while Ukrainian farmers still have incentives to increase productivity and output.

Regulations also need to be adapted to changing circumstances. Viet Nam, once a food-deficit country concerned with food security, still regulates rice production, requiring that rice be grown on certain areas, even though it now produces a large surplus and is a major rice exporter.

### Incentives for CSA investments

Incentive measures need to focus on overcoming barriers to the adoption of CSA practices. There are two main barriers to adoption. First, implementing CSA often involves upfront investments that take time to bring about gains in productivity. Second, present markets cannot accurately account for the value of the environmental benefits that CSA delivers. To reap the long-term benefits that CSA brings with regard to productivity, resilience and climate change mitigation, farmers and governments need to take advantage of a range of available financing sources (see also Module 14 on financing). The most successful programmes often blend different sources of funding and include a mix of policy support measures.

The Plan Vert (Green Plan) of Morocco follows an integrated approach to providing incentives for CSA. In its river basin management activities, the Plan takes account of the increasing challenges posed by water scarcity. It has a dual approach. In irrigated areas, Plan Vert provides incentives for improving water management and conservation, and integrating national value chains with international markets. In rain-fed areas, Plan Vert increases access to social services, and supports participatory natural resource management initiatives. It also supports a programme for replacing arable crops with more drought tolerant olive trees and other tree crops. Plan Vert is implemented through a range of measures that are incorporated into policy instruments. It also receives targeted support for specific technical innovations. Box 13.4 provides an example of a targeted support programme in Colombia and Zambia.

The valuation of ecosystem services (see Module 2 for more on ecosystem services), which measures the degree to which activities carried out in one part of an ecosystem or economic sector benefit other sectors, remains a challenge. Payment for ecosystem services is one policy instrument for providing incentives to adopt CSA. Carbon finance, which focuses on mitigation, is an important example of this approach. However, as the previous sections have highlighted, CSA also provides many other environmental services. Broadly conceived, incentives can include indirect mechanisms, such as laws and regulations, and direct incentives, such as cash subsidies and grants or non-cash subsidies, including technical assistance and other forms of support.

## 13.3 Improving access to knowledge and monitoring: the role of implementing actors

### Role of local institutions and participatory approaches

CSA policies and programmes, as with any cross-sectoral development programme, need to be aligned across various levels of government. Another requirement is the widespread building of capacities because in many countries decentralization processes have not been accompanied by adequate strengthening of local level

### Box 13.4 CSA incentives in Colombia and Zambia

In Colombia, there is a new focus on integrated landscape planning within a broader strategy for sustainable agriculture, forest intensification and reduced deforestation. One key theme is “to be a good cattle farmer it is necessary to be a good agricultural farmer.” A mix of policies and incentives has brought about sustainable increases in productivity for livestock by encouraging landscape-based mixed agrosilvopastoral systems. The objective has been to introduce trees and improved pasture in grazing lands. This provides improved fodder and shade, lowers heat stress for animals and reduces soil degradation. Results have included: increased meat and milk yields; improved water infiltration; increased bird populations; reduced methane emissions; and greater carbon capture. These approaches have helped achieve a ‘triple win’: increased productivity, enhanced resilience to climate variability, and reduced carbon emissions (Lopez, 2012).

In Zambia, support has focused on technological advice to producers. In addition, modest support has been provided to producers to help them overcome the upfront costs of moving to sustainable land management in cropping and livestock systems, such as the incorporation of trees into the agricultural system. Five basic conservation farming techniques are being used: retaining crop residues; concentrating tillage and fertilizer application in a permanent grid of planting basins or series of planting rows; completing land preparation in the dry season; weeding aggressively to reduce plant competition; and intercropping or rotating nitrogen-fixing legumes on up to 30 percent of cultivated area. Many farmers also incorporate nitrogen-fixing trees, which provide fodder and fuelwood. Findings show that these practices bring significant benefits (Scherr *et al.*, 2011). However, there is also evidence that considerable barriers exist when it comes to the adoption and maintenance of these practices (Arslan *et al.*, 2013). This evidence attests to the need for institutions and policy alignment to support the adoption of CSA practices.

capacities (see also Module 12 on local institutions and Module 17 on capacity development). Developing CSA policies and programmes demands an understanding of the structure and functioning of different levels of government. This principle cuts across sectors. Participatory approaches, which are more likely to build lasting results than top-down approaches, need to be adapted to local circumstances.

