MODULE 14:

FINANCING CLIMATE-SMART AGRICULTURE

Overview

Investments made in the agricultural sector are intended to achieve multiple objectives, such as agricultural growth for food security, poverty reduction and economic development. Climate change, already evident in the increased frequency of extreme weather events, is projected to have profound effects on the agricultural sector in the future. It has become necessary to explicitly incorporate projections of future impacts of climate change into today's investment planning. Integrating adaptation to existing and future threats posed by climate change into current agricultural planning and investment is essential for reducing vulnerability to the impact of climate change and the costs of dealing with these impacts. It is also essential to identify and account for mitigation potential. Reducing projected emissions growth from agricultural development can slow the progression of climate change and reduce the costs of adaptation. Many mitigation actions are synergistic with activities that promote agricultural growth and have the potential to attract new sources of finance for sustainable agriculture.

This module gives an overview of how climate change alters agricultural investment needs. It focuses on agricultural growth to support food security and poverty reduction objectives in developing countries. The first part of the module summarizes the current state of agricultural investment in developing countries, including major sources, levels and composition, and looks at how climate change adaptation and mitigation affect investment needs. It also provides insights as to how climate change affects farmers' investment behaviour and the implications that this has for public sector investments to support the adoption by farmers of climate-smart agriculture (CSA).

The second part of the module describes the current and future potential of climate finance to support CSA. Six sources of climate finance are analysed in terms of their potential for CSA investment financing: financing mechanisms directly under the UNFCCC; UN organizations or programmes; Multilateral Development Banks (MDBs); bilateral public financing channels; compliance and voluntary carbon markets; and private sector investors and philanthropy. The module concludes with a look at emerging opportunities for CSA financing and the need for national actions that ensure readiness to access this financing.

Key messages

- Current agricultural investment flows are insufficient to adequately finance sustainable agricultural development. This financing deficit is due not only to a lack of overall funds, but also to the fact that the activities that are currently allocated resources do not generate the highest returns for sustainable agricultural growth. The main sources of agricultural investment finance are the farmers, herders, fishers and foresters themselves. For this reason, public investment that enables agricultural producers to make investments in CSA is a priority.
- The changes in agricultural systems needed to achieve agricultural growth for food security under climate change are largely built upon sustainable agricultural intensification activities. Building an evidence base to identify the most suitable activities (e.g. explicitly accounting for adaptation and mitigation impacts) is an essential part of developing CSA strategies, investments and financing plans.

- Climate finance can play an important role in meeting the CSA investment gap, but there are some challenges that must be addressed. To date, most public sector climate finance, as well as almost all private sector climate financing, flows into mitigation activities in the industrial and energy sectors. While the newly established Green Climate Fund (GFC) may shift the balance between mitigation and adaptation funding in the mid-term, currently adaptation financing, a significant part of which is targeted to agriculture activities, is small in comparison to mitigation financing. Consequently, the financing gap for CSA remains large. In addition, the traditional separation of mitigation and adaptation in funding sources has hindered investments in activities that generate synergies between the two; a key facet of CSA.
- A recent positive developments related to CSA financing is the Global Environment Facility's (GEF) movement towards combining adaptation and mitigation activities in the draft GEF-6 CCM strategy. The substantive upgrading of CSA in the GEF-6 Strategy might be reflected to some degree in the priority setting of the GCF. This means that, regardless of the ultimate structure of financing channels, the GCF has the potential to be a clear and direct financing option for CSA activities, presumably with a significantly higher volume than current multilateral funding instruments.
- While interest in agricultural GHG emission reductions has been increasing in voluntary carbon markets, the share of actual activities in any carbon market remains small. There are some promising niche markets for agricultural carbon credits, such as methane avoidance from manure management, fertilizer use efficiency and REDD+ forest certificates. However, because of high transactions costs and a lack of methodologies, together with the challenges that carbon markets are facing in general, carbon finance is unlikely to develop into a significant source of CSA finance in the near future.
- For developing countries, changing patterns of climate finance represents an opportunity as well as a challenge. To successfully access, but more importantly, to effectively use increasing volumes of international CSA financing, developing countries will have to ensure that they have fulfilled the necessary prerequisites. Building the CSA evidence base and institutional capacities will be needed to secure a foundation for larger-scale CSA investments.

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14.1 Introduction

This module addresses the issue of financing climate-smart agriculture (CSA). The first part of the module looks at how climate change affects investment needs for agricultural development to support food security, poverty reduction and economic growth. The focus of the module is on the near term – particularly the next 20 years, as this is the critical window of opportunity to transform agricultural systems to reduce the vulnerability of rural populations to climate change by improving rural livelihoods, income and welfare. Some 70 percent of the food insecure people in the world are rural and directly or indirectly dependent on agriculture for income as well as food (IFAD, 2011). People who are poor and food insecure, and who rely on agricultural production for their livelihoods are amongst the most vulnerable to climate change (HLPE, 2012). In the next 20 years, rural populations in the two areas of the world with the highest incidence of food insecurity and poverty, sub-Saharan Africa and South Asia, are expected to peak (IFAD, 2011). Investment to support sustainable agricultural growth in these areas is essential, as experiences have shown that the most effective means of reducing poverty and food insecurity amongst rural populations in agricultural-based economies is economic growth in the agricultural sector (World Bank, 2008; De Janvry and Sadoulet, 2010). Agricultural growth for food security and poverty reduction is also a key adaptation strategy by reducing vulnerability and increasing the resilience of affected people. Investment is the engine for such growth, but until now the levels and composition of investment have not been adequate to stimulate needed growth, particularly in those regions where it is most important.

Climate change multiplies and alters the challenges of achieving sustainable agricultural growth for food security, and this has important implications for investment strategies. The necessity of adapting to and mitigating climate change mandates reconsideration of growth strategies and investment priorities. Most of the models assessing climate change impacts on agriculture indicate that major impacts on temperature and rainfall patterns and thus agricultural production will occur after 2050. In the intervening years, however, increased frequency and intensity of climate shocks such as drought, flooding and extreme temperatures are expected and are already occurring (IPCC, 2012). The critical importance of achieving mitigation in the near term to avoid future and larger costs of climate change compels planners to incorporate low emission considerations into large capital investment plans that have the potential to generate significant new emissions, as is the case with widespread agricultural growth strategies in developing countries.

However it is also important to consider the effects of climate change on agricultural growth and investment strategies within the larger context and challenges of sustainable agricultural development. Major drivers of change — such as rapidly evolving food systems and food markets, increasing population land ratios in rural areas and increasing resource scarcity and costs in some areas— mandate the need for different agricultural development models. Strategies have been articulated in the sustainable agricultural development and intensification literature, which forms an important basis for building CSA strategies and investments for specific contexts.

14.2 How does climate change affect investment needs for agriculture?

In order to understand how climate change affects agricultural investment needs in developing countries, it is necessary to first obtain an understanding of investment needs to support development and the current deficit in meeting these needs (this is referred to as the "development deficit"). This then must be complimented with an analysis of how climate change alters what is needed to achieve development – e.g. to "keep development on track" (Brooks *et al.*, 2011). Accounting for the costs of failing to adequately adapt to climate risks is defined as the "adaptation deficit" which essentially adds to the development deficit. A final, but equally important issue to consider is how mitigation may affect agricultural investment requirements, and the implications for financing – e.g. a "mitigation deficit". In this section we present information on the current state of understanding on these three dimensions of investment requirements for agriculture, concluding with a discussion of the overall implications for financing flows and instruments to support CSA.

The development deficit

In 2009, FAO estimated that average annual investment flows amounting to US$ 209 billion would be needed to meet the projected growth in demand for agricultural products in 2050 in 93 developing countries (Schmidhuber *et al.,* 2009). This estimate was derived under a set of assumptions about population and consumption growth and focussed on investment to meet global food demand which implies some reduction in food insecurity but not total eradication of hunger. In a separate study analysing the additional incremental public expenditures needed to eradicate hunger by 2025, Schmidhuber and Bruinsma (2011) estimated that an additional annual investment expenditure of US$ 50.2 billion/year would be needed. The categories where the largest additional investment needs for hunger eradication were rural infrastructure (roads and water) and safety nets, but additional investments for improved management of natural resources, research and development and rural institutional development were also identified (Schmidhuber and Bruinsma, 2011).

Farmers (as well as herders, fishers and foresters) are by far the largest source of agricultural investment finance (FAO, 2012a). However, they face significant barriers and disincentives to invest in activities that support sustainable agricultural growth, particularly smallholders. One key barrier is gender; on average, women comprise 43 percent of the agricultural labour force in developing countries, ranging from just over 20 percent in Latin America to almost 50 percent in Eastern Asia and sub-Saharan Africa, yet they have considerably less access to the land, financing, inputs and knowledge needed to support investments (FAO, 2011a). Other important barriers include poorly functioning systems of rights to land and water, thin or non-existent credit and insurance markets, lack of effective extension services and the technical packages for agricultural productivity growth adapted to specific contexts, as well as poor agricultural value chains (McCarthy *et al.*, 2011). Thus, a key role of public sector finance is to create the conditions and incentives for farmers to make needed investments. However, recent research indicates that public sector investments in agriculture are lagging in areas where growth is essential for poverty reduction (e.g. South Asia and sub-Saharan Africa). Furthermore, the composition of public sector spending on agriculture does not favour investments with the highest returns to long-term agricultural growth.

Table 14.1, reproduced from the 2012 State of Food and Agriculture report, illustrates the problem. The table summarizes public sector spending per agricultural worker in low- and middle-income countries by region. It indicates that the absolute levels of spending per agricultural worker in South Asia and sub-Saharan Africa are the lowest amongst the regions, and the growth rate over past decades has been very low (South Asia) or negative (sub-Saharan Africa).

Table 14.1
Public spending on agriculture per worker in low- and middle-income countries by region

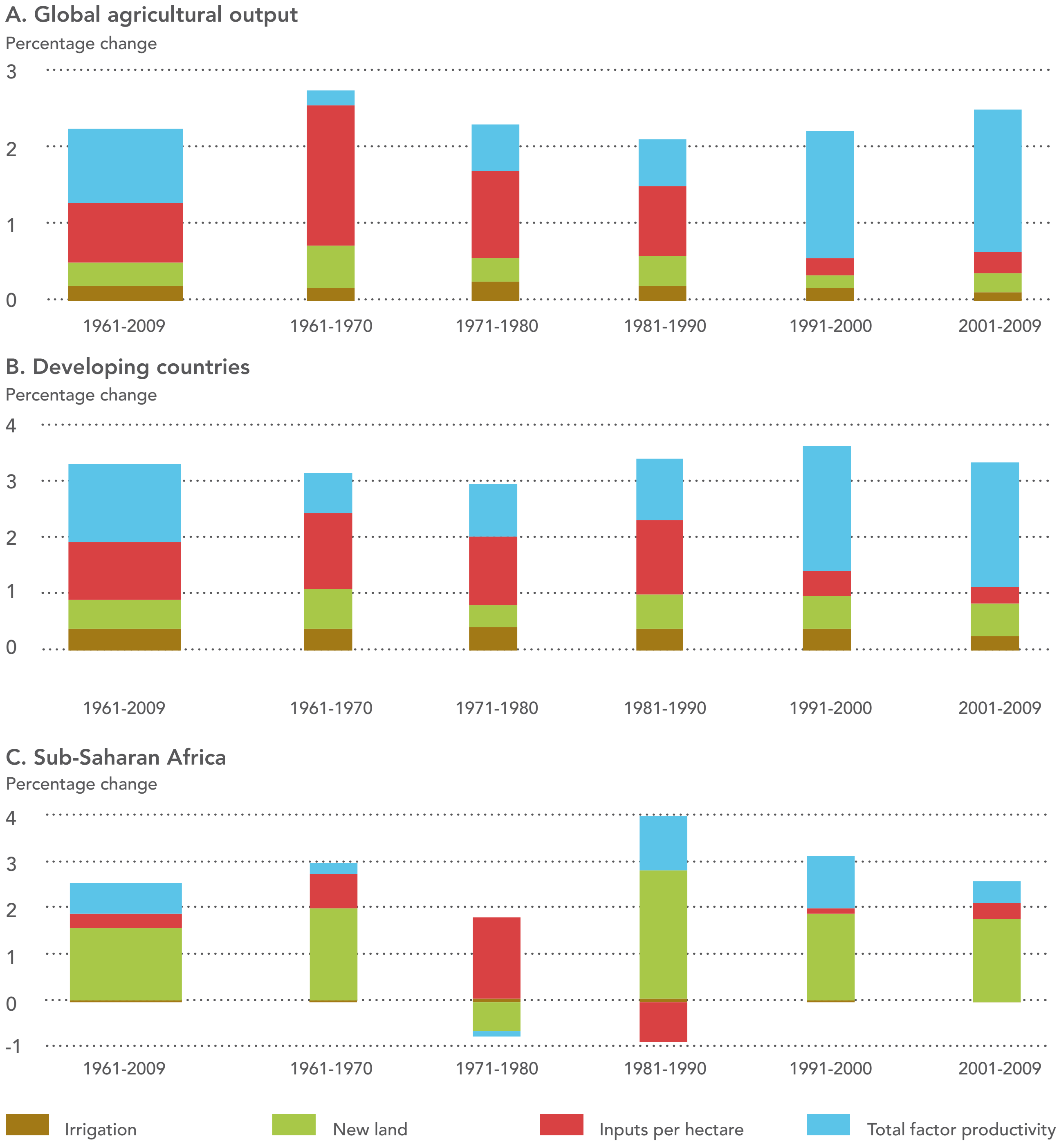
Region	1980–89	1990–99	2000–04	2005–07
(Constant 2005 PPP dollars)				
East Asia and the Pacific (8)	48	69	108	156
Europe and Central Asia (9)		413	559	719
Latin America and the Caribbean (10)	337	316	309	341
Middle East and North Africa (7)	458	534	640	677
South Asia (7)	46	50	53	79
sub-Saharan Africa (10)	152	50	51	45
total (51 countries)	68	82	114	152

Notes: calculations include 51 low- and middle-income countries. The number of countries included in each group is shown in parentheses. For countries in Europe and Central Asia estimates are from 1995 to 2007.

