A3 Managing landscapes for Climate-Smart Agriculture systems - a landscape approach to CSA

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Overview

This module describes why and how landscape approaches can be used as an instrument to achieve climate-smart agriculture objectives at multiple scales in agricultural ecosystems. Landscape approaches increase synergies and minimize trade-offs among the various strategies and actions designed to meet the increasing demand for food, conserve ecosystems and support resilient rural livelihoods. By contributing to local, subnational and national goals, they can also contribute to global efforts to reach many of the Sustainable Development Goals (SDGs).

Chapter A3-1 presents the key concepts related to landscape approaches. Chapter A3-2 looks at the challenges that climate change poses to natural resources, the enabling environment needed to support the achievement of climate-smart agriculture objectives, and the synergies between landscape approaches and climate-smart agriculture.

Chapter A3-3 presents the key elements of landscape approaches for climate-smart agriculture; sets out a step-by-step guidance for implementation of climate-smart agriculture using landscape approaches; and explains the relation between climate-smart agriculture, landscape approaches and sustainable food and agricultural systems.

Chapter A3-4 looks at the national policies and the legislative and institutional enabling environment required for the implementation of landscape approaches. It focuses on how landscape approaches help improve climate-smart governance and decision-making. Because the success of climate-smart agriculture intervention that apply landscape approaches will depend on the active participation of communities that have a stake in the sustainable management of the landscape, the chapter considers approaches for bringing stakeholders together to plan and negotiate acceptable and equitable practices and management actions and establish conflict resolution mechanisms.

This is essential to ensure that the decision-making processes address gender and youth power differentials, and the benefits of the interventions are shared equitably.

Key messages

- The application of landscape approaches takes into consideration the synergies and trade-offs among the range of activities carried out to promote the sustainable intensification of agricultural production, enhance adaptation to climate change, reduce and/or remove greenhouse emissions, and support disaster risk reduction at various scales and with many sectors and stakeholders.
- The success of climate-smart agriculture activities in delivering benefits to stakeholders requires establishing sound land-use planning and decision-making processes that are based on participatory, consensus-based and people-centred approaches, and the establishment of an enabling policy and institutional framework.
- To improve the resilience of landscapes to the impacts of climate change, actions in the agriculture sectors and other sectors (e.g. tourism, industry, mining, energy, urban development) need to be well coordinated to minimize conflicts, enhance equity and sustain ecosystem services. This involves reducing competition for resources, determining the most acceptable trade-offs, minimizing negative externalities and optimizing synergies.
- Measuring and monitoring the multiple benefits of climate-smart agriculture interventions that apply landscape approaches is essential for tracking the impacts of cross-sectoral and multistakeholder efforts at different scales and adjusting to change. Measuring and monitoring activities, which are critical for optimizing benefits and empowering stakeholders, can be realized in part through self-assessments undertaken by stakeholder groups of the value of sustainable land management, and by recognizing the importance of traditional landscape management practices.
- Scaling up successful pilot projects to large-scale climate-smart landscape programmes requires specific strategies and processes that support system-wide capacity development that can foster country ownership. Scaling up climate-smart landscape programmes also involves mainstreaming climate change into policies and institutions, creating an enabling policy environment, improving communications and building public-private partnerships.
- Catalysing landscape-scale climate-smart agriculture interventions requires increasing access to financing. Financing options that can support the scaling up of sustainable land management include creating incentives for sustaining ecosystem services through innovative market-based mechanisms that compensate farmers and farming communities for maintaining these services.

Landscape approaches: key concepts

There are many different ways of applying landscape approaches. The different approaches will reflect different entry points, processes and institutional arrangements (Scherr, Shames and Friedman, 2013). Box A3.1 present a list of definitions related to landscape and landscape approaches. According to Minang *et al*. (2015, p.8) a landscape approach:

> "refers to a set of concepts, tools, methods and approaches deployed in landscapes in a bid to achieve multiple economic, social, environmental objectives (multifunctionality) through processes that recognize, reconcile and synergize interests, attitudes and actions of multiple actors"

In a background paper for the 2012 Second Global Conference on Agriculture, Food Security and Climate Change, FAO noted that the landscape approach:

> “deals with large-scale processes in an integrated and multidisciplinary manner, combining natural resources management with environmental and livelihood considerations. .... The landscape approach also factors in human activities and their institutions, viewing them as an integral part of the system rather than as external agents. This approach recognizes that the root causes of problems may not be site-specific and that a development agenda requires multistakeholder interventions to negotiate and implement actions” (FAO, 2012a, p.5).

Another important factor in landscape approaches is the management of production systems and natural resources in an area that is large enough to produce vital ecosystem services and small enough to be managed by the people using the land and producing those services (FAO, 2013). Landscape approaches involve long-term collaboration among different groups of land managers and stakeholders to achieve multiple objectives and expectations within the landscape for local livelihoods, health and well-being (LPFN, 2016).

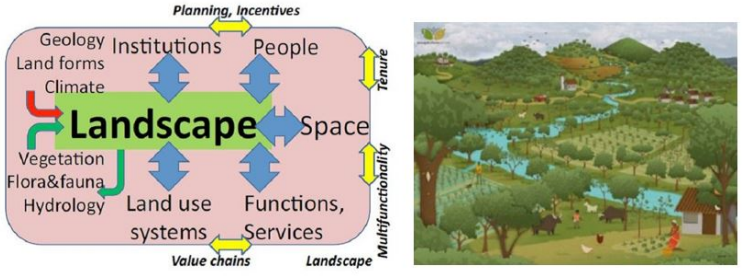
Box A3.1 Defining landscapes

This sourcebook has adopted the definition of 'landscape' proposed by the Landscapes for People, Food and Nature Initiative:

> "A landscape is a social-ecological system that consists of a mosaic of natural and/or human-modified ecosystems, often with a characteristic configuration of topography, vegetation, land use, and settlements that is influenced by the ecological, historical, economic and cultural processes and activities of the area" (LPFN, 2016).