### Policies to mobilize non-state actors

It is important that civil society, the private sector and financial institutions are all involved in the development of CSA (more on institutions in Module 12). Civil society organizations can play a role in the development of new, adapted technologies and in the provision of extension services. An example of civil society engagement is the Kenyan agricultural soil carbon project, which is supported by World Vision, a non-governmental agency. Civil society organizations have played a strong role in testing and scaling up the ‘system of rice intensification’ (SRI). Paddy rice production system that poses special challenges for climate change mitigation. For example, the majority of GHG emissions in the agricultural sector in Viet Nam are linked to paddy rice production. SRI

### Box 13.5 Linking productivity, adaptation and mitigation through incentive measures: the case of Karnataka, India

In India, the US\$ 120 million Karnataka Watershed Project addressed dryland and hill-farming practices covering an area of 0.5 million hectares and benefiting about 1.8 million people. Using participatory approaches it introduced improved technologies and farming practices, which led to the recovery of groundwater levels (up to 50-90 feet in 3 agro-ecological zones) and improved groundwater discharges (from 250 to 326 gallons per hour). As a result, average crop yield increased by 24-26 percent; and household incomes by about 53 percent. A related follow-up operation, the Mid-Himalayan watershed project supports social mobilization; soil and water conservation treatments that follow a micro-watershed approach; farm system intensification, including improved horticultural practices and animal health; forest institution capacity building; income-generating activities; and institutional strengthening. Watershed management operations in some areas of India (e.g. the Mid-Himalayas in Umal Pradesh) are now gaining leverage with the International Development Association (IDA) and local funders through carbon finance in reforestation programmes.

Source: World Bank *et al.*, 2013

**Box 13.6****Improving climate resilience through participatory pastoral development in Ethiopia**

Ethiopian pastoralists are one of the most vulnerable groups to climate shocks. Livestock products, including hides and skins, are a key source of livelihoods in Ethiopia, and, after coffee, the second largest source of foreign exchange earnings. Well managed rangelands and pastoral systems are climate-resilient, bring economic benefits and conserve the natural environment.

A community pastoral development programme in Ethiopia (US\$ 80 million) is working to increase the resilience of Ethiopian pastoralists to external shocks and improve the livelihoods of beneficiary communities, and in doing so, contribute to overall poverty alleviation in the country. The objectives of the programme's first component of is to enhance sustainable livelihoods and strengthen decentralized and participatory planning at the community/*kebele* (sub-district) and *woreda* level, while operating within the regional government structure. Women and men in pastoral and agropastoral communities design and implement community action plans that reflect their development priorities. The programme's second component addresses pastoral risk management. The goal of this component is to improve the existing pastoral early warning system through a participatory approach; establish an early response fund; and support disaster preparedness and mitigation investment planning and financing of associated subprojects. The third component involves improving community-level participatory learning and knowledge management and supporting knowledge management and information exchange at the federal and regional levels. The fourth component deals with project management and supports project management units at the regional and federal levels in their efforts to coordinate, supervise and implement project activities under the direction of the ministry of federal affairs and the pastoral commissions and bureaus of each region.

Source: World Bank, 2008a

is an approach to rice cultivation that increases rice yields significantly and at the same time reduces requirements for seeds, water and chemical inputs. The system originated in Madagascar, and has been successfully tested in 30 countries in West Africa, Latin America and Asia often with the support of civil society organizations.