Source: FAO, 2012a

The 2012 SOFA report also gives evidence that the deficit in overall levels of spending is compounded by poorly targeted expenditures that generate relatively low returns to agricultural growth and poverty reduction. In an analysis comparing the sources of growth in agricultural output over time, the report found that in most areas of the world recent growth has been attributable to growth in Total Factor Productivity (TFP), a measure of resource-use efficiency, which is a fundamental building block of CSA. This is in contrast to past decades where growth was driven by area expansions and increases in input use. However, one exception is sub-Saharan Africa, where TFP as a source of growth has actually decreased since 2001, with input use increasing as a source of output growth. Altering investment patterns to augment the role of TFP in driving agricultural growth, and reducing the importance of area expansion and increased input use is needed to support climate-smart agricultural growth.

Figure 14.1
Sources of growth in agricultural output by investment category



Source: FAO, 2012a

Focussing public sector spending on essential public goods such as agricultural research and development, rural transport and human capital development will allow countries to shift to more sustainable and climate-smart sources of agricultural growth. Analysis has shown that expenditures in these categories have consistently shown higher returns than expenditures on semi-private goods such as input subsidies (FAO, 2012a). Yet public expenditures for such goods are still a high proportion of total public investments in agriculture for many countries (FAO, 2012a).

Thus, meeting the development deficit will require not only an increase in overall spending, but also a significant shift in composition of spending for many countries.

Investments for adaptation

The need to adapt to climate change in the near, medium and long term implies changes in agricultural investment needs ranging from the farm scale up to the national and international levels. There is more than one way of categorizing adaptation actions in agriculture. For example, in the fourth assessment report of the Intergovernmental Panel on Climate Change (IPCC), the nature of the changes required for adaptation was divided into two main categories: spontaneous and planned.

A more recent publication divides adaptation actions into three categories: adapting to the current adaptation deficit, adapting to incremental changes and adapting to qualitative changes (Brooks *et al.*, 2011). The table below is reproduced from the report and gives examples of what is included in each category.

Table14.2
Adaptation categories, types and examples

Category of Type of adaptation action		Examples
Addressing the adaptation deficit	Resilience building	• Livelihood diversification to reduce poverty in context of climate variability • Crop insurance, seasonal forecasting and other agricultural innovations including irrigation • Early warning systems for disaster risk reduction
Adapting to incremental changes	Climate proofing	• Upgrading of drainage systems to accommodate greater runoff due to more intense precipitation • Adapting cropping systems to shorter growing seasons, greater water stress and heat extremes (e.g. through crop substitution, irrigation and new strains) • Improving disaster risk reduction systems to cope with more frequent and severe extremes
Adapting to qualitative changes	Transformational change	• Phased relocation of settlements away from areas at existential risk from sea-level rise • Shifts in emphasis in large-scale economic activity away from areas/ resources threatened by climate change (e.g. away from water-intensive agriculture, climate-sensitive tourism, high-risk marine resources, to less sensitive activities) • Transformation of agricultural systems from unsustainable (under climate change) intensive rainfed or irrigated agriculture to lower input e.g. pastoral or agropastoral systems.

Source: Brooks *et al.*, 2011

It is useful to categorize adaptation in terms of how it alters the projection of agricultural investment needs for development – in terms of amount, timing and type of investment required. This entails estimating the additional costs adaptation imposes on agricultural investments. Some studies have been done on this issue at global, national and local levels with various methods employed. For example, the United Nations Framework Convention on Climate Change (UNFCCC) estimated an additional US$ 14 billion would be required annually for adaptation in agriculture globally, divided equally between developing and developed countries (Parry *et al.*, 2009).

Nelson *et al.* (2009) estimate the negative impacts of climate change on crop productivity and then on child malnutrition. Their model's results indicate that approximately US$ 7.1 billion is needed annually in additional productivity enhancing investments to counteract the negative impacts of climate change and maintain a baseline level of welfare, of which US$ 3 billion would be for sub-Saharan Africa, and US$ 1.5 billion for South Asia.

It is important to recognize that these studies are generally based on calculating the additional resources climate change adaptation necessitates – assuming that the base investment requirements for development are in place (Parry *et al.*, 2009). As the discussion in the previous section has indicated, this is generally not the case, and particularly in the case of the two most vulnerable agricultural areas in the world – sub-Saharan African and South Asia— there is a large deficit in investment resources. This is the adaptation deficit and it is the main reason these countries are considered so highly vulnerable to climate change.

Another important issue to consider is the potential costs of maladaptation (e.g. agricultural investments that increase vulnerability to climate change or increase risks of economic losses associated with unsustainable and unprofitable investments). Investments, particularly large fixed capital investments with significant lifetimes, are particularly vulnerable to being maladaptive if climate risks are not considered. An example that is likely to be maladaptive and essentially add to the adaptation deficit is a case where major capital expenditures on irrigation systems use outdated estimates of water demand and supply in areas where climate change is predicted to have major impacts.

Screening agricultural investment plans for their degree of "climate smartness" is a simple first step that can be taken to identify the potential overlap between adaptation and development investments, as well as potential maladaptive agricultural investments. FAO (2012b) presents a simple screening methodology and applies it to a set of agricultural investment plans developed under the Comprehensive African Agricultural Development plans (FAO, 2012b). The screening methodology considers the potential contribution of planned activities to various aspects of adaptation as well as mitigation.

The conclusion of the screening was that there potentially is a high degree of "climate smartness" in existing agricultural investment planning, although more detailed analysis for specific locations and climate change effects would be needed.

A more detailed analysis of the potential investment costs likely to be associated with CSA activities was conducted for Malawi, using the screening methodology applied to the national agricultural strategy and investment plan as a starting point (Branca *et al.*, 2012). The Agriculture Sector Wide Approach (ASWAp) is the national agricultural plan for Malawi, and it includes prioritization and target scales for major agricultural investment activities. Using information from the ASWAp, as well as indicative investment costs from a range of sources, Branca *et al.* (2012) developed the estimates shown in Table 14.3 below. This table shows the unit and total capital investment costs associated with priority agricultural investments that have high potential CSA characteristics (e.g. the potential to generate agricultural growth while incorporating the need for adaptation and mitigation).

Table 14.3
Indicative investment costs for top ranking CSA investments in Malawi's ASWAp

Practice	Details of the practice	Target area	Total capital cost	Unitary capital cost
		ha	(000$)	($/ha)
Agronomy	Develop improved crop varieties, multiply breeder seed, increase distribution of improved maize seed, train staff and farmers in seed multiplication	3 200 000	230 976	72
Integrated nutrient management	Promote good agricultural practices (GAP), develop and promote technologies taht maintain soil fertility (increased efficiency of fertilizers and organic fertilization), fertilizers subisdy programme	3 200 000	390 976	122
Tillage/residue management	Conservation agriculture	150 000	21 100	141
Agroforestry	Live barriers, promote coomunity-based dambo management, prevent river banks degradation	70 000	35 920	513
Water management	Rehabilitate existing irrigation schemes and develop new ones with appropriate systems, establish rainwater harvesting systems (dams, box ridges), strengthen technical capacity for irrigation management, promote water users associations	228 000	167 670	735

Note: Values are from 2009-2013 in the cereals sub-sector

Including mitigation in investment analysis

Unlike adaptation, mitigation is a political choice rather than a biophysical necessity, despite its critical importance in ensuring human well-being. The role of developing countries in contributing to global mitigation has been the subject of much debate in the UNFCCC process and the issue is still not resolved. Yet the case for including mitigation considerations into agricultural planning is strong. Not only is the agricultural sector a projected significant source of emission growth, it is also one where a considerable number of new capital investments are required in order to achieve needed growth. Thus, there is the opportunity to build low emission capacity directly into the sector, rather than replacing existing inefficient capital infrastructure. Delaying emissions reductions (from any source) will result in higher global costs of climate change, and the developing countries and their agricultural sectors stand to bear much of these costs.

The cost of generating mitigation from agricultural sources is generally estimated by looking at the impact on the returns to agricultural activities. The opportunity cost – or the amount of income that a farmer would have to forego in making a climate-smart investment is calculated to give an estimation of mitigation costs. This involves estimating the net returns to a baseline or "without mitigation" agricultural investment compared with the returns to alternative options that include mitigation. Since many of the activities associated with agricultural mitigation also have the potential to generate positive net returns to the agricultural system itself (e.g. there are synergies between mitigation and agricultural returns) the opportunity costs are negative or very low (FAO, 2009). For example, restoring degraded grazing lands can generate a net positive return to grazing activities – as well as generate mitigation. In this sense the mitigation cost would be considered zero, or even negative (e.g. the positive return to grazing could be considered a negative cost to mitigation). Two key features of sustainable agricultural intensification strategies that increase agricultural returns offer the potential to capture significant mitigation co-benefits: increasing resource use efficiency and increasing carbon stocks in soils and above-ground biomass (e.g. trees and perennials).

However it is important to recognize the shortcomings in adopting this approach. First of all, the returns to agricultural activities that also generate positive mitigation benefits vary considerably across agro-ecological and socio-economic conditions, so broad estimates of positive returns need to be carefully scrutinized in more specific contexts. Soil type, rainfall patterns, farming systems and input and output market conditions are all key determinants of the returns. Secondly, the costs of transitioning to the agricultural activity with mitigation benefits can be quite significant, involving the need for institutional and infrastructural investments that are generally not fully included in the opportunity cost assessment. The costs of having an effective extension service, road transport and input supply that would be essential to achieve higher returns under an improved practice are generally not included in opportunity cost analysis of mitigation activities which would look only at farm level returns. The importance of having such an enabling environment and the implications for agricultural investments can be seen from the experience in recent decades of promoting sustainable agriculture. Often, these efforts have not resulted in the scale of adoption and transformation envisioned, because the necessary enabling environment was not in place (FAO, 2011c).

A final and important cost issue to consider when looking at the potential response of agricultural producers to mitigation payments, is that the transaction costs of participating in such a programme are not included and they can be a significant barrier, particularly where fairly stringent measurement, reporting and verification (MRV) requirements are needed to access financing (FAO, 2009 and 2011b). This issue is particularly important when looking at the potential of carbon market finance for smallholder agriculture (FAO, 2011b). It is also one of the reasons that public sector mitigation finance integrated into agricultural financing channels is considered a more viable option for scaling up mitigation financing in many developing country contexts.

The table below, Table 14.4, summarizes some of the potential synergies and trade-offs that may arise in implementing agricultural activities that have high mitigation potential. The left hand column in the table (changes in agricultural systems) refers to activities identified by the IPCC fourth assessment report as major potential sources of mitigation potential. The columns to the right then summarize potential impacts on crop/agricultural returns, as well as potential effects on the variability of returns, which is a key element of adaptation. The table gives illustrative examples only, but indicates that while there is considerable potential to capture synergies between productivity, stability and mitigation from changes in agricultural systems, there is also considerable potential for trade-offs to arise in specific contexts.