A landscape can also be defined as the interaction between human actions, ecosystems and the abiotic factors that shape the physical environment (see Figure A3.1). Landscape approaches are based on “an overarching principle of concept and implementation rather than the retreat into the compartmentalization and order that we all seem to strive for” (Sunderland, 2014).

Figure A3.1 Landscape as interaction between human actions, ecosystems and the abiotic factors that shape the physical environment (Minang *et al*., 2015; Scherr, 2013).



The ten principles of landscape approaches have been established by Sayer *et al*., 2013 and have been accepted by the Convention for Biodiversity. They include:

- continued learning and adaptation,
- common concern entry point,

- multiple scales,
- multifunctionality,
- multiple stakeholders,
- negotiated and transparent change logic,
- clarification of rights and responsibilities,
- participatory and user friendly monitoring,
- resilience,
- strengthened stakeholder capacity.

From climate-smart agriculture to climate-smart landscapes

A thorough analysis of the pressures and demands on natural resources and ecosystems, the biophysical and socio-economic impacts of climate change, and the opportunities and the constraints that land users face to adapting to change and threats is required when applying landscape approaches in interventions to support climate change adaptation and mitigation. This analysis must be undertaken in coordination with all stakeholders in the landscape. (see module C8 on climate change impact scenarios and module C1 on system-wide capacity development). Reversing trends in environmental degradation involves the use of landscape approaches to address climate change. It has been often been demonstrated that the best approach to achieve the objectives of climate-smart agriculture is to broaden the agricultural management practices from single farming unit to the management of the entire landscape by multiple stakeholders (e.g. decision-makers, farmers, industrial groups). An example of this is the integration of trees into pastures, with the support of community-based forest management and planning and the collaboration of local authorities, to establish productive silvo-pasture systems (see module B5 on integrated production systems). Other examples of agricultural ecosystem management practices that are pertinent to landscape approaches for agricultural production are dealt with in more detail in the modules in Section B. A landscape and ecosystem perspective is addressed also in module C5 on disaster risk reduction.

Climate change is exacerbating pressures on natural resources

Natural resources and ecosystems are under increasing pressures from population growth and unsustainable management practices associated with agricultural production and land use. The degradation of soil, freshwater resources and biodiversity; the overexploitation of agricultural lands and their encroachment into marginal areas; and insecure tenure regimes, all affect ecosystem functions and services. These forces are leading to declines in the productive capacity of croplands and rangelands, and driving deforestation, which accelerates the loss of ecosystem services. The impacts of climate change (e.g. unpredictable rainfall, changing temperatures, seasonal shifts, drought, and extreme events), exacerbates these drivers of environmental degradation, undermines agricultural production and increases threats to ecosystems, livelihoods and food security.

Land degradation, which is reflected in the loss of fertile soils, the erosion of biodiversity and a reduction in carbon stocks, threatens the livelihoods and well-being, the food, water and energy security, and the resilience of millions of people. Land degradation is both a cause and a consequence of climate change. Ecosystem degradation and climate change form a ‘negative feedback loop’ that increases greenhouse gases emissions from agricultural production. The loss and degradation of soil and vegetation significantly reduces the capacity of soils to act as a 'carbon sink'. These negative loops affect agriculture production and livelihoods at all levels. Land degradation and sustainable soil and land management are addressed in module B7. Climate-smart energy solutions are a priority objective for preserving natural resources and preventing the degradation of the natural environment (see Box A3.2). Module B9 looks at the management of energy in the context of climate-smart agriculture.

Box A3.2 Charcoal production, environmental degradation and climate change mitigation

In some areas, the unsustainable production of charcoal is one of the drivers of deforestation. In sub-Saharan Africa the reliance on charcoal in rural areas and expanding urban areas is a serious environmental issue. Unsustainable charcoal production degrades the natural resource base on which people depend and increases greenhouse gas emissions. Investment is needed to enhance the access of urban and rural populations to appropriate alternative fuel sources. This involves increasing capital, know-how and technology, and creating incentives to encourage a shift towards more sustainable and resilient fuel and energy supplies.

The 2017 FAO publication, The charcoal transition: greening the charcoal value chain to mitigate climate change and improve local livelihoods, provides data and information to allow for informed decision-making on the contribution sustainable charcoal production and consumption can make to climate change mitigation (FAO, 2017a).

To satisfy the increasing demand for limited land resources, governance institutions in many areas are turning a blind eye to, or even encouraging, the expansion of agricultural production systems into forest lands, wetlands, marginal drylands and protected areas. This expansion can momentarily increase production, but generally leads to negative if not catastrophic mid- and long-term outcomes.

Implementing a landscape approach, which includes land-use planning, helps reduce conflicts over the use of resources; addresses the threats to forest areas, wetlands and other biodiversity-rich ecosystems; and can contribute to restoring key ecosystem functions and services. Despite potential difficulties in initially establishing a landscape approach, the approach can deliver positive and sustainable outcomes for the long-term resilience of populations facing unpredictable and extreme weather events (IPCC, 2014; FAO, 2015a). As integral parts of broader landscapes, forests and trees contribute to the stability and vitality of ecosystems and play a key role in sustaining livelihoods (see module B3 on forestry and module B5 on integrated production systems).

Extractive land use practices are not sustainable and are associated with high rates of greenhouse gas emissions. Often establishing an enabling environment and increasing investments are not sufficient to support the adoption of sustainable agricultural practices that sequester carbon in the soil or prevent carbon dioxide emissions caused by soil mineralization; sustain ecosystem functions and agricultural productivity; and enhance the adaptive capacity of vulnerable populations.