Improving the broad enabling environment for responsible investment has a key role to play in CSA. Many private sector companies are committed to reducing the environmental footprint of their operations. They are also the principal players in building value chains and connecting farmers with markets. Box 13.7 provides an example of a technical innovation by an Indian private-sector organization in India that has developed a production system adapted to local conditions.

## Monitoring and assessment framework

As assessments, monitoring and evaluation are covered in Module 18, this section only provides a brief overview on monitoring and evaluation issues from a policy perspective.

In general, monitoring and assessment for CSA should be integrated into existing measurement and assessment systems for agriculture and climate-responsible development. Simple results-based systems should be used. Also, the present capacity for monitoring and evaluation of the transition of existing agriculture and food systems to CSA needs strengthening in many countries (also see Module 17 on capacity development).

Measuring climate change adaptation is a highly debated topic. Using a single approach to measure adaptation, adaptive capacity and vulnerability presents challenges. In general, the measurement of adaptation (or vulnerability) is hampered by difficulties in defining the concept to be measured and the interaction of multiple factors, which vary depending on location, time and scale.

One way of overcoming these difficulties is to build monitoring and learning networks across food systems and across different levels of governance. The household-level decisions concerning agricultural production are often influenced by higher-level institutions and policies. A comprehensive food system monitoring and learning network enhances the understanding of an intervention's impact on the food system and on other interven-

**Box 13.7****Producing a climate resilient backyard chicken in India**

Kegg Farms in India has bred a robust and improved dual-purpose backyard chicken. The 'Kuroiler' lays 100-150 eggs a year. Native chicken breeds (Desi) lay around 40 eggs a year. In addition, Kuroiler birds grow to 2.5 kilograms in about half the time a native breed needs to reach 1 kilo. Because the meat is darker and more flavourful, the Kuroiler chickens typically command a premium of about 60 Rupees per kilo over other broiler chickens.

Kegg Farms produces about 16 million day-old chicks a year, which it sells to 1 500 small enterprises. The chicks are then raised for about two weeks before they are inoculated and sold to about 6 500 bicycle salespeople, who in turn sell them to approximately 800 000 farmers. Most of these farmers are women living in some of the remotest parts of the country. The turnover in sales of chicks is about US\$ 5 million a year. There is another US\$ 5 million turnover from the thousands of small rurally-based businesses that raise and sell the chicks. An independent assessment indicates that the average gross revenue generated per Kuroiler chick (as eggs and meat) is US\$ 3.10. With some 16 million chicks distributed annually, the total output is about US\$ 50 million, with a net profit of about US\$ 10 million. Profits from the Kuroiler are significantly higher than profits from the native breed. The Kuroiler birds contribute significantly to household cash flow. Women have maintained control over their chicken-growing enterprises as the business has become more commercial.

The success of Kegg Farms is due to several factors. Its chickens are more robust than other chickens; they can scavenge for food and have higher food conversion ratios. They are thus adapted to long periods of drought and can survive with limited nutrition. The company's business model features a devolved, rural-based distribution system with built-in incentives.

Source: Isenberg, 2006

tions. To track adaptation in food systems, it is often necessary to monitor process and outcomes, as well as impacts. For example, policy-level processes (e.g. the implementation of price and tenure policies) may lead to different outcomes, such as modifications in fertilizer use and more secure land tenure, and have a range of impacts, such as less fertilizer waste and more efficient land use. Finally, monitoring and learning networks contribute to the achievement of the key food system-level objective of more efficient use of scarce resources (Thornton and Lipper, 2013).

A number of countries and programmes have developed Indicators for monitoring the changes in food and agricultural systems the systems. One example is the Climate Investment Funds, which have designed generic result frameworks that are being used for the Strategic Programmes for Climate Resilience developed under the Pilot Programme for Climate Resilience (CIF, 2010). These result frameworks use key indicators for monitoring enhanced resilience, including: the presence of adequate early warning systems; changes in land degradation; social protection systems; access to long-term finance; income diversification; and budget allocations to climate-resilient activities. Process indicators include: the existence of sector policies addressing climate variability and change; the quality of planning processes and the availability of information to the public, including science-based information that incorporates local knowledge.