Table 14.4
Food production and resilience impacts of changes in agricultural production systems

Changes in agricultural systems	Impacts on Food Production		Impacts on Yield Variability and Exposure to Extreme Weather Events	
	Positive	Negative	Positive	Negative
Cropland Management				
Improved Crop Varieties	Increased crop yield		Reduced variability at plot level; greater diversity of seed varieties should reduce variability at the local/sub-national level	
Improved crop/ fallow rotations	Higher yields during crop rotation, due to increased soil fertility	Reduced cropping intensity may compromise household food security in short-run	Reduced variability due to increased soil fertility, water holding capacity	
Use of legumes in the crop rotation	Higher yields due to increased nitrogen in soil	Reduced cropping intensity may compromise household food security in short-run		
Use of Cover Crops	Higher yields due to reduced on-farm erosion and reduced nutrient leaching	May conflict with using cropland for grazing in mixed crop-livestock system	Reduced variability due to increased soil fertility, water holding capacity	
Increased efficiency of nitrogen Fertilizer/Manure Use	Higher yields through more efficient use of nitrogen fertilizer and/or manure		Lower variability more likely where good drainage and infrequent drought ; experience can reduce farm-level variability over time	Potentially greater variability frequent droughts and inexperienced users
Incorporation of Residues	Higher yields through increased soil fertility, increased water holding capacity	Potential trade-off with use as animal feed	Reduced variability due to increased soil fertility, water holding capacity	
Reduced/Zero Tillage*	Higher yields over long run, particularly where increased soil moisture is valuable	May have limited impact on yields in short-term; weed management becomes very important, potential waterlogging problems	Reduced variability due to reduced erosion and improved soil structure, increased soil fertility	
Live Barriers/ Fences	Higher yields	Reduces arable land to some extent	Reduced variability	
Perennials/Agro-Forestry	Greater yields on adjacent croplands from reduced erosion in medium-long term, better rainwater management; and where tree cash crops improves food accessibility	Potentially less food, at least in short-term, if displaces intensive cropping patterns	Reduced variability of agro-forestry and adjacent crops	

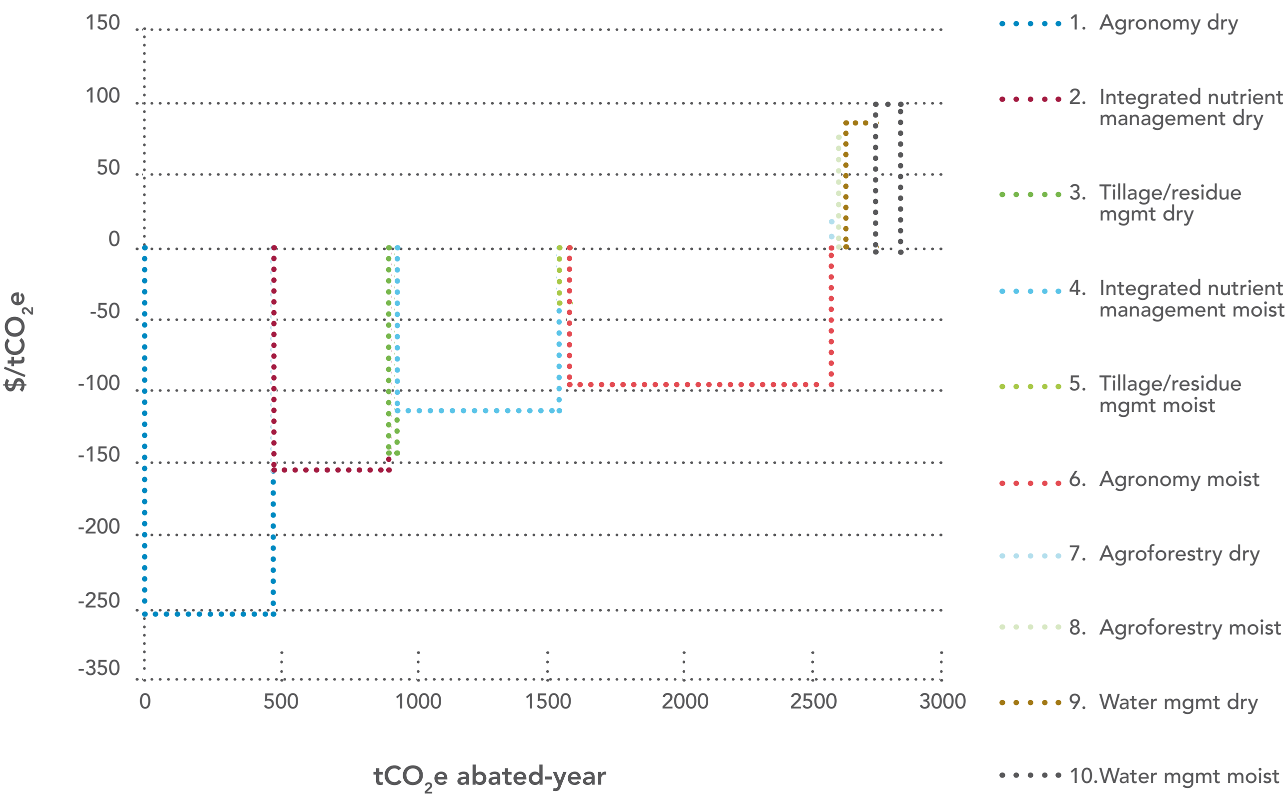
Changes in agricultural systems	Impacts on Food Production		Impacts on Yield Variability and Exposure to Extreme Weather Events	
	Positive	Negative	Positive	Negative
Water Management				
Irrigation	Higher yields, greater intensity of land use		Reduced variability in well-functioning systems	
Bunds/Zai	Higher yields, particularly where increased soil moisture is key constraint	Potentially lower yields when extremely high rainfall	Reduced variability in dry areas with low likelihood of floods and/or good soil drainage	May increase damage due to heavy rains, when constructed primarily to increase soil moisture
Terraces	Higher yields due to reduced soil and water erosion, increased soil quality	May displace at least some cropland	Reduced variability due to improved soil quality and rainwater management	
Pasture and Grazing Management				
Improving forage quality and quantity	Higher livestock yields due to more and higher quality forage		Reduced variability where improved forage is adapted to local condition	Potentially increased variability where improved forage more sensitive to climate conditions than natural pasture
Seeding fodder grasses	Higher livestock yields due to greater forage availability		Reduced variability where seeded fodder is adapted to local condition	Potentially increased variability where improved seeded fodder more sensitive to climate conditions than natural pasture
Improving vegetation community structure	Greater forage/fodder in medium-long term	May reduce forage/ fodder in short-term	Reduced variability due to improved soil structure, reduced erosion	
Stocking rate management	Potential increased returns per unit of livestock	Returns at the herd level may decline, at least in the short term	Potentially lower variability in long term, where forage availability is key factor in livestock output variability	
Rotational Grazing	Higher livestock yields due to greater forage availability and potentially greater forage quality	Short-term losses likely if rotational system supports fewer head of livestock	Potentially lower variability in long term, where forage availability is key factor in livestock output variability	
Restoring Degraded Lands				
Re-vegetation	Improved yields when crops sown in the medium-long run; improved yields on adjacent crop or grassland due to reduced wind, soil and/or water erosion		Reduced variability in local landscape due to reduced wind, soil and/or water erosion	
Applying nutrient amendments (manures, bio-solids, compost)	Improved yields when crops sown in the medium-long run			

Source: FAO, 2009

This suggests that climate-smart agricultural investments with mitigation co-benefits should be identified within the context of existing agricultural investment strategies developed for the purposes of agricultural growth for a specific context. One fairly simple (albeit crude) way of doing that is using the CSA screening methodology described in the previous section. Such a process can identify the potential for agricultural transitions planned for agricultural growth and development to generate mitigation co-benefits. Once these have been identified further analysis to develop a marginal abatement cost curve for agricultural mitigation can be conducted to identify where synergies are most likely to be present.

Figure 14.2 below illustrates an example of such a marginal abatement cost curve developed from screening the Malawi ASWAp described in the preceding section (Branca *et al.*, 2012). The analysis is built upon estimates of the potential mitigation that can be generated from agricultural activities prioritized in the ASWAp and the CSA screening process[1]. The analysis indicates that several of the planned activities will generate mitigation benefits at no additional cost at the farm level (e.g. activities whose costs are less than zero in the figure). The two activities with high up-front investment costs — agroforestry and water management in drylands— are the ones showing a positive marginal abatement cost, implying the need for external finance (e.g. for the associated mitigation benefits) to support the investment. The width of each step in the marginal abatement cost curve is derived from the magnitude of the targeted activity articulated in the ASWAp. This type of analysis can be useful in obtaining a rough estimate of potential mitigation benefits agricultural investment activities could generate, which can be used both for ranking investments as well as setting targets. This type of analysis can ultimately develop linkages to climate finance with a mitigation focus; however, as noted above, it is essential that it be accompanied by an analysis of the barriers to adoption and investment implications to overcome them, in order to obtain a full understanding of the costs and benefits of the activities.

Figure 14.2
Marginal abatement cost curve for selected CSA practices in Malawi



Source: Branca *et al.*, 2012

[1] The analysis was conducted using the Ex-Act tool (this tool is also discussed in Module 18). A more complete description of the analysis can be found in Branca *et al.*, 2012.

Farmers' investment behaviour

Given the importance of farmers as a source of agricultural investment, the potential impacts of climate change on farm investment decision-making is a critical issue to consider, and explicitly account for, in agricultural investment planning. Since the changes in agricultural systems needed to achieve agricultural growth for food security under climate change are largely built upon sustainable agricultural intensification activities, it is useful to also look at the lessons learned on farmers' investment patterns across different farming systems and socio-economic conditions. There are generally a range of possible options for sustainable agricultural intensification. Therefore, building an evidence base to identify which are most suitable to meet agricultural development goals under climate change (e.g. explicitly accounting for adaptation and mitigation impacts as well as food security and economic growth) is an important step in developing climate-smart agricultural strategies and investment plans.

In this section we highlight two important areas where climate change affects the incentives and constraints agricultural producers face in making investment decisions: increasing risk and uncertainty and augmenting the benefits of resource use efficiency (as well as the costs of inefficiency). Both of these factors are well recognized as important issues in agricultural investment behaviour in the context of sustainable agricultural intensification, and this module recommends building on this knowledge in assessing the potential impacts of climate change and potential public investments needed to address associated barriers to farm level investment. The responses to these two challenges as well as the implications for agricultural investments are often interlinked.

Coping with increased risk and uncertainty

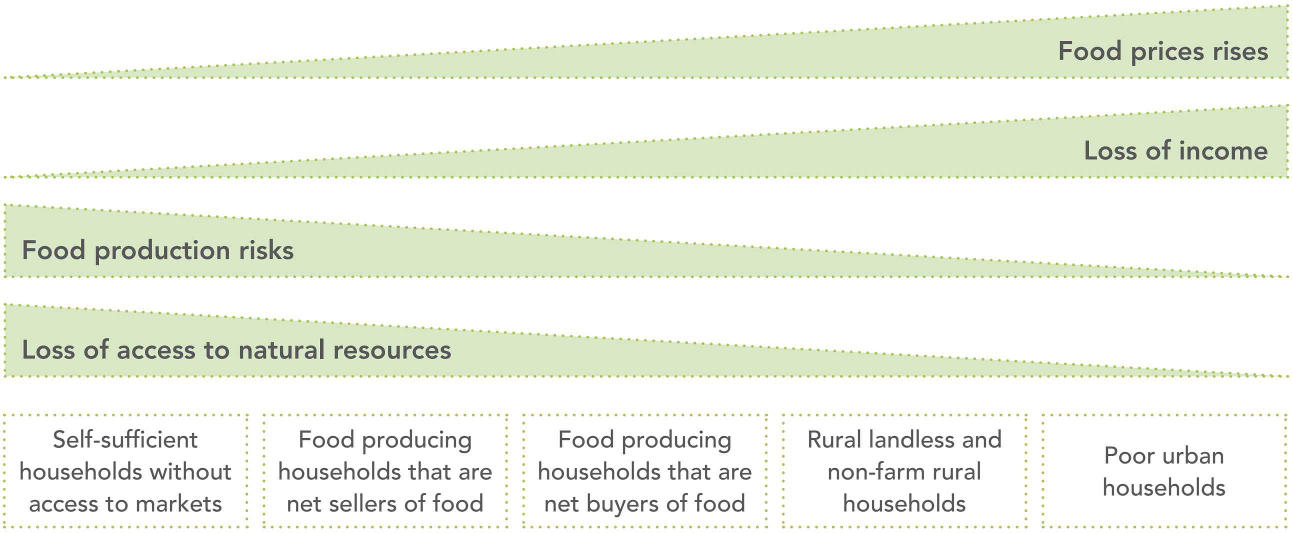
Climate change is already having effects on the risks and uncertainty that farmers face, and this has important implications for their decisions on agricultural investment. A large body of research on the effects of risk and uncertainty on farm decision-making indicates that they significantly change investment patterns in a number of possible ways: the selection of low-re urn but low-risk subsistence crops for investment (Heltberg and Tarp, 2002; Sadoulet and de Janvry, 1995; Fafchamps, 1992; Roe and Graham-Tomasi, 1986), lower likelihood of applying purchased inputs such as fertilizer (Dercon and Christiaensen, 2011; Kassie *et al.,* 2008), lower likelihood of adopting new technologies (Feder *et al.,* 1985; Antle and Crissman, 1990) and lower overall levels of investment (Skees *et al.,* 1999). All of these responses generally lead to both lower current and future farm profits (Hurley, 2010; Rosenzweig and Binswanger, 1993).