Lack of enabling environment for climate-smart agricultural practices

The lack of institutional capacities, which includes a lack of capacity for land-use planning, financial planning and implementation, contributes to the limited support for climate-smart practices (Scherr, Shames and Friedman, 2012). Environmental and economic sustainability can be achieved by moving away from sector-driven initiatives to cross-sectoral activities that address the objectives and needs of multiple stakeholders who depend on natural resources and ecosystems. This can be done by planning and carrying out interventions at the landscape level (see Case Study A3.1 on Autochthonous pig breeds for climate-smart landscapes in the Balkans). The policy processes that support the landscape and ecosystem approach are addressed in module C3 as part of a set of instruments for

the adoption and scaling up of climate-smart agriculture. A system-wide capacity development approach to strengthen the capacities of people, institutions and policy makers is addresses in module C1.

In some climate change scenarios, adaptations to change will need to be based on local practices. If stakeholders are not empowered to self-assess their actions or are not directly involved in monitoring the results of land planning this can create a lack of ownership over the actions undertaken in the landscape (See module C1). The enabling environment should include options for self-evaluating the impacts of interventions. There is also a lack of capacities and methods for assessing the effectiveness of the multiple dimensions of landscape-based climate-smart interventions that involve multiple sectors and are carried out at a variety of scales. Metrics and indicators need to be developed for monitoring progress toward climate-smart landscapes; assessing the impacts of climate-smart agriculture interventions; justifying the application of landscape approaches in supporting climate-smart agriculture. The evaluation of the impact of climate-smart agriculture interventions is addressed in module C9.

Reversing trends through landscape approaches

An assessment of climate change dynamics related to agriculture indicates that three key features should be part of a transformational approach to establish climate-smart landscapes:

- climate-smart practices at the field and farm level;
- a diversity of land uses in the landscape, which including areas set aside for conservation, the provision of ecosystem services, and improvements in the capacity of ecological and social systems to cope with extreme events (see module A2); and
- the management of ecosystems and land-use interactions at the landscape scale to deliver social, economic and ecological benefits (Scherr, Shames and Friedman, 2012).

Climate-smart agriculture provides opportunities, but also presents considerable challenges. To seize these opportunities and meet these challenges, it is necessary to adopt a holistic, integrated approach to capacity development in which all stakeholders participate actively and gain a sense of ownership over the activities (See module C1). An integrated approach, which encompasses the socio-economic, agro-ecological and policy dimensions, ensures greater efficiency in the use of resources and more sustainable management of natural processes and human activities in the landscape. Production systems need to capitalize on natural biological processes and recycle waste and residues. It is also important to create integrated and diversified farming systems that can generate a range of goods and services at the landscape level (see Case Study A3.2 on Climate-smart landscape intervention planning in Burundi).

The integration of agro-ecological and governance dimensions, which includes socio-economic and policy issues, can greatly reduce the pressure on the natural resources and minimize the need for external inputs (e.g. energy, chemical fertilizers and pesticides) and lessen the impact of agricultural production on ecosystems. The integration of agro-ecosystem and the livelihood approach presents multiple benefits as it “combine(s) vertical and horizontal integration” (van Ginkel *et al*., 2013). Vertical integration is an approach in which field, farm, landscape and region are nested to address contextual variations in the drivers of adoption of activities to improve the long-term sustainability of the land management process.

Horizontal integration involves working across disciplines and sectors (e.g. agriculture, forestry, markets, environment, water and energy) to address the policy and institutional requirements for optimizing benefits, reducing tradeoffs and enhancing innovation uptake at different scales (See also module C1). For example, the Great Green Wall for the Sahara and Sahel Initiative, which was initially not designed to address the impacts of

climate change, is reversing land degradation by working both at the wider landscape level through the management of agricultural ecosystems and improving governance. The Initiative, which builds on farmers' endogenous environmental rehabilitation practices in the Sahel, supports rural communities adapt to climate change and helps reduce the concentration of greenhouse gas emissions in the atmosphere. (See Case study A3.3 Positive dynamics: re-greening of the Sahel and the Great Green Wall action plans.

The need for landscape approaches to achieve climate-smart agriculture objectives

Climate change is one of many challenges within the fields of environmental and natural resource management that are referred to as 'wicked problems' due to their complex and interwoven nature. Solutions to these wicked problems often demand significant policy changes in modifications in the behaviours of a broad range of stakeholders (Balint *et al.*, 2011).

Increasing the resilience of agricultural communities so that they can maintain their food security in the face of climate change calls for multiple interventions that include social protection, climate-smart agricultural practices, biodiversity conservation and risk management (FAO, 2016a). (See also modules in section B for climate-smart agricultural practices, module C5 for disaster risk reduction and module C7 for social protection and decent rural employment). Holmgren (2012) noted that although the landscape approach makes planning and management challenging, there are no other options for achieving climate-smart agriculture's goals. Designing national and decentralized level plans in a participatory manner for different land uses and productive sectors is particularly important given that all sectors are affected by climate change, resources are limited, and the demand for goods and services are high. Climate-smart agriculture cross-sectoral planning and management makes the most efficient use of valuable and limited natural resources.

Implementing climate-smart agriculture through landscape approaches

Elements guiding landscape approaches for climate-smart agriculture

The common underlying objective of integrated landscape planning and management is to find and promote synergies among activities that improve production systems, enhance livelihoods, support the conservation of biodiversity and sustain ecosystem services. The ultimate goal is to ensure sustainability.

Integrated landscape planning and management is instrumental for achieving climate-smart agriculture. It is an umbrella for natural resource management that recognizes the value of various ecosystem services to multiple stakeholders, and the different values that can lead stakeholders to pursue different land-use objectives or livelihood strategies (MEA, 2005). When implementing landscape approaches, the trade-offs between conservation and development are taken into consideration. This demands the increased integration of activities to reach a range of different objectives related to poverty alleviation, agricultural production and food security. In addressing multiple objectives in an integrated manner, the emphasis is placed on adaptive management and stakeholder involvement (Sunderland, 2012).