Within programmes, specific indicators can also be designed for particular project areas. For example, the Colombian programme of support to agrosilvopastoral systems (see Box 13.4) has led to reduced temperatures in the project area, lower heat stress for animals and greater productivity. The Ethiopian productive social safety nets programme (see Box 13.9) seeks to address the link between drought and the number of people requiring food aid.

In the United Kingdom the goal is to integrate national adaptation plans and other supported adaptation actions with departmental and 'whole-government' development approaches. While this benefits implementation, it makes it difficult to measure the impact of specific actions as opposed to the performance of the whole system. The United Kingdom has responded to these multiple challenges by devising a flexible, multidimensional and less costly approach to measuring climate change adaptation (DEFRA, 2010). The Organisation for Economic Cooperation and Development (OECD) countries has also argued for this approach.

There are a variety of approaches that are suited to monitoring mitigation and the carbon footprint of CSA interventions including: Reduced Emissions from Deforestation and Forest Degradation (REDD +) strategies; carbon footprint tools, such as the Ex Ante Carbon Balance Tool (EX-ACT) (Bockel *et al.*, 2010); value chain and farm level tools (e.g. FAO, United States Department of Agriculture, Unilever); and pilot project carbon finance operations.

Table 13.1 illustrates a framework to compare the impact of investment or policy options on the areas analysed (adaptation, resilience, food security, vulnerability and mitigation) in assessments of CAADP investment plans (Branca *et al.*, 2011). As many countries already have agricultural development plans and national climate change policies that support the development of CSA, efforts are needed to pinpoint common elements and ensure a coordinated vision. This will further enable the identification of priority actions, the institutions and policies that support CSA activities, and overall investment strategies (FAO, 2012b). Marginal abatement cost curves have also been developed to compare the cost effectiveness of different activities within low-carbon development strategies (Favor *et al.*, 2011).

**Table 13.1**  
Multicriteria assessment of planned investments' climate-smartness

Multicriteria Assessment of the degree to which planned investments are climate-smart						
Adaptation: Reducing vulnerability related to slow onset climate change (increasing system resilience)			Mitigation: comparison against a business-as-usual <sup>1</sup> growth baseline			
Dimensions of system resilience			Reduce vulnerability to extreme weather events	Carbon sequestration	GHG emission reductions	GHG emission efficiency
Increase physical resilience	Increase economic resilience	Increase social resilience		Carbon sequestered (tCO <sub>2</sub> /ha) (net balance)	GHG reduced (tCO <sub>2</sub> /ha) (net balance)	GHG reduced from increased efficiency of production (tCO <sub>2</sub> /unit of product) (net balance)
Water quantity and quality	Income diversification	Extension and research				
Soil resource and soil fertility	Equity, risk management and off-farm	Technical know-how				
Seed resources	Diversity of employment opportunities	Connection to social networks				
Livestock	Health and social services	Education and training				
	Markets	Information management				

Source: modified from Branca *et al.*, 2011

Improving general information, data collection and data availability is a priority in many developing countries. To formulate CSA strategies and interventions reliable information, including good quality data, documented vulnerabilities and accurate evidence is required. Frequently, these data are lacking or are only available for some sub-sectors. In Africa, for example, while estimates of food produced for subsistence are generally monetized and reflected in GDP estimates, this is often not the case for timber and non-timber forest products. For The FAO Global Forest Resource Assessment records the value of non-timber forest products in Europe as US\$ 7 billion (where they are of minor economic importance) compared with US\$ 0.5 billion in Africa, where they are of much greater importance. This gap has relevance in prioritizing climate-smart approaches, whose

benefits often include elements that are not easily monetized. A programme is underway to pilot valuing natural capital in national accounts through the WAVES (Wealth and Valuation of Ecosystems Services) initiative using country-led approaches. At present, Botswana, Madagascar, Colombia, Costa Rica and the Philippines are participating, together with a number of OECD countries including Norway and Spain.