Managing risk and uncertainty at the farm level is thus essential in creating an enabling environment for farmers to invest in CSA practices. This in turn has implications for the development of public sector investment strategies: what does the public sector need to invest in to provide the enabling environment for managing risk and uncertainty under climate change? Gitz and Meybeck (2012) argue that there are three ways to increase resilience[2] in agricultural systems to address climate change risks: 1) reduce exposure; 2) reduce the sensitivity of systems to shocks; and 3) increase adaptive capacity. Measures can be taken ex-ante, ex-poste or during shocks and they comprise actions aimed at increasing resilience in ecosystems as well as in social and economic systems. The measure that will be most effective in increasing resilience in any specific context will depend on the main sources of vulnerability.

Figure 14.3 below, illustrates different sources of vulnerability across a range of household types, differentiated according to their entitlements to food (e.g. through own production and purchased with wage, agricultural income or transfers) (Sen, 1981). The figure illustrates that the main source of vulnerability to food insecurity can range from a production loss to market disruptions and volatile food prices. In analysing the public investment requirements to mitigate climate change induced vulnerability in the agricultural sector it is important to identify the nature of the vulnerability in order to develop an effective response. Planning and investments to increase resilience must also take into account the effects of increased uncertainty on developing "no regrets" strategies and avoiding maladaption (Gitz and Meybeck, 2012).

[2] Resilience is defined as "increasing the capacity of systems, communities, households or individuals to prevent, mitigate or cope with risk and recover from shocks." Gitz and Meybeck, 2012. p.29.

Figure 14.3
Sources of vulnerability across different groups



Source: FAO, 2012c

The following section highlights important strategies for increasing resilience in agricultural systems under climate change and their implications for investment planning.

Information generation and dissemination. Generating, disseminating and translating information into a useful form is the key response to uncertainty generated by climate change. Much effort has been invested in helping farmers to make more effective climate-sensitive decisions (e.g. planting times and livestock shelter) via improved access to timely, meaningful and trustworthy climate information and knowledge. The investments need to support the development of a technical component developing agro-climate tools (Hansen and Coffey, 2011) — with institutions improving channels both for uptake of information and for demand for that information— supported by new information technology (e.g. information communication technology applications) (Thornton and Lipper, 2013). Investments to generate needed information as well as to support institutions/programmes for its dissemination are thus important in CSA.

Insurance. Agricultural insurance has expanded rapidly in recent years, with global agricultural premium value expanding from US$ 8 billion in 2004 to over US$ 20 billion in 2008 (Mahul and Stutley, 2010). However in low-income countries the penetration rates (measured by ratio between agricultural insurance premium value and agricultural gross domestic product) are still very low. Both the private and public sector could have a role in expanding insurance coverage in low-income countries vulnerable to climate risk. The ultimate costs depend on the nature of the support provided. Subsidizing premiums is the most common form of support in high-income countries, which require high levels of public investment. However, concerns have been raised about the effectiveness of such programmes, and their potential to lead to maladaptation by providing incentives to maintain production patterns that are no longer economically viable (Mahul and Stutley, 2010; FAO, 2012e).

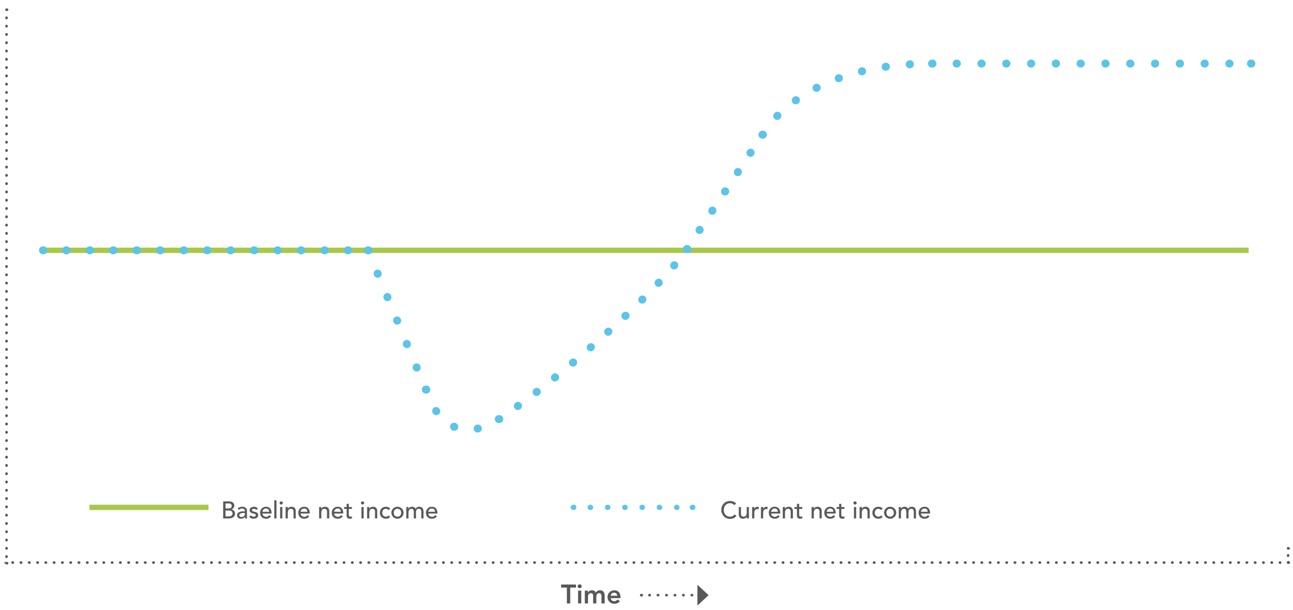
Safety nets are a form of social protection comprised of programmes supported by the public sector or non-governmental organizations that provide transfers to the poor to address risks, vulnerability and social exclusion. There is a broad range of activities that can fall into this category: conditional and non-conditional cash transfers, food vouchers and subsidies, seed and tool distribution, input subsidies and employment-based programmes such as food-for-work. Over recent years there has been a major expansion in social protection programmes, particularly cash transfers (HLPE, 2012a). Cash transfers have been found to stimulate investments in agriculture and livelihood activities (HLPE, 2012b). Investment costs for such programmes can be quite substantial, but they may not be included in investment plans for the agricultural sector, but rather under social protection investment plans. Regardless of where they are budgeted, their potential effects on risk management and farmers' investment behaviour are important factors to consider in designing CSA investment plans.

Diversification within and external to agricultural sources of income is widely regarded as a potential adaptation strategy under climate change. However, the ultimate impacts of diversification on farm level returns, food security and adaptation depend very much on the options selected for diversification. Diversifying into low-risk, but low-returning activities can lead farmers into a "poverty trap" characterized by decreasing farm incomes and increasing food insecurity (Barrett, 2007). Thus climate-smart agricultural diversification strategies rely on public sector investments to create options for diversification that contribute to increased farm incomes. Essentially this involves investments in developing alternative agricultural value chains and market linkages. It also involves changing public investment patterns that encourage mono-cropping, such as price supports and input subsidies for single crops.

Enhancing/restoring ecosystem services within agricultural production systems. Increasing the resilience of agricultural production systems to withstand and maintain productivity under extreme events such as drought and climate change is an important feature of CSA. To a large extent, this involves restoring and protecting ecosystem services related to soils and watersheds through the introduction of improved management systems and better management of biomass (including crop residues, perennials and trees) (FAO, 2010; Meybeck and Place, 2013).

The public sector can play a key supporting role in building resilient agricultural systems by developing financing schemes to support farmers in making investments whose returns are realized only after significant periods of time. Many sustainable land management practices require three to five years before a positive return is achieved, with even longer lags for restoration activities (McCarthy *et al.*, 2011). The extended lag time for realizing positive returns to sustainable agriculture investments was a key point made in FAO, 2007. Figure 14.4 illustrates the problem; sustainable agricultural investments can result in a short-term loss of income to the investors while ecosystems are being restored, and this represents an important barrier to adopting such changes.

Figure 14.4
Investment barrier to adoption



Source: FAO, 2007

Even where credit for agricultural investments is available, they generally do not support such long-term investments. Restoration of degraded ecosystems can involve even longer periods before positive returns are gained, and involve very significant opportunity costs in the form of foregone income from the ecosystem during restoration. A classic example is restoration of degraded grazing lands which involves reduction (or even elimination) of grazing for extended periods. The table below, Table 14.5, is reproduced from and shows the number of years before a positive return to restoring grazing lands can be obtained for a pilot project in Qinghai, China.

Table 14.5
An example of opportunity costs of implementing improved grazing management practices

Size of herd	Baselinenet income	NPV-HA over 20 years	N° of years to positive cash flow	N° of years to positive incremental net income compared to baseline net income
	($/ha/yr)	($/ha)	(number of years)	(number of years)
Small	14.42	118	5	10
Medium	25.21	191	1	4
Large	25.45	215	1	1

Source: McCarthy *et al.*, 2011

The smallest producers face the longest wait for positive returns – implying the importance of long-term financing to food security and poverty reduction. The implications for public sector finance are to support credit/safety net programmes that can maintain farm income levels over periods required for restoration.

Improving markets to reduce volatility is another key strategy to increase the resilience of agricultural producers to extreme events (FAO, 2012c). Recent experiences with food price spikes revealed the vulnerability of current food marketing systems to extreme events. Implications for national level agricultural investments are for improvements of both physical infrastructure (roads, storage, etc.) as well as regulations to support greater integration and stability of market processes (FAO, 2012c).

Increasing resource use efficiency

Increasing resource use efficiency is a key component of sustainable agricultural intensification strategies (FAO, 2011c, also see Module 1). For example, the environmental strategies underlying sustainable crop intensification include maintaining healthy soil to enhance crop nutrition, using well-adapted, high-yielding varieties and good quality seeds, integrating management of insects, pests and diseases and efficiently carrying out water management (FAO, 2011c). These strategies are all means of increasing resource use efficiency. They also have considerable potential to contribute to both adaptation and mitigation.

Resource use efficiency refers to a ratio between inputs and outputs (e.g. the amount of water or fertilizer utilized in producing a unit of agricultural output). TFP is a measure of resource use efficiency, and as argued in the first section of this module, increasing its importance as a source of agricultural growth is a fundamental principle for CSA. For example, increasing water use efficiency is a key adaptation strategy in areas where climate change is expected to reduce availability of water supplies (FAO, 2011b). Increased resource use efficiency is also highly correlated with reduced emissions per unit produced (Thornton and Lipper, 2013).

What kinds of investments are needed to support farmers in increasing resource use efficiency? One key category of investment required is information. For example increasing water use efficiency requires mapping water demand and use over time and space and calculating where and when inputs are necessary. Similar information is needed to increase fertilizer and pesticide efficiencies. This implies a need for investments in research as well as extension. While this need has been well recognized (FAO, 2011c) public sector investments have not been adequate, as discussed in the first section. Investments into development of technologies and practices that increase efficiency, such as drip irrigation or improved livestock feeding are another important investment category (Global Agenda of Action, 2012). Investing in efficient input supply chains that ensure the availability of inputs when they are needed in the quantities and packaging required is another important type of public sector investment needed to enhance farmers' willingness and capacity to increase resource use efficiency. For example, timely delivery of fertilizer in small packs was found to be key in determining efficient fertilizer management on farms in Kenya (Duflo and Kramer, 2011). This all would imply much greater attention to the design of input supply systems to support efficiency.

Building the evidence base to support CSA

One of the most important aspects of effectively implementing CSA is the use of evidence-based information to identify best options for changes in agricultural systems and the investments at farm, local institutional and national level to support scaling up implementation. Essentially this requires the development of a set of proposed changes in agricultural systems (e.g. from national agricultural planning) and screening them for their potential adaptation and mitigation benefits as well as agricultural benefits related to food security. A second important component of the evidence base is an analysis of the barriers to adoption of the practices or changes and their implications for achieving permanent adoption of improved practices. Consideration of investments in an enabling environment that supports sustained adoption of improved practices, avoids problems of dis-adoption after short-term project interventions. As discussed in the above section, another important component of the evidence base is assessing the need for risk management policy instruments as well as the potential for coordinating and capturing synergies between them. Finally, financial and economic analysis of scaled up CSA interventions is needed.

The costs associated with building an evidence base arise from data collection and analysis. These can range from large-scale quantitative survey data collection and analysis, to participatory approaches using simple tools such as the CSA screening methodology discussed above, with very different cost implications. It is clear that participatory approaches that involve key stakeholders from farmers to policy-makers in the discussion and development of the evidence base are needed to realize the effective potential of implementing CSA. In many cases data and analysis, as well as possible participatory processes already in place that CSA processes could build upon, could reduce overall costs. It also highlights the need for more simplified tools to help planners with CSA investment analysis. One recent publication (FAO, 2012d) gives good guidance on best practices that are very useful for CSA investment planning. Likewise the CSA screening methodology described above is another tool that can be used for building a very simple and low-cost evidence base. However these tools need to be improved, refined and extended before they can provide the needed level of detail and accuracy that CSA investment planning at the country level requires.