The key elements guiding landscape approaches for climate-smart agriculture interventions are:

- The integration of mechanisms for the governance of natural, semi-natural and agricultural ecosystems.

Landscape approaches for climate-smart agriculture are based on optimizing synergies between multiple stakeholders and sectors in the landscape in terms of production, climate adaptation and mitigation. To enhance resilience to climate change, interventions applying a landscape approach should bring together agro-environmental and socio-economic governance issues that are of interest to multiple stakeholders. This requires:
    - drawing on expertise and processes from a wide range of methodologies, best practices, concepts and tools;
    - engaging in joint processes related to diagnostics, planning, the management and monitoring of progress and results, and the promotion of collaborative activities between stakeholders and sectors; and
    - building on the interactions between multiple sources of knowledge (e.g. research, institutional, civil society, traditional, indigenous).
- Support multiple ecosystem functions.The dynamics and functions of ecosystems, including agricultural ecosystems, are at the heart of landscape approaches for climate-smart agriculture interventions. Ecosystems function extend over different spatial and temporal scales. Consequently, activities need to be undertaken at multiple scales to encompass the entire agricultural ecosystem and follow a life cycle approach. Ecosystem functions also operate at nested scales, which requires the integration of geographical and technical solutions within broader landscapes.
- Support governance and an enabling environment. Landscape approaches for climate-smart agriculture should undertake system-wide capacity development to enhance the capacities of people, organizations, institutions and the enabling environment. This includes the strengthening institutions; formulating suitable policies and regulations and ensuring their enforcement; and building multidisciplinary scientific and technical capacities at all levels (see module C1 on system-wide capacity development, and module C3 on policies and processes);
    - Landscape approaches also depend on individual and collective tenure security. A rights-based approach is required that fosters endogenous negotiations to address social inequality and imbalanced power relations and recognizes the complex cross-sectoral character of agricultural ecosystems and the impact that climate change will have on these ecosystems.
    - In the field, and especially on small farms, this involves the design of packages of incentives for maintaining ecosystem services that can support small-scale producers' adoption of best practices and sustain climate-smart interventions.
- Adaptive and nested scales management. Landscape approaches for climate-smart agriculture should seek improvements in management practices that are based on sound assessments, experience and climate risk analyses (see module C8 on climate impacts assessment and climate-smart agriculture options appraisal, and module C9 on climate-smart agriculture programme and project monitoring and evaluation).
    - Decision-making needs to be iterative and reactive in face of uncertainty and changes in climatic conditions.
    - Initial planning and monitoring, learning and evaluation call for participatory approaches and the use of inclusive methods for diagnostics, collaborative planning and data collection, analysis and documentation. Simple and integrated metrics should track the range of the agro-ecological and sociocultural benefits derived from climate-smart landscape initiatives (Scherr, Shames and Friedman, 2012);
    - Management undertaken at nested scales needs to integrate small-scale results into the broader landscape. Activities related to the sustainable increase of agricultural production or small-scale natural resources management should be included in broader level planning (e.g. watershed). Such small scale planning should later contribute to district or decentralized planning which should then be inscribed within national goals and harmonized policies. Finally, attainment of such goals concurs to reaching SDGs.

In an in-depth analysis of current practices, Duguma *et al*. (2014a) suggests that more emphasis is being placed on complementarity (i.e. mitigation projects that provide adaptation co-benefits and vice versa) rather than synergies.

They note that, unlike complementarity, synergies should emphasize functionally sustainable landscape systems in which adaptation and mitigation are optimized as part of multiple functions. They also clarify that moving forward from complementarity to synergies will require a paradigm shift from current compartmentalization between mitigation and adaptation to 'systems thinking' at the landscape scale. However, conducive policy, institutional, and investment conditions need to be in place at global, national, and local levels to achieve synergies. Duguma *et al*. (2014b) also propose a synergy score analysis to identify, analyse and compare enabling conditions for achieving synergies.

How climate-smart landscapes are multifunctional

Adapted from Minang *et al*., 2015.

- Landscape approaches provide an effective and efficient scale for the analysis and management practices to establish climate-smart multifunctionality.
- Multifunctionality in landscapes is achieved by promoting synergies and reducing trade-offs across different land uses and objectives.
- Both additive synergies, in which the sum of parts constitutes the whole, and superadditive synergies should be sought within landscapes to promote multifunctionality.
- Objectives guiding the identification of opportunities to achieve synergies should be clearly defined and understood, and ideally identified through collaborative multistakeholder processes.
- If synergies and landscape multifunctionality are not sought, there is risk that detrimental feedback cycles will be perpetuated and exacerbate the negative impacts of climate change.

Step-by-step guide to implement landscape approaches for climate-smart agriculture

The process of applying landscape approaches for climate-smart agriculture interventions follows these steps:

1. **Designing the methodology:** This step includes the development of the analytic framework and the selection of tools for the intervention. It also involves raising awareness of climate risks and the need for adaptation and mitigation to promote the wider uptake of climate-smart agriculture. For country-level interventions, this is the step in which the strategy and action plan are prepared. The action plan is generally aimed at the implementation of the intervention, the expansion of activities on the ground and the mainstreaming of climate-smart practices. A step-by-step guide to the national implementation of climate-smart agriculture is outlined in module C10).
2. **Assessing and prioritizing:** This step includes the preparation of assessments of land and other natural resources, and socio-economic conditions. This step also includes a system-wide capacity needs assessment (See module C1). During this step, training materials are developed and disseminated. At this time, climate change impact and vulnerability assessments are also carried out, which can also include climate analysis, agro-meteorology forecasts and climate modelling (see module C8). At this step, a participatory wide-scale assessment is undertaken to identify hot spots (e.g. areas where there is a severe degradation of ecosystem services or declining production) and bright spots (e.g. areas where the land is being managed sustainably). Based on the assessment's findings, the priority landscapes interventions are selected through a collaborative process involving all stakeholders and sectors. This process considers the livelihoods, ecosystem functions and services, and other agro-environmental factors in the landscape. A participatory and inclusive process is fundamental to ensure country-ownership and commitment, which are key ingredients for making a transition to climate-smart agriculture.
3. **Analysing and planning**: This step includes the detailed biophysical characterization of the environment.