## 13.4 Conclusions

While principles for CSA and related sustainable development and food security policies may be similar, there are likely to be specific policy differences between agriculture-dependent economies, urban economies and economies in transition. There will also be differences between countries that are land or water-scarce and countries that have abundant land and water resources. To formulate CSA strategies and interventions reliable information, including good quality data, documented vulnerabilities and accurate evidence is required. In addition, national capacities to implement CSA interventions and current barriers to adoption need to be systematically assessed.

CSA contributes to a cross-cutting range of development goals. It needs to be implemented using an integrated, cross-sectoral approach to agriculture and food security that links it to other aspects of sustainable development, poverty reduction and economic growth. CSA policies and programmes, as with all cross-sectoral development programmes, need to be developed so that they are aligned among all levels of government. This requires an understanding of the structure and functioning of each level of government. Comprehensive capacities need to be developed because in many countries, local-level capacity development has not been included as part of the decentralization processes.

To create an enabling environment for the development and mainstreaming of CSA in the overarching national plan, appropriate institutions with effective and transparent governance structures are needed. These institutions would coordinate the division of sectoral responsibilities and the work done by national local institutions that will incorporate CSA strategies into legal and regulatory frameworks. Regulations need to be adapted to country environments and accompanied by other supporting incentives if CSA interventions are to be successful in changing behaviour and providing additional incentives for advancing CSA.

Investment in CSA brings long-term gains in productivity, builds resilience, reduces GHG emissions and increases carbon sequestration. The most successful programmes often blend sources of funding. Incentive measures need to focus on overcoming barriers to adoption of CSA practices. Price and non-price measures are needed to support transition to CSA. Behavioural change is also an important element. Price support certainly has a role to play in countries affected by climate change, but often other forms of support (regulations, incentives, capacity development, investments in technology, innovation, efficiency gains and infrastructure, connectivity or the broader enabling environment, social protection and safety nets, and use of social capital) are more effective in paving the way for CSA.

Civil society, the private sector and financial institutions all play vital roles in implementing CSA. These groups should work jointly with key national line ministries and development agencies and donors through an efficient stakeholder consultation process.

## Notes

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## Acronyms

<b>BDNES</b>	Brazilian National Development Bank
<b>CAADP</b>	Comprehensive Africa Agriculture Development Programme
<b>CAP</b>	Community Action Plan
<b>CCAFS</b>	Climate Change, Agriculture and Food Security
<b>CIF</b>	Climate Investment Fund
<b>CSA</b>	climate-smart agriculture
<b>DEFRA</b>	Department for Environment, Food and Rural Affairs
<b>DRM</b>	disaster risk management
<b>EX-ACT</b>	Ex Ante Carbon Balance Tool
<b>GAFSP</b>	Global Agriculture and Food Security Program
<b>GDP</b>	gross domestic product
<b>GHG</b>	greenhouse gas
<b>IDA</b>	International Development Association
<b>IFAD</b>	International Fund for Agricultural Development
<b>IISD</b>	International Institute for Sustainable Development
<b>NAMA</b>	National Appropriate Mitigation Action
<b>NAPA</b>	National Adaptation Programme of Action
<b>OECD</b>	Organisation for Economic Cooperation and Development
<b>PPCR</b>	Pilot Program for Climate Resilience
<b>PSNP</b>	Productive Safety Net Programme
<b>REDD</b>	Reduced emissions from deforestation and forest degradation
<b>UNEP</b>	United Nations Environment Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>WAVES</b>	Wealth and Valuation of Ecosystem Services

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## Additional Resources

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