14.3 Global climate finance: catalysing the transition towards CSA

The reform of agricultural sectors to incorporate climate change considerations ultimately relies on the restructuring of agricultural investments, public as well as private, at the national level. Nevertheless, international financing plays a crucial role in this transition. International climate finance can act as a catalyst for the broader adoption of CSA practices by demonstrating the feasibility of CSA approaches, facilitating climate change mainstreaming into national policy and legal frameworks, and promoting the creation and transfer of skills, knowledge and technologies. If used correctly, the leverage of relatively small amounts of international climate finance can help to transform public agriculture budgets and private investments into sources of CSA financing. For many countries, learning how to access and effectively use international financing options represents the first step in the long-term transition towards CSA.

The challenging landscape of international climate finance for CSA

In the past, accessing international climate financing for CSA activities has been a particularly challenging endeavour for mainly three reasons:

1. Total funding falls well short of developing countries' needs. This overall resource constraint presents a problem for climate finance as a whole, but it is especially pronounced for CSA activities. Thus far, the lion's share of climate financing from public sources as well as almost all private sector climate financing flows into mitigation activities in the industrial and energy sectors. Adaptation financing, with a significant part targeting agriculture activities, is small in comparison to mitigation financing. Consequently, the financing need-supply gap is especially large for CSA.
2. The disjointing of mitigation and adaptation in UNFCCC negotiations has traditionally been reflected in a separation of corresponding funding sources. CSA draws its strength from the utilization of synergies between mitigation and adaptation, but few of the existing financing options provide clear funding channels for integrated activities.
3. While adaptation financing is strongly connected to agricultural investments, greenhouse gas (GHG) reductions from agricultural practices have no equally prominent role in the international financing of mitigation activities.

(Buchner, 2011)

Fortunately, all of these obstacles are already in the process of being removed or will potentially be lowered in the mid-term future. Existing funding mechanisms have started to move towards a more integrated view of adaptation and mitigation. Accordingly, funding eligibility criteria are changing to more readily accommodate combinations of adaptation and mitigation financing. The increasingly cross-cutting perspective also extends to the combination of climate change with other related areas such as forest management, biodiversity or land degradation. This shift bodes well for integrative approaches like CSA. Regarding the overall availability of resources, all eyes are on the Green Climate Fund (GCF), which was created with the expectation to disburse US$ 100 billion annually by the year 2020. Furthermore, in the UNFCCC the "Terms of reference for the design of the Green Climate Fund" in paragraph 1(c) states the "objective of achieving a balanced allocation between adaptation and mitigation" (UNFCCC, 2010) pointing towards an adjustment in the distribution at least of public climate financing in favour of adaptation. Even if these ambitious goals are not met, the GCF has the potential to ease at least some of the constraints on climate finance availability in general and adaptation financing in particular. Until then, developing countries can consider two interlinked paths of action: first, to access existing climate financing for agriculture, thereby facilitating CSA advances while creating a basis for accessing future funding and second, to prepare for accessing future GCF funds by building a tailored project pipeline, improving policy and legal foundations, and creating necessary implementation capacity. Both require a good understanding of existing finance options for CSA as well as current developments.

The existing climate finance options for CSA

The landscape of CSA financing options is complex, featuring a multitude of funding channels with different objectives and eligibility criteria. Financing options specifically targeting CSA are still limited, necessitating a strategic use and combination of existing funding sources. The basis for any CSA activity should be the identification of a country's opportunities and vulnerabilities, corresponding needs and preferred options for CSA activities. After national priorities have been defined, a strategic approach to sources of international finance based on an understanding of available channels will not only increase the chances for approval, but also enhance the fit between the finance option and the country's overall approach to climate change in agriculture. Without making the futile attempt to cover all available sources of international climate finance, this section will provide an overview of six categories of important climate finance options provided by:

1. Financing mechanisms directly under the UNFCCC;
2. United Nations (UN) organizations or programmes;
3. Multilateral Development Banks (MDBs);
4. Bilateral public financing channels;
5. Compliance and voluntary carbon markets; and
6. Private sector actors and philanthropy.

UNFCCC

The first category entails climate finance options for CSA directly connected to the UNFCCC (see Figure 14.5). The Global Environment Facility (GEF) serves as one of the "entities operating the financial mechanism" of the UNFCCC. Through the GEF Trust Fund, donor countries provide financing to cover the incremental cost developing countries incur when undertaking activities that create global environmental benefits. Climate change mitigation, as a particularly clear-cut case of global environmental benefits, represents one of the GEF's largest focal areas. Climate change adaptation activities are not funded under the GEF Trust Fund, but receive financing through separate funds, the Least Developed Countries Fund (LDCF) and the Special Climate Change Fund (SCCF) described in detail below.

The GEF Focal Area Strategies[3] provide the basis for GEF funding priorities. In line with the small role agriculture traditionally holds within international mitigation financing, activities reducing GHG emissions from agriculture are not particularly highlighted under the current GEF Strategy (GEF, 2007). Nevertheless, the GEF Trust Fund provides funding opportunities for agricultural GHG reductions, most importantly under Focal Area Objective Climate Change Mitigation (CCM)-5 on the promotion of the conservation and enhancement of carbon stocks through sustainable management of land use, land-use change and forestry. The current GEF strategy puts an emphasis on sustainable forest management, which connects to CSA practices under the broader landscape approach. In addition, the objective includes the enhancement of carbon stocks in non-forest lands, making CSA mitigation activities in a narrow sense eligible for GEF Trust Fund financing. Another niche for agricultural activities within the current GEF Strategy is the financing of biomass applications under the renewable energy objective (CCM-3). Overall, agriculture does not play a prominent role in the current GEF CCM Strategy. However, this situation is likely to change with the new upcoming GEF Strategy on CCM, which is likely to put an explicit focus on CSA (see section below on "Prospective development in climate finance for CSA").

In addition to the financing provided through the GEF Trust Fund, the UNFCCC has established several additional funds. The LDCF and the SCCF, both established in 2001, are managed by the GEF and have developed into one of the central global financing options for climate change adaptation activities. The LDCF's original mandate was to provide full cost financing to least developed countries[4] for the formulation of National Adaptation Programmes of Action (NAPAs). By now, practically all eligible countries have accessed their funds for NAPA preparation. Therefore the LDCF has shifted its focus towards the implementation of projects that respond to NAPA priorities. As agriculture is arguably the sector most vulnerable to climate change impacts, it is a priority for NAPA implementation in most countries. Consequently, agriculture is the main sector receiving LDCF funding. Following the GEF's own classification, 28 percent of the US$ 537 million LDCF resources dispersed to date were allocated to agricultural adaptation activities. A closer examination of LDCF and other NAPA related projects suggests that this percentage is actually much higher, as most LDCF projects across all categories are in fact "mainly related to agriculture" (Meybeck, 2013). Accordingly, the LDCF represents one of the most important sources for the adaptation aspects of CSA activities in least developed countries.

Only least developed countries are eligible to access LDCF funding. Other developing countries have to rely on funding from the SCCF. The SCCF formally features a broad mandate covering practically all aspects of climate change adaptation and mitigation. De facto, the SCCF has developed into a funding source for climate change adaptation activities accessible to non-least developed countries[5]. As in the LDCF, agriculture is one of the main target sectors for SCCF funding. More than half of total SCCF resources (US$ 189 million mobilized by June 2012) were dispersed to projects in agriculture, land management, and water management. The adaptation aspects of CSA activities thus connect directly to SCCF priorities. However, the SCCF particularly suffers from the limitation of overall financial resources and the unpredictability of finance availability. Other than

[3] GEF Focal Area Strategies are effective for the respective four-year long GEF replenishment period. The current replenishment period, GEF-5, extends from July 1st 2010 through June 30th 2014. On July 1st 2014, the new GEF Focal Area Strategies for the GEF-6 replenishment period are expected to come into effect.

[4] For a list of eligible least developed countries see GEF, 2011, p. 8.

[5] Least developed countries are also eligible for SCCF funding, but in most cases choose to use the often more readily available resources provided by the LDCF.

the GEF Trust Fund, which is replenished for four year periods, the LDCF and SCCF rely on voluntary ad hoc contributions from donor countries, making the planning of resource allocation difficult. While the situation is less problematic for the LDCF as it receives an overall higher volume of resources, it makes the availability of resources for SCCF activities highly uncertain, increasing the risk for countries and implementing agencies of conducting the laborious process of project preparation in vain.

One aspect that makes GEF managed funding channels especially suitable for the financing of CSA activities is their combinability in form of Multi Focal Area and Multi Trust Fund activities. The GEF hosts resource channels for climate change mitigation and adaptation under one roof. In addition, the GEF also serves as a financial mechanism for other international environmental conventions like the Convention on Biological Diversity or the United Nations Convention to Combat Desertification and in this function provides funds for biodiversity conservation, sustainable land management and other environmental concerns. All of these GEF funding channels are combinable, meaning that one project can access funding from different GEF channels for the respective aspects of the activity. As an integrated approach to agricultural development, CSA emphasizes the utilization of synergies. The combinability of GEF financing options provides opportunities to translate the integrative nature of CSA into additional financing. The combination of mitigation and adaptation funding in Multi-Trust Fund initiatives, merging GEF Trust Fund with LDCF/SCCF resources, corresponds most directly with CSA activities (see Box 14.1). For some CSA initiatives a combination of funding from different GEF focal areas like biodiversity or land degradation might also be an option. The combination of funding from different focal areas is especially incentivized for activities on Sustainable Forest Management (SFM) through the SFM/Reducing Emissions from Deforestation and Forest Degradation (REDD+) Incentive Mechanism (GEF, 2010).

Box 14.1
GEF/SCCF Multi-Trust Fund projects

The FAO/GEF Multi-Trust Fund project on Promotion of Climate-smart Livestock Management Integrating Reversion of Land Degradation and Reduction of Desertification in Vulnerable Provinces combines GEF Trust Fund and SCCF funds for an integrated approach to increase multiple benefits needed in the livestock sector in Ecuador. The proposed project is particularly innovative because it seeks to harness the synergies between sustainable land management, climate change mitigation, and climate change adaptation. Climate-smart livestock management (CSLM) integrates both climate change adaptation and mitigation practices in the agro-livestock sector, while enhancing the achievement of national food security and development goals. The overall GEF financing of US$ 3.86 million, which includes US$ 1.46 million from the SCCF, will support interventions to reduce soil degradation, increase adaptive capacity to climate change, and mitigate GHG emissions by implementing cross-sectorial policies and climate-smart livestock management, with emphasis on vulnerable provinces.