The detailed assessment of selected areas in the landscape allow for the joint selection of the most suitable ('best') practices for climate-smart agriculture based on local livelihoods and natural resources. In building climate change scenarios, the assessment considers the impacts of climate change, determines mitigation benefits and identifies options for adaptive management. Community or territorial management plans are then developed through a negotiated and collaborative multistakeholder right-based process.

4. **Implementing, monitoring and learning to scale up best practices**: The implementation of plans is undertaken by using a variety of technologies and approaches based on both indigenous and scientific knowledge. Activities are 'retrofitted' through endogenous monitoring, self-evaluation and the sharing of lessons learned. The sustainability of climate-smart practices demands continued action and support from all stakeholders. The mainstreaming of the best practices requires appropriate policy, planning and institutional support and the establishment of sustainable financing for scaling up climate-smart practices and ensuring all stakeholders have adequate incomes. This should include financial and non-financial incentives for ecosystem services and should be negotiated between stakeholder groups from all sectors.

Table A3.1. Examples of tools that can support the implementation (the list is not intended to be exhaustive)

Steps	Tools
Designing methodologies	- CRYSTAL Tool, IUCN - Guidelines for designing data collection and sharing systems for co-managed fisheries - Designing nutrition-sensitive agriculture investments - Incorporating climate change considerations into agricultural investment programmes - Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security (ADB) - MOSAICC (Modelling System for Agricultural Impacts of?Climate Change)
Assessing and prioritizing	- Modernizing Irrigation Management (MASSCOTE) - SHARP Self-evaluation and Holistic Assessment of climate Resilience - LADA WOCAT - Dryland Restoration Initiative Platform DRIP - Social Mobilization Approach - Safe Access to Fuel and Energy (SAFE) toolbox - BEFS Operator Level Tool - CRYSTAL Tool, IUCN - Climate-Smart Agriculture Prioritisation Toolkit, CCAFS - Ex-Ante Carbon-balance Tool (EX-ACT)
Analysing and planning phase	- WOCAT - LADA Local - Guidelines for the economic valuation of pollination services at a national scale - GreeNTD - EAF planning and implementation tool - CRYSTAL Tool, IUCN

Steps	Tools
Implementing, monitoring and learning to scale up best practices	**Implementing** - Integrated pest management - Conservation agriculture - Farmer Field Schools - Climate Smart Villages, CCAFS - Incentives for Ecosystem Services (IES) - Certification/eco-labelling - CRYSTAL Tool, IUCN - LINK methodology: A participatory guide to business models that link smallholders to markets: **Monitoring and learning** - Ecosystem Service Valuation - System of Environmental-Economic Accounting for Agriculture Forestry and Fisheries - Self-evaluation and Holistic Assessment of climate Resilience SHARP - LADA WOCAT - Guidelines for the economic valuation of pollination services at a national scale - CRYSTAL Tool, IUCN - Ex-Ante Carbon-balance Tool (EX-ACT) - Adaptation for Smallholder Agriculture Programme (ASAP) IFAD

Case Study A3.2, Climate -smart landscape-level intervention planning in Burundi, describes a five-step process that includes both agro-environmental and governance activities to enhance the sustainability of climate-smart interventions. At the national level, interventions that employ a landscape approach needs to operate at the nested scale, initially prioritizing the investments with national stakeholders and then intervening in the selected agricultural ecosystem using local-level planning and implementation. Case Study A3.4, A step-by-step landscape approach to prioritize sustainable land management investments outlines the process used by FAO to assess, prioritize, and mainstream sustainable land management actions from a landscape perspective at the national level. Case Study A3.5, Capacity development at multiple levels for effective implementation of sustainable land management, illustrates how system-wide capacity development can strengthen country ownership and commitment.

Box A3.3 Why participatory monitoring and assessment is important for integrated landscape adaptive management

In general, any management cycle includes initiation, planning, execution, monitoring and closure. All these steps are needed in the management of the process for scaling up of appropriate technologies and practices to increase food security and establish climate-smart landscapes. Continuous monitoring and assessment are also key aspects of adaptive management because they help determine the effects of the planned actions and identify incremental changes that can ensure a transition towards a more productive and resilient system. Also, they help to review progress towards objectives and adjust the actions so as to optimize the benefits and scale up successful climate-smart agriculture practices and technologies. In landscape approaches, the participation of stakeholders and beneficiaries is vital for obtaining critical observations of the results of the actions, and modifying them as appropriate through the management cycle. An endogenous assessment process strengthens ownership, raises awareness of issues and reinforces the knowledge that has been gained.

There is also a need to monitor and assess the effectiveness of any incentive measures and the involvement of stakeholders in landscape management schemes. For payment for environmental services

schemes or the implementation of public-private partnerships, the monitoring and evaluation process helps to raise awareness of stakeholders so that they are more responsive to changes in adaptive management.