Source: GEF, 2013b

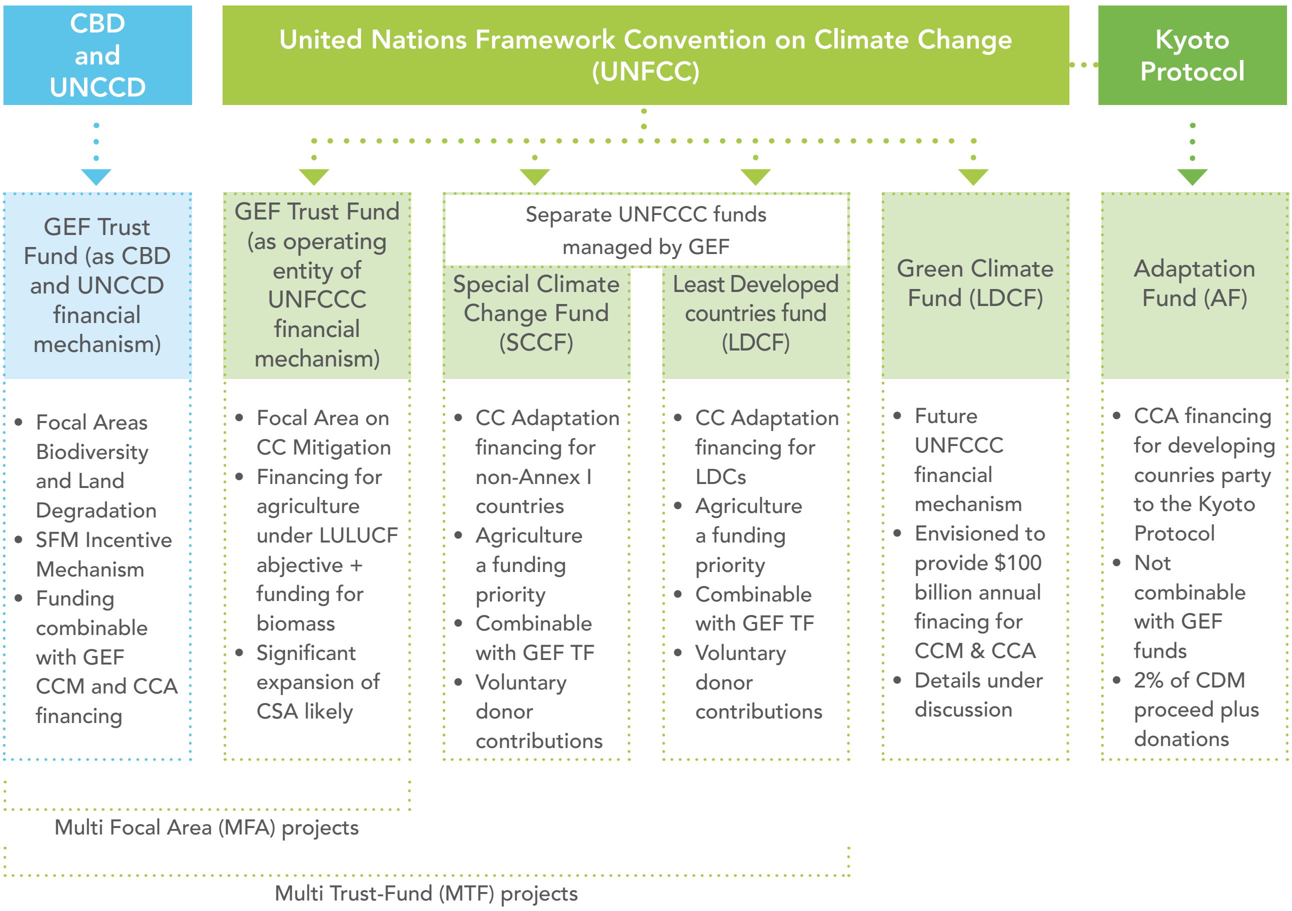
In addition to LDCF and SCCF, the UNFCCC created another fund to address adaptation needs of non-Annex I countries: the Adaptation Fund (AF), established in 2001 under the Kyoto Protocol. The AF began operations in 2007. Since then 28 projects with a total volume of US$ 184 million have been approved. The GEF provides secretariat services to the AF, but its governing body, the Adaptation Fund Board, is separate from the GEF governance structure and hence, the AF follows distinct policies. The most significant difference is the principle of direct access. For most GEF Trust Fund or LDCF/SCCF financed activities, developing countries have to partner with one of the ten GEF Agencies[6], which are accredited to apply for GEF funding and implement the respective project. The AF instead emphasizes the direct access to resources by National Implementing Entities in the recipient countries. At present, 15 National Implementing Entities are accredited to apply for AF funding. In addition, the AF has accredited ten Multilateral Implementing Entities as well as one Regional Implementing Entity. The most significant challenge the AF currently faces is the future inflow of financial

[6] The ten GEF Agencies are: World Bank Group, Inter-American Development Bank, Asian Development Bank, African Development Bank, European Bank for Reconstruction and Development, UN Development Program, UN Environment Program, UN Food and Agriculture Organization, UN Industrial Development Organization, and the International Fund for Agricultural Development.

resources. The primary source of AF resources is the sale of Certified Emission Reductions under the Kyoto Protocol's Clean Development Mechanism with two percent of its proceeds going to the AF. However, with the deflation of carbon markets and the corresponding collapse of Certified Emission Reduction prices in combination with the uncertain shape of the Post-Kyoto emission trading architecture, the financial basis of the AF is being threatened. One response of the AF has been to intensify efforts to increase the share of resources from donor contributions. With this shift, the competition over donor contributions between AF, LDCF and SCCF has increased, while the total resource availability remains tightly constrained.

The continuous lack of total available resources for climate change action in developing countries prompted efforts to overhaul the architecture of climate financing under the UNFCCC. The most visible result of these negotiations is the establishment of the GCF formally created at the Conference of the Parties (COP) 16 in Cancun. In distinction from other special funds, the GCF is envisioned to become an operating entity of the UNFCCC comparable to the GEF. The creation of the GCF Board as the fund's governing body as well as the selection of Incheon (South Korea) as host to the GCF represent first steps towards making the GCF operational. The details of the GCF's operation, its business model, resource mobilization, channels of disbursement as well as funding areas and priorities remain under discussion. The GCF is envisioned to provide US$ 100 billion of climate finance per year by 2020, which would represent a dramatic increase of multilateral funding relative to current resource levels. Potential sources to reach this funding goal are donor contributions, revenues from carbon markets, and private sector funding mobilized through a Private Sector Facility still to be designed. Even if these ambitious funding goals are not realized, the GCF can be expected to fundamentally change the overall architecture of global climate finance. The way in which the GCF will relate to the existing funding mechanism under the UNFCCC will influence the shape of international climate financing structures probably for decades to come.

Figure 14.5
Climate finance options under the UNFCCC



UN Agencies and Programmes

UN Agencies and Programmes play a central role as implementing agencies for the activities financed through the funding channels under the UNFCCC described in the previous section. In addition, UN Agencies also provide climate financing directly, primarily through multi-donor trust funds financed by member states. The UN REDD programme and the Rural Energy Enterprise Development (REED) Programme are two prominent examples for this category of international climate finance.

The landscape approach places CSA activities in the context of the broader ecosystem highlighting interdependencies with surrounding land uses. In many cases, this creates a direct link between CSA and sustainable forest management. Therefore, this module includes financing options aimed at the reduction of GHG emission from deforestation and forest degradation and the enhancement of carbon stocks through forest conservation and sustainable forest management, commonly summarized as REDD+. In addition to GEF funding for SFM, the main source of financial support for corresponding activities is the UN REDD programme. The programme, a collaborative initiative of the United Nations Development Programme, the United Nations Environment Programme (UNEP) and FAO, is currently financed by Denmark, Japan, Norway and Spain with funds amounting to approximately US$ 120 million. UN REDD primarily prepares countries for REDD+ activities, creating prerequisites like MRV and monitoring systems, enhanced policy and legal frameworks, stakeholder awareness and management accountability. The UN REDD programme coordinates its activities with the Forest Carbon Partnership Facility of the World Bank (see below).

Another example for CSA relevant funding options administered directly through UN Agencies and Programmes is the REED Programme implemented by UNEP. The programme makes investments in small and mid-size enterprises dealing in clean energy solutions in rural areas, thereby following a seed capital approach instead of the more conventional grant approach. The areas covered by the recipient enterprises include clean technology applications that play an integral role in CSA activities (e.g. solar crop drying and wind water pumping).

MDBs

The primary function of MDBs is to provide loans under conditions and objectives based on their overall principles as well as the specific agreements between a specific country and the respective development bank. The agricultural sector remains one of the primary target sectors of MDB loans, representing a share of the agricultural official development assistance discussed in Part 14.2 of this module. As MDBs are increasingly incorporating environmental sustainability criteria into their agricultural lending practices, their loans play an increasing role as a financing option for CSA activities.[7] Among the MDBs, the European Investment Bank plays a particular role with respect to climate finance, being one of the world's largest lenders for climate action. In 2011, European Investment Bank climate change related loans amounted to € 18 billion, approximately one third of its yearly total lending. More than € 2 billion was invested outside the European Union.[8]

In many cases, climate related MDB loans are coupled with grants from different funds described in this module. At the core of grant-based climate, finance provided through the MDBs are the Climate Investment Funds, a joint initiative of the World Bank and the Regional Development Banks envisioned to provide climate finance in line with the UNFCCC framework but without prejudicing outcomes of UNFCCC negotiations. With pledges of US$ 7.6 billion and currently 67 approved projects for a total of US$ 2.7 billion, the Climate Investment Funds carry significant weight within the climate finance architecture. However, only a very small part of Climate Investment Funds' resources can be accessed for CSA activities. The Climate Investment Funds consist of two separate funds: The Clean Technology Fund and the Strategic Climate Fund. The Clean Technology

[7] A prominent example for the increasing emphasis on environmental issues, including climate change, in MDB lending practices is the recent World Bank Group Environment Strategy 2012 – 2022 "Toward a Green, Clean, and Resilient World for All" released in May 2012. At the operational and procedural level, climate change criteria for World Bank lending are stipulated in the World Bank Group Safeguard Policy on Environmental Assessment, which links to Operational Policy and Bank Procedure 4.01. In this context, climate change criteria are laid out in the Environmental Assessment Sourcebook under Chapter 2: Global and Cross Sectoral Issues in Environmental Assessment.

[8] European Commission, 2013.

Fund currently has 41 projects and US$ 2.3 billion of resources approved (US$ 5.2 billion pledged), providing financing for renewable energy, sustainable transport, and energy efficiency. The Clean Technology Fund does not provide a clear channel for GHG reduction from the agricultural sector. Again, the comparably small role of the agricultural sector in mitigation financing is reflected in the priority setting of the Climate Investment Funds. The Strategic Climate Fund comprises three targeted programmes. The Programme for Scaling-Up Renewable Energy in Low Income Countries targets the realization of low carbon pathways in six pilot countries' energy sectors and has received US$ 505 million in pledges. No Scaling-Up Renewable Energy in Low Income Countries project has been approved yet and they would not provide clear financing options for CSA. The Forest Investment Programme thus far has received US$ 639 million in pledges for reducing emissions from deforestation and forest degradation in eight pilot countries. It is more closely connected to CSA activities from a landscape perspective, but no projects have been approved at this point. The Pilot Program for Climate Resilience (PPCR) is the part of the Climate Investment Funds that represents the most direct financing option for CSA activities. Financing under the PPCR is, however, earmarked for climate adaptation activities. In addition, PPCR funding is concentrated on nine pilot countries and two pilot regional initiatives[9] and only these countries are eligible for PPCR funding. Given the small pool of eligible countries, the available PPCR resources per country are much larger than through other funding channels, opening extraordinary opportunities for the pilot countries. With the approach of resource concentration, the PPCR aims to provide significant investments necessary to achieve comprehensive sector-wide transitions towards increased climate resilience. Naturally, the agricultural sector is of high priority under the PPCR. Eligible countries thus have a unique chance to receive significant funding for deploying a CSA approach at a large scale. For PPCR pilot countries, this represents an opportunity that is not to be missed. In addition, the PPCR supported transformations of agricultural sectors will be among the first examples at this scale and will potentially serve as crucial examples for the future of climate finance under the GCF.

Box 14.2
Strengthening climate resilience in the Kafue River Basin in Zambia under the PPCR

The Kafue River Basin is a sub-basin of the Zambezi River Basin and a headwater catchment located entirely within Zambia. The impacts of climate change are projected to increase the variability of precipitation in the area, exacerbating problems caused by drought and flooding. One of the PPCR project sub-components focuses on fostering sustainable water and land management, agricultural and pastoral practices that help local communities to better address the current and future impacts of climate change and variability. It would finance climate resilient Integrated Development Plans and Local Area Plans. The PPCR will assist communities to implement such plans in partnership with non-governmental organizations and other development agencies.

Source: PPCR, 2011

In addition to the jointly implemented CIFs, the MDBs also administer their own specific climate change financing mechanisms. Among these, the Forest Carbon Partnership Facility of the World Bank has already been mentioned as complementary to the UN REDD programme, leading in the area of economic analysis for REDD strategies including pilots on performance-based incentive payment systems. Examples for climate finance mechanisms managed by Regional Development Banks include the African Development Bank's Congo Basin Forest Fund addressing deforestation in the Congo basin, as well as the Asian Development Bank's Clean Energy Financing Partnership Facility targeting policy, regulatory and institutional reform promoting clean energy development.

Bilateral public financing channels

Bilateral instruments remain one of the primary sources of climate finance. Analysis provided by the Climate Policy Initiative estimates that total annual climate finance to developing countries through bilateral sources

[9] PPCR Pilot Countries and Regions: Bangladesh, Bolivia, Cambodia, Mozambique, Nepal, Niger, Tajikistan, Yemen, Zambia; Caribbean Region (Dominica, Grenada, Haiti, Jamaica, St. Lucia, St. Vincent and the Grenadines) and the Pacific Region (Papua New Guinea, Samoa, Tonga).

(ca. US$ 23 billion) is in fact higher than the amount channelled through multilateral instruments (ca. US$ 17 billion). This gap becomes even wider when looking at climate change adaptation activities separately with bilateral sources amounting to US $3.6 billion and multilateral channels disbursing less than US $0.5 billion. Bilateral Financial Institutions play a central role as intermediaries disbursing climate funding to developing countries. Spending on climate change by the French Development Agency, the German Development Bank and the Japan International Cooperation Agency amounted to US$ 11.4 billion in 2009, including both official development assistance and non- official development assistance finance (UNEP, 2010). In addition, levels of South-South bilateral climate finance are increasing. The Brazilian Development Bank, China Development Bank, the Indian Renewable Energy Development Agency and the Overseas Private Investment Corporation have provided approximately US$ 4 billion of climate finance in 2010 (Buchner, 2011). As with other funding channels, most of the bilateral climate financing is concentrated in the industrial and energy sectors and therefore not available for CSA activities.

The member states of the European Union have traditionally been the main source of climate change financing assisting developing countries, both through national level initiatives as well as climate finance activities coordinated at the European Union level. Recently, the Global Financial Crisis and the European Debt Crisis have had devastating effects on the European Union's funding levels for climate change. The official development assistance numbers released by the Organisation for Economic Co-operation and Development (OECD) show that European Union contributions for climate change adaptation in developing countries has dropped by 55 percent from € 1.4 billion in 2010 to € 619 million in 2011[10]. Nevertheless, the European Union continues to finance a number of major initiatives providing international climate finance. One important programme from a CSA perspective is the Global Climate Change Alliance (GCCA), launched in 2007 as a European Union initiative coordinated by the European Commission (EC). GCCA has already disbursed € 243 million from 2008-2012 with € 47 million pledged for 2013.[11] The GCCA currently supports 30 country level initiatives and 8 regional programmes in the priority areas of mainstreaming climate change into poverty reduction, adaptation, REDD, participation in carbon markets, and disaster risk reduction. Most GCCA priorities link directly to the agricultural sector and indeed a large share of GCCA funding has targeted agricultural activities, making it a promising CSA financing option. Another major programme funded by the European Union with potential links to CSA activities include the ACP-EC Energy Facility promoting access to sustainable energy services for poor rural populations in sub-Sahara Africa, the Caribbean and the Pacific. In addition to these umbrella initiatives, the European Union, through the EC budget, provides support for a large number of individual climate change projects including agricultural activities. One recent example is a joint EC-FAO project that will provide € 5.3 million for assisting Malawi, Vietnam and Zambia transition towards a CSA approach.

Most of the individual European Union member states also have national level programmes, partially linked with the bilateral finance institutions listed above, providing climate financing to developing countries. Examples for important initiatives in the CSA context are Germany's International Climate Initiative which receives funding of € 120 million per year for the promotion of climate-friendly economic development, measures for climate change adaptation and for the preservation or sustainable use of carbon reservoirs (REDD+), as well as the United Kingdom's International Climate Fund, which handles the United Kingdom's contributions to many of the multilateral funds described above, but also provides direct climate financing for initiatives in developing countries on adaptation to climate change, low-carbon growth and REDD+. Total International Climate Fund pledges amount to £ 2.9 billion of climate finance from within existing aid commitments from 2011 to 2015. Outside the European Union, significant national sources of climate finance include the USAID Development Grants Program, which includes a priority area on climate change adaptation, as well as Japan's Hatoyama Initiative[12], which pledged US$ 15 billion in public and private climate financing covering all areas of mitigation and adaptation. Among national initiatives, Australia's International Forest Carbon Initiative stands out due to

[10] Global climate change adaptation funding fell from US$ 3.1 billion to US$ 1.8 billion during the same period (OECD, 2013).

[11] GCCA resources come from the EC budget, the 10th European Development Fund, and contributions from individual European Union member states. GCCA funding includes parts of the fast start finance pledged at the UNFCCC COP 15 in Copenhagen in 2009.

[12] Often referred to as the Japan Fast-Start Financing

its specific focus and purpose. The International Forest Carbon Initiative strives to demonstrate feasibility and create a solid basis for the inclusion of REDD+ in a Post-Kyoto global climate change agreement. Accordingly, the International Forest Carbon Initiative provides financing for pilot REDD+ activities, enhancement of forest carbon monitoring and accounting systems, and the development of market-based REDD+ approaches. In addition, Australia's Aid Program also provides CSA relevant financing through its Adaptation to Climate Change Initiative.

Carbon markets

Despite all the difficulties with its implementation, the concept of putting a price on GHG emissions and installing a market-based price-setting mechanism through certificate trading provides a powerful instrument of climate finance. Carbon markets could possibly be a large source of international funding for CSA activities. However, the inclusion of carbon credits from agricultural GHG reductions in compliance with carbon markets has been a matter of continuous controversy for at least two decades. The scope of this module does not allow for a full presentation of the complex debate on agricultural carbon credits. However, this is a list of some of the central concerns: a) challenge of MRV and related difficulties to ensure environmental integrity with respect to possible leakage, uncertain permanence and additionality of GHG reductions; b) high transaction costs, especially through the coordination of large numbers of smallholder farmers that would be required to make soil carbon Certified Emission Reductions profitable; c) high opportunity costs through the diversion from conventional climate change efforts towards the complex process of achieving carbon market readiness; d) concerns about the potentially adverse effect on food security through increases in food price volatility and displacement of food production in favour of more effective carbon sinks; e) questions about the use of untested technologies to create easily calculated GHG reduction. These issues are usually embedded in a more general rejection of carbon markets as a tool for agricultural mitigation, highlighting the unstable situation of carbon markets overall and concerns about shifting the burden of emission reductions to developing countries.

The combination of these and other concerns led to the exclusion of carbon reductions from soil carbon management in croplands and grassland from the Clean Development Mechanism. Consequently, the existing compliance carbon markets have ruled most agricultural carbon credits as ineligible for trading. Most importantly, the European Union's Emissions Trading System, being the world's dominant source of demand for Certified Emission Reductions, does not accept carbon credits from soil management activities. The exclusion of large parts of agricultural mitigation potential from the Clean Development Mechanism and compliance markets also prevent the development of a comprehensive set of approved baseline and monitoring methodology to determine the amount of generated Certified Emission Reductions. One notable exception is methane avoidance through manure management, which has witnessed an exceptional level of activity after the Clean Development Mechanism introduced a manure methodology in 2006. The amount and proportion of Clean Development Mechanism manure projects dropped sharply after 2006, but continue to provide niche financing. Overall, however, the agricultural sector lags years behind the industrial and energy sectors with large Certified Emission Reductions markets and a corresponding wealth of approved methodologies, experiences and knowledge. However, for the time being, compliance carbon markets do offer limited opportunities for CSA financing (World Bank, 2011).

Voluntary carbon markets have been somewhat more inclined to include carbon credits from land use, land-use change and forestry activities (PwC and Rockefeller Foundation, 2011). The majority of credits derives, however, from REDD activities, with carbon reductions from CSA still playing a very limited role. Some of the major voluntary carbon market standards like Verified Carbon Standard or the American Carbon Registry allow for carbon credits from CSA activities. Also, in the emerging voluntary carbon market in China, based on its first domestic carbon standard, the Panda Standard, GHG reductions from agriculture, forestry and other land use are explicitly promoted (UNEP Riso Centre, 2011). In consequence, a broader spectrum of certification methodologies for CSA credits has been developed under these standards including for agro-forestry, integrated farm energy systems, nutrient management, rice system management, tillage and residue management and watershed restoration.

Most prominently, the Verified Carbon Standard recently approved a carbon accounting methodology for sustainable agricultural land management developed in the context of the controversially discussed Agricultural Carbon Project in Kenya. The project, implemented by the Swedish non-governmental organization Vi-Agroforestry, produces carbon credits from CSA activities that will be bought by the World Bank's BioCarbon Fund. The BioCarbon Fund is set up as a public-private trust fund and is part of a larger set of different carbon funds managed and administered by the World Bank's Carbon Finance Unit.[13] The BioCarbon Fund specifically provides carbon finance for projects that create GHG reduction in forest, agro and other ecosystems. Active exploration of opportunities to create carbon credits from carbon sinks makes the BioCarbon Fund an unusual player in the climate finance universe. The Emission Reduction Purchase Agreement signed between the BioCarbon Fund and Vi-Agroforestry in 2010, was the first for soil carbon credits, garnering significant international attention. Through the Verified Carbon Standard approval, these carbon credits will be tradable on the voluntary carbon market. The BioCarbon Fund thereby advances the inclusion of CSA activities in carbon trading schemes. At the same time, opponents of agricultural carbon credits have criticized the Agricultural Carbon Project in Kenya as affirming some of the concerns listed above, especially the lack of accurate measurability of soil carbon sequestration (see Box 14.3).

Box 14.3
BioCarbon Fund: the Agricultural Carbon Project in Kenya

The Kenya Agricultural Carbon Project has received much international attention and praise as a ground-breaking pilot initiative with the goal to illustrate the potential and feasibility of agricultural soil carbon sequestration in the context of carbon markets:

"The Kenya Agricultural Carbon Project is breaking new ground in designing and implementing climate finance projects in the agricultural sector. The project is regarded as an innovative example for climate-smart agriculture within and outside the World Bank. For the first time, while increasing productivity and enhancing resilience to climate change, smallholder farmers in Africa will receive payments for greenhouse gas mitigation based on sustainable agricultural land management. Quantification of carbon sequestration is monitored based on a newly developed carbon accounting methodology." (Woelcke, 2012)

"The Kenya Agricultural Carbon Project is not only the first project that sells soil carbon credits in Africa, it is also paving the way for a new approach to carbon accounting methodologies. As Kenya ramps up its participation in carbon markets, this project illustrates concretely how carbon finance can both support the environment and generate revenues for local communities." (Chassard, 2010)

At the same time, the project has drawn criticism pointing to the displayed high transaction costs and questions about the adequacy of the employed MRV methodology, which will not include actual soil sampling. This criticism is mostly embedded in a more general rejection of carbon markets as a suitable tool for agricultural mitigation, highlighting the large potential for leakage and impermanence, the unstable situation of carbon markets overall, and concerns about shifting the burden of emissions reductions to developing countries.

"Nearly half of the monetary benefits from the proposed offset credits would be absorbed by project developers as 'transaction costs,' with miniscule returns to the farmers who would be implementing the project. While carbon markets are promoted as a way to 'leverage' climate funding, to judge by this project, the rules being developed risk oversimplifying evolving science on climate mitigation and diverting resources from the urgent task of adaptation. [...] Given the high degree of uncertainty about this model project's mitigation benefits and high transaction costs to achieve mostly co-benefits, could such co-benefits be more efficiently achieved through direct access to finance for agricultural adaptation?" (Sharma, 2011)

Private sector and philanthropy

In the context of this section, private sector CSA investments do not mean the "transformed" agricultural investments by agribusiness or smallholders that follow CSA principles, but international private sector funding that contributes to catalysing this transition. Looking at the entire landscape of climate finance, the private sector is in fact the single largest source of financing (Buchner, 2011). However, private sector funding in the

[13] Funds managed by the World Bank's Carbon Finance Unit also include the Community Development Carbon Fund.

form of market-rate loans or capital investments is almost exclusively targeted at climate change mitigation activities in the renewable energy sector and in industrial energy efficiency. The global share of private sector climate finance in adaptation, agricultural or otherwise, is currently still negligible (Buchner, 2011). Similarly, the exclusion of agriculture from compliance carbon markets limits direct private sector investments in agricultural mitigation activities. Voluntary carbon markets, which are small but expanding, provide a channel for private CSA financing, but current volumes are still minimal, as discussed above. Overall, private sector investments at this stage provide "niche financing" that create positive impacts on CSA development at a case-by-case level, but do not play a large role in the overall landscape of CSA financing.

Nevertheless, there are a number of innovative private sector initiatives worth highlighting in this context. Usually, these are driven by a combination of three factors: a) protection of a company's value chain from climate change impacts; b) opportunities for increased profits through environmental certification schemes; and c) corporate social responsibility linked to a company's image and self-understanding. These motives particularly apply to large, multinational food-product corporations with strong interests in increasing climate resilience of agricultural production within their value chain. At the same time, these multinational companies have much to gain from creating a premium price market for products certified as "climate-friendly". Environmental certification schemes for food products are already relatively wide-spread and well established in several markets (Blackmann, 2011 and 2012). In comparison, climate change related product certification is still at its beginning. Highly publicized examples for companies' individual or joint efforts in this regard include the collaboration of Coca-Cola and the WWF on sustainable sugarcane in Brazil (see Box 14.4). One of the already existing umbrella initiatives aiming at coordinating private sector efforts in this direction is the Sustainable Agriculture Initiative Platform, which includes Nestle, Unilever, Group Danone, McDonald's, Coca Cola, Kellogg's, General Mills, and others.