Climate-smart landscapes for sustainable food and agriculture

Interventions that use landscape approaches operate at multiple scales in the agricultural ecosystem to enhance the ecosystem dynamics and functions (e.g. the cycling of nutrients, water and carbon, the control of pests and diseases). This provides the basis for protecting the environment and creating opportunities and benefits for many stakeholders. When landscape approaches are applied for climate-smart agriculture interventions a key goal is to sustain resilient agricultural livelihoods that can safeguard food security by sustainably increasing productivity and incomes of the various land users and producers. Landscape approaches for climate-smart agriculture also require building awareness among all stakeholders of the need for sustainable natural resource management that can generate benefits not only for individual producers but also support a range of ecosystem services that benefit society as a whole and increase the resilience of the productive sectors.

Change management adds a strategic, long-term objective to policy, legal and research frameworks (FAO, 2011a). Sustainably increasing or intensifying productivity can mitigate climate change by decreasing pressures to open up of forest or grazing land for agriculture. Restoring degraded grassland ecosystems and rehabilitating eroded croplands involves reducing soil erosion, restoring fertile soils and improving vegetation cover. Grassland management can also be complemented by the introduction of trees, shrubs and plants that can sequester carbon above and below ground. Improved grazing management can lead to an increase of soil carbon stocks (Conant, 2009). See module B.2 for further information on livestock management and module B5 on integrated production systems.

If biological processes are preserved, ecosystems, such as wetlands and peatlands (see also module B7) can provide important water regulatory services and act as large carbon sinks. Due to the vast amount of land they cover, dryland and rangeland ecosystems also play a crucial role in climate change adaptation and carbon sequestration. Landscape-level land-use planning strategies need to identify and protect these key ecosystems and the important ecosystem services they provide. Special attention should be paid to the management of organic soils as they have significant potential for mitigation climate change (Biancalani and Avagyan, 2014).

Box A3.4 Example for integrating elements of landscape management for climate-smart agriculture into a farming system

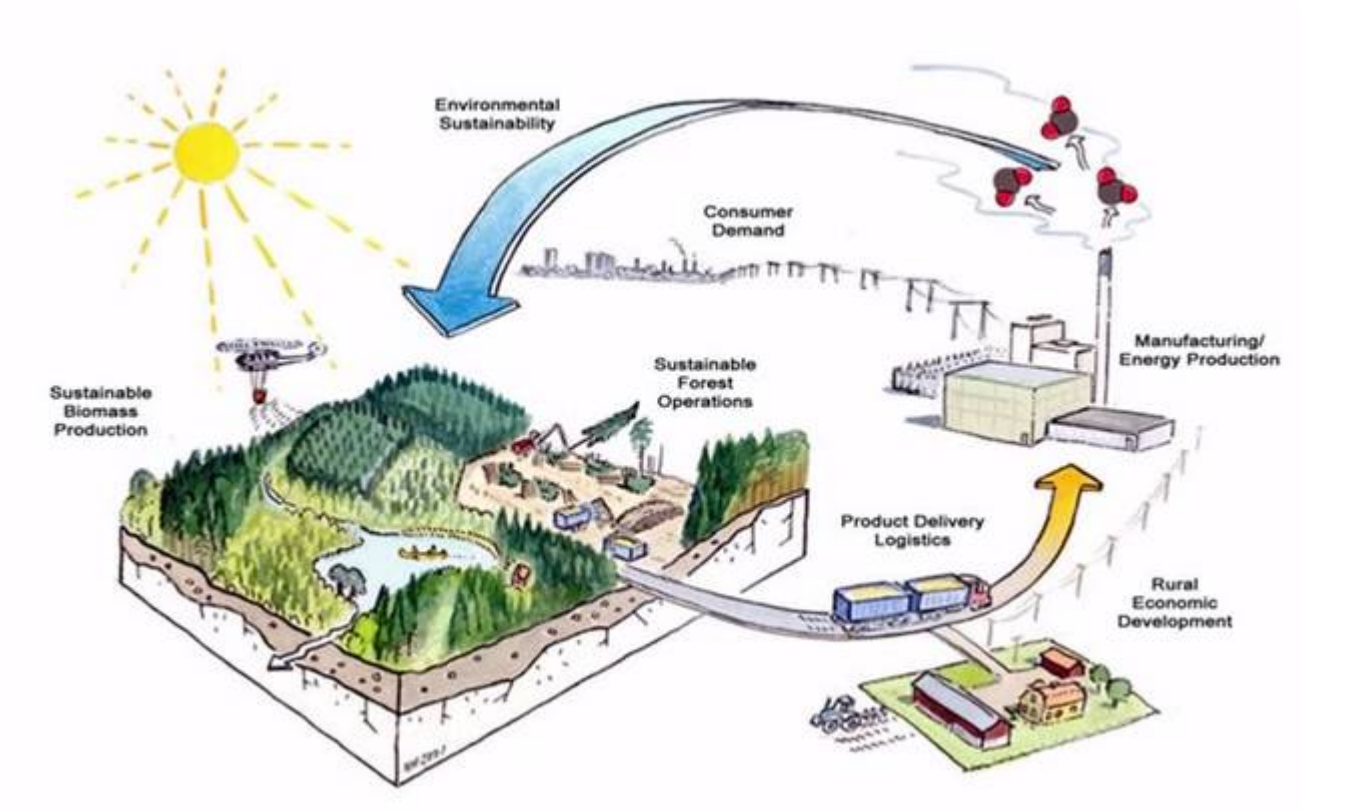
In dryland systems, livestock production systems, which often rely on the mobility of animals, provides milk and meat to rural communities. These production systems also make effective use of limited land and water resources. The manure from the animals can help maintain or increase soil fertility for crop production and grazing land. The planting of leguminous shrubs and trees can provide fodder and fuel. The integration of trees and shrubs in agricultural production systems can also provide litter for mulching, which can help restore soil organic matter, improve moisture retention and enhance soil microbial activity. Landscape approaches focus on enhancing these micro-ecologies in different locations within the landscape. They also foster interactions throughout the landscape that optimize the ecosystem functions and support the production of a variety of different products.