Box 14.4
Private sector: promoting the advancement of sustainable sugarcane in Brazil

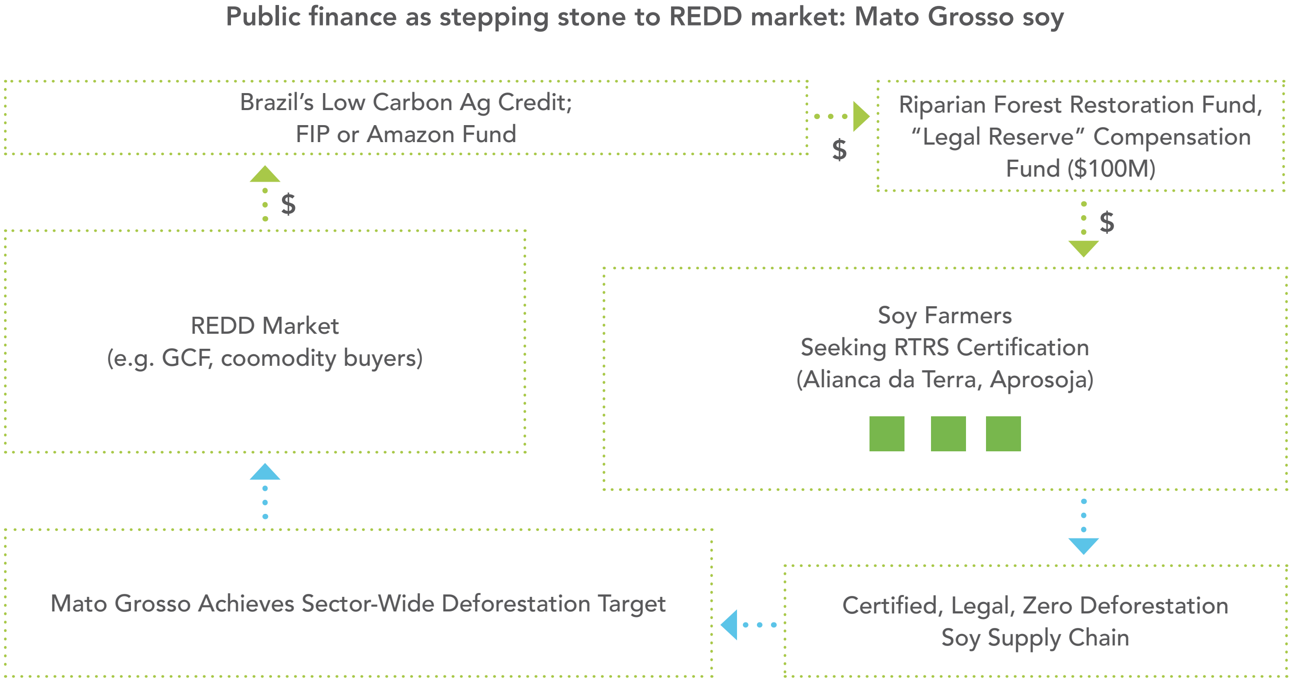
In 2007, The Coca-Cola Company and World Wildlife Fund (WWF) confirmed a joint commitment to improve water efficiency, reduce carbon emissions, and help conserve seven of the world's most important freshwater river basins. As a critical piece of this initiative, Coca-Cola affirmed the goal of advancing sustainable agriculture practices through promoting environmental stewardship and ensuring workplace rights. Among agricultural products, sustainability in the sugarcane supply chain (farm, mill, and refining processes) is a key priority for The Coca-Cola Company and a focal point of the WWF/Coca-Cola partnership. As such, they also worked with Brazilian Sugar Mill suppliers.

Coca-Cola and WWF have identified Bonsucro certification as a means of ensuring increased sustainability, and believe the newly formed standard will provide a globally recognized, third-party certification for sustainably produced sugarcane. Developed through an independent, multi-stakeholder initiative, the Bonsucro certification provides a mechanism for achieving sustainable production from sugarcane in respect of economic, social and environmental dimensions. Coca-Cola, in partnership with WWF, has collaborated with key suppliers to initiate activities that assist sugar mills to understand and work towards certification. As Coca-Cola and WWF support mills to meet certification standards, sugarcane producers will continue to benefit, with global implications of aligning the industry towards responsible and sustainable environmental stewardship.

Source: Sustainable Agriculture Initiative, 2010

Climate change related product certification is often particularly promising when catalysed through public climate financing sources. In some cases, product certification can then also be linked to market-based carbon financing. One successful example is the Round Table on Responsible Soy (RTRS) certification initiative. This widely recognized standard combines a number of components including social and labour standards, biodiversity, pesticide, soil, water use and others. The land use and zero deforestation aspect of the RTRS standard connect it to REDD+ carbon markets which again opens additional financing for further certification efforts, closing the virtuous cycle of public finance, product certification, and carbon markets (see Figure 14.6).

Figure 14.6
Public climate finance: RTRS certification and REDD+ carbon markets



Another private funding source is philanthropic contributions, usually channelled through charitable foundations or international non-governmental organizations. Organizations like the Rockefeller Foundation, the Co-operative for Assistance and Relief Everywhere, Oxfam, or Conservation International have all invested in CSA activities (Shames *et al.*, 2012). The Rockefeller Foundation's Developing Climate Change Resilience Initiative is one of the most visible programmes in this context. The Howard G. Buffett Foundation supports CSA projects in Tanzania, Burundi, Sierra Leone and Sudan through a partnership with the Cooperative for Assistance and Relief Everywhere.

A final example for involvement of private sector actors in CSA activities, albeit not in the form of direct investments, is the international insurance business. The establishment of insurance schemes to help farmers manage agricultural climate change risks, while providing incentives for risk prevention and improvement of risk information (The Geneva Asssociation, 2012), has become one of the innovative and prominently employed instruments used in the design of many CSA projects financed through international climate finance. In this, the private insurance sector is often a crucial partner and provider of tailored services and products as well as knowledge and expertise.

Prospective development in climate finance for CSA

This section began with the premise that receiving funding for CSA activities within the international climate finance landscape is challenging, but that there are signs that this situation is improving. Probably the clearest sign can be found in the ongoing discussions on the sixth replenishment of the GEF and the formulation of new GEF-6 Focal Area Strategies. The GEF's movement towards combining adaptation and mitigation activities has already been discussed. This trend continues in the draft GEF-6 Strategy for climate Change Mitigation which turns an explicit spotlight on CSA. While agriculture was hardly mentioned in the GEF-5 CCM Strategy, the current GEF-6 CCM draft highlights cross-cutting financing options as one of GEF's specific value propositions, explicitly citing CSA as an example:

Since GEF-5, an increasing number of projects that address both mitigation and adaptation are being supported by the GEF to help countries realize the low carbon and climate resilient development goals. Topics of emerging importance to address the global commons, such as urban management and climate- smart agriculture, also transcend mitigation and adaptation concerns. The flexibility of the GEF to support such initiatives by combining resources from the GEF Trust Fund and the two trust funds managed by the GEF for adaptation is a distinctive feature of the GEF." (GEF, 2013a)

The GEF-6 CCM draft mentions mitigation in agriculture in general and CSA in particular several times, cumulating in the explicit inclusion of CSA as a funding priority under "Objective 2, Programme 2: Promote Conservation and Enhancement of Carbon Stocks in Forest, and other Land-Use, and Support Climate-Smart Agriculture." In doing so, the GEF-6 strategy acknowledges the "need to go beyond GEF-5 efforts on carbon dioxide emissions and sequestration from the agriculture and forestry sectors and to include activities targeting the methane and nitrous oxide emissions of these sectors." The strategy complements this by highlighting its focus on the forest-agriculture nexus as well as the necessary strengthening of MRV of GHG emissions and carbon sequestration in forests and agriculture. The strategy lists the following examples for activities to receive financing under GEF-6: agro-forestry, conservation tillage, livestock management, methane mitigation, irrigation, and fertilizer management. The GEF through its multiple funding channels has thereby fully incorporated CSA in its financing strategy.

This significant shift has implications well beyond the GEF itself. As the financial mechanism of the UNFCCC, the GEF serves as arguably the most important source of examples and experiences for the design of the Green Climate Fund, which is envisioned to also become a UNFCCC financial mechanism. It is still unclear how the GCF will reshape the architecture of funding channels under the UNFCCC (Abbott, 2011; Lattanzio, 2013). Possible options range from the absorption of some or all of the GEF climate finance instruments into the GCF to the coexistence of all funds with the GCF taking an umbrella function, coordinating existing funds under the GEF and representing a middle ground option. However this debate turns out, the substantive upgrading of CSA in the GEF-6 Strategy is likely to be reflected to some degree in the priority setting of the GCF. This means that regardless of the ultimate structure of financing channels, the GCF will represent a clear and direct financing option for CSA activities, presumably with a significantly higher volume than current multilateral funding instruments.

Another pending development, with the outcome regarding CSA less certain, is the result of UNFCCC negotiations on the overall structure of the Post-Kyoto carbon finance system and the possible inclusion of carbon credits from REDD+ and agricultural soil sequestration in compliance carbon markets like the European Union's Emissions Trading System. The Durban Platform agreed upon at COP 17 sets out a roadmap for a Post-Kyoto binding emission reduction agreement to be finalized by 2015 and come into effect in 2020. On REDD+, great efforts have been made over the past years to work towards a comprehensive inclusion of REDD+ issues in the Post-Kyoto framework, potentially opening the door for broader market-based trading of forest carbon credits (Anger, 2008; Platinga, 2008). Initiatives like UN REDD, several Forest Carbon Funds described above as well as bilateral programmes like Australia's International Forest Carbon Initiative have prepared the ground for an inclusion of REDD+ in compliance carbon markets. Under the Kyoto Protocol, a limit set of afforestation and reforestation are already eligible for the Clean Development Mechanism, albeit with temporary credits of limited fungibility. One other important indicator for the carbon trading potential of forest carbon is the share of REDD+ certificates in voluntary carbon markets. Despite all these positive dynamics, UNFCCC negotiations on REDD+ are difficult and slow. During COP 19 in Doha, no decisions could be reached on REDD+ and intense disagreements on a number of issues, especially related to verification and financing, persist.

The difficult REDD+ situation sends a signal with regard to the inclusion of agricultural carbon sequestration in future global emission agreements. While interest in agricultural GHG emission reductions has generally been increasing in the context of voluntary carbon markets, the share of actual activities remains small. The agricultural sector, with the exception of the established niche of methane avoidance from manure management, is well behind the forest sector in addressing the methodological barriers and political controversies described in the previous sections. In combination with the great challenges that carbon markets in general are facing today, the trading of agricultural carbon credits is highly unlikely to develop into a significant source of CSA financing in developing countries in the mid-term future.

14.4 Preparing for the way forward in international CSA financing

The current dynamics in international climate finance are in favour of CSA with significant potential for new and additional opportunities to use international financing for turning public and private agriculture investments into CSA investments. Fragmentation of climate finance sources has been a particular challenge for concepts like CSA that draw their comparative advantage from the utilization of cross-cutting synergies. With the ongoing shift in focus towards integrative approaches, exploring ways to sensibly and effectively combine thematically separated channels of funding, this barrier to accessing international funding for CSA projects is gradually diminishing. This conceptual change is reinforced by an overall increasing attention on agriculture in a climate change context, representing not only the arguably most important sector for climate change adaptation, but at the same time one of the world's largest sources of GHG emissions. Especially in combination with forest degradation and competing land use, agriculture is increasingly recognized as one of the crucial parts of the global climate challenge.

While underdeveloped financing channels, like private sector investments or carbon markets, are likely to provide only limited financing for specific niches (e.g. manure management or product certification) in the mid-term, bilateral as well as multilateral public financing is starting to put more explicit emphasis on CSA activities. For example, the ongoing process of the GEF-6 replenishment is pointing in this direction. Perhaps most importantly in the mid-term future, the current design process of the Green Climate Fund might be influenced by this overall dynamic, which bodes well for the development of CSA financing. Assuming that the GCF will have a significant impact on the entire climate finance landscape, not only in structure but also in prioritization and principles, a clear focus on CSA embedded in the GCF design would make a difference for the way CSA approaches can be realized and scaled-up in the coming decades.

For developing countries, this implies an opportunity as much as a challenge. In order to successfully access, but more importantly to effectively use increasing volumes of international CSA financing, developing countries will have to ensure that the necessary prerequisites are in place. While significant readiness activities have been ongoing in REDD+ for a long period of time, there are still more gaps to be filled in the agricultural sector to improve the basis for larger-scale CSA investments. Challenges include the usual suspects, such as the quality and quantity of available data, the effectiveness of monitoring systems to institutional and technical implementation capacity as well as the suitability of policy and legal frameworks. Existing knowledge and experiences on CSA as well as the wealth of climate change needs assessments and priority setting at the national level (e.g. through NAPAs, Nationally Appropriate Mitigation Actions, etc.) provide a solid basis for concrete and country-specific preparatory measures. In order to get a head-start on CSA, developing countries could consider putting the fundamentals in place now to be ready to use new CSA opportunities as they emerge.

Notes

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Acronyms

AF	Adaptation Fund
ASWAp	Agriculture Sector Wide Approach
CCM	Climate Change Mitigation
COP	Conference of the Parties
CSA	climate-smart agriculture
EC	European Commission
GAP	good agricultural practices
GCF	Green Climate Fund
GEF	Global Environment Facility
GHG	greenhouse gas
IFAD	International Fund for Agricultural Development
IFC	International Finance Cooperation
IPCC	Intergovernmental Panel on Climate Change
LDCF	Least Developed Countries Fund
MDBs	Multilateral Development Banks
MRV	measurement, reporting and verification
NAPA	National Adaptation Programme of Action
OECD	Organisation for Economic Co-operation and Development
PPCR	Pilot Program for Climate Resilience
PwC	PricewaterhouseCoopers
REDD+	Reducing Emissions from Deforestation and Forest Degradation
REED	Rural Energy Enterprise Development
RTRS	Round Table on Responsible Soy
SCCF	Special Climate Change Fund
SFM	Sustainable Forest Management
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wildlife Fund

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