The local production of a diverse range of food products, the presence of local storage facilities and food processing activities ensures that nutritious, locally preferred foods are available in farming communities. This also contributes to dietary diversification and supplies local markets with nutritious fresh foods (e.g. fruits and vegetables). Local production, storage and processing can increase market access for local goods, ensure greater returns for producers and use energy efficiently. This can foster the growth in local agricultural value chains, which in turn improves livelihoods, food and nutrition security, and food sovereignty.

Diversified local food systems can enhance and stabilize production throughout the year. They also contribute to climate adaptation and mitigation by optimizing the use of soil, water, and biological resources and developing a resilient and integrated agro-ecological system.

Adaptive management is the key to implementing landscape management plans and strategies that can enhance the capacity of the system to cope with the impacts of climate change and reduce greenhouse gas emissions (see module A2). Since landscapes change and evolve over time, the objective of sustainable management is to ensure the continued and growing supply of goods and services for the present and next generations (Sangha Group, 2008). In a crop or crop-livestock system, attention will be given to well-adapted crop and livestock varieties and breeds, and sustainable agronomic and livestock management practices (see module B1 on climate-smart crop systems and module B5 on integrated production systems). These practices will improve productivity and support climate change adaptation and mitigation. A landscape approach also takes into account interactions with other land uses and multiple value chains to enhance synergies and reduce negative impacts of the specialized production systems (e.g. crop production) on forests, pastoral communities, settlements and other land users. Areas where there may be interactions and potential synergies include the maintenance of recreational value of the forest; the sustainable use of biomass and re-afforestation; improved logistics and transport; and wood product production and energy production to support sustainable urban development.

Figure A3.2. Interaction and synergies in a landscape approach for wood products factory



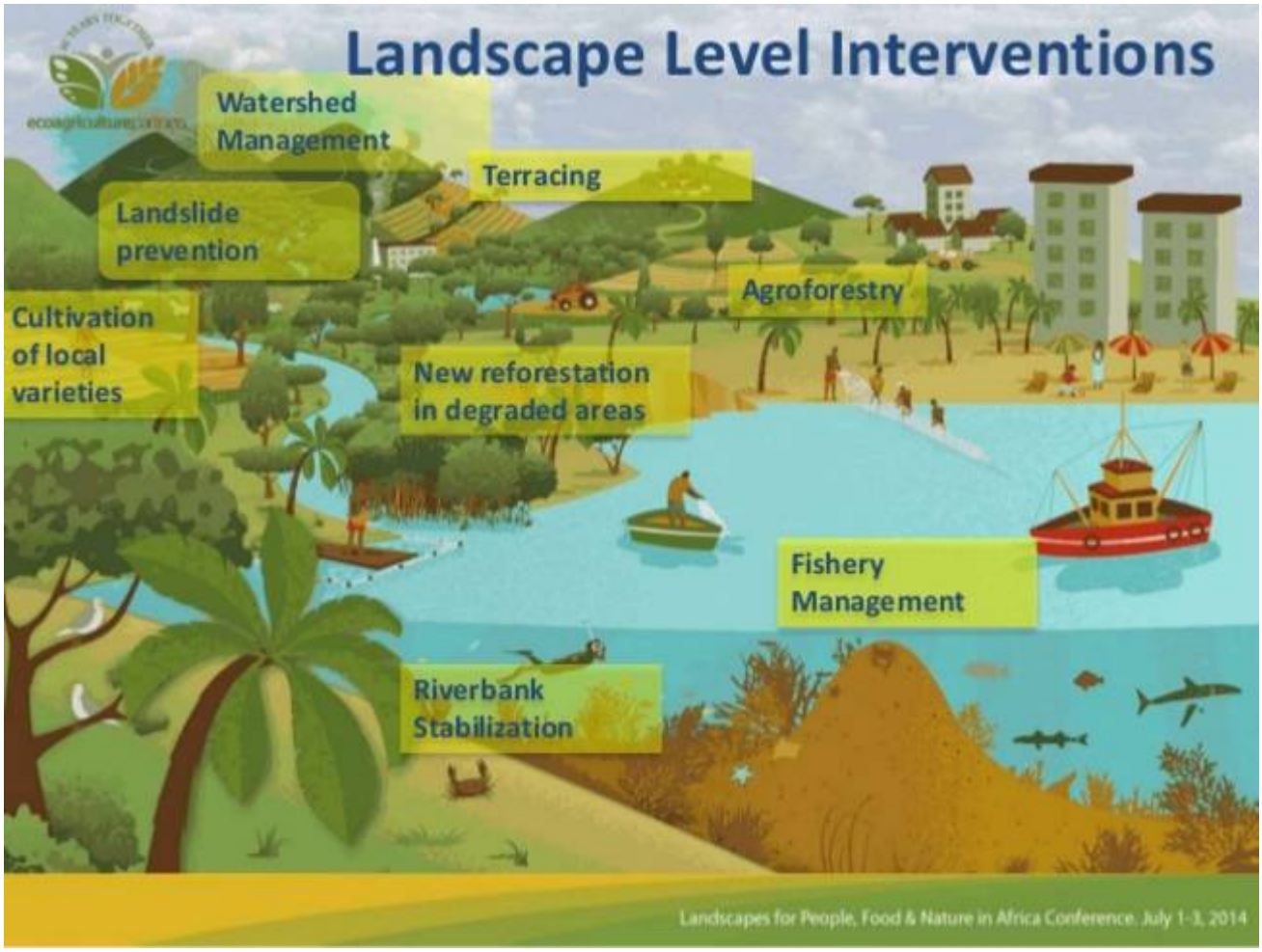
Source: van Oosten, 2015

An example of an intervention that optimized synergies is presented in Case Study A3.2, Climate-smart landscape-level intervention planning in Burundi.

Both risk management and change management form an integral part an integrated landscape approach. Disaster risk reduction focuses on preventing new risks, reducing existing risk and managing residual risk (see module C5).

Landscape approaches can be carried out through a variety of mechanisms, including watershed and territorial management committees; land-planning and water-users associations; and producer associations. These mechanisms, which allow for multistakeholder dialogues on local conditions and specific priority issues, can be organized through networks, platforms or roundtables where all stakeholders or their representatives can settle their conflicts, negotiate trade-offs or make plans. See Case Study C1.11 from the Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) Project on how data sharing within the community influences water use, and Box C5.4 on integrated community approaches to disaster risk reduction and adaptation in Papua New Guinea.

Figure A3.3. Landscape-level interventions



Source: Scherr, 2013

Both policy makers and land users gain from organized and democratic planning that aligns land use with local and national goals. Ideally, land-use planning is a country-wide and nested effort, from local villages through communes, districts, and provinces in which local needs are harmonized with national priorities. Stakeholders may include village and municipal authorities, private sector interests, district authorities and members of the country's ministry of planning or national planning commission and even budget and finance. At the local level, it is important that all community groups are represented – men and women, young and old, wealthy and poor, farmers, herders ¬and fishers – and their diverse views and perspectives are taken into account. See also Box C5.7 on a community-based integrated watershed management approach to disaster risk reduction and climate change adaptation in Uganda.

Governance and decision-making for climate-smart landscape approaches

Ensuring the participation of all stakeholders in the decision-making process is key to enhancing ownership and ensuring strong commitments for the sustainable management of landscapes and the uptake of climate-smart agriculture. The negotiation process must include stakeholders with differential authority, including local officials, local village leaders, land owners, land users, tenant farmers, central government institutions and livestock keepers. A collaborative capacity assessment and facilitated participatory decision-making processes are essential for fostering collaboration and sharing information among different stakeholders (See module C1). To increase

agricultural productivity and incomes and deliver environmental benefits, multistakeholder planning and management needs financial support.

The enabling environment for coordinated planning

Within national policy, legislative, and institutional settings, a supportive and integrated policy environment for interventions at the landscape level must replace the traditional 'silo' approach. To implement landscape approaches, joint planning and coordinated interactions among ministries are essential and they can be fostered through cross-sectoral consultation mechanisms. Scherr, Shames and Friedman (2012) highlight that strengthening the capacities for climate-smart landscape planning and implementing climate-smart practices requires land-use planning skills, as well as the capacity to mobilize investments, promote innovation, improve production cycle management. This capacity development is needed to increase productivity and marketability, develop rural businesses, reinforce financial benefits and boost planning and negotiation.

For landscape approaches to be successful, it is necessary to implement a broad planning framework that links diverse planning activities and decision-making processes. If planning is only made at the national or regional level without adequate involvement of local stakeholders, there is a greater likelihood that the implementation of planned activities will not be successful or sustainable. Conversely, activities planned at the landscape or community level that are not supported by enabling policies or governmental authorities may also struggle to succeed due to a variety of constraints, such as insecurity of tenure, poor infrastructure, and inadequate institutions and markets.

Policies should be developed to support planning processes at local levels and allow communities to manage and benefit from the diverse resources in the landscape, including, for example, forested and cultivated highlands, fertile valleys and watercourses. Local planning processes also need to take into account rural-urban interactions.

Planning for the sustainable management of transboundary resources (e.g. water, transhumant livestock and wild species) requires coordination among stakeholders with competing claims. This will include groups working to protect the natural environment, and national or multinational institutions, laws and policies, which regulate and create incentives for the sustainable use of resources.

Institutional capacities are often a crucial bottleneck in creating an enabling environment for implementing landscape approaches for climate-smart agriculture. Scherr, Shames and Friedman (2012) note that the strengthening of institutions and political support for climate-smart landscape planning and implementation through landscape approaches involve systematic comparative analysis of different institutional models to inform programme design. They require flexible governance mechanisms and may also require local flexibility in defining land, forest and water rights and responsibilities.

A good example of a harmonized approach is the development of the Reducing Emissions from Deforestation and Forest Degradation (REDD+) mechanism of the UNFCCC. REDD+ activities, which also include the role of conservation, sustainable management of forests and enhancement of forest carbon stocks, address different drivers of deforestation both within and outside the forestry sector. When designing national REDD+ strategies, policies, laws and action plans, consideration can also be given to agricultural and rural development goals, and an integrated landscape approach should be adopted to consider interactions with other land uses. See module B3 and Case Study C1.2 on participatory processes to support improved governance - the REDD+ Participatory Governance Assessment in Indonesia.

In some cases, major policy barriers will need to be removed so that the prioritization of climate-smart development can be ensured and maintained. Some examples of policies that can support a transformative shift to climate-smart agriculture include:

- using climate finance as a catalyst to leverage larger flows of public and private funds;
- establishing social protection systems to support environmental sustainability by minimizing negative coping strategies and enhancing household capacities to invest in sustainable, climate-smart interventions (FAO, 2017a);
- maximizing the enforcement of tenure rights (FAO, 2012b);
- promoting information technologies that are tailored to the needs of small-scale agricultural producers and developing climate information services that can bridge the gap between data producer and users;
- encouraging institutional development that supports mobile services and capacity development methods capable of following producers practicing transhumance to ensure the sustainable use of grazing lands and improve grassland soil carbon stocks; and
- promoting scenario thinking and data development; improving the accessibility to information for decision-making; and developing appropriate platforms for discussions and the formulation of common strategies.

Policies should be conducive to minimizing trade-offs, optimizing synergies, and monitoring and assessing interactions. To ensure synergies, at the local, national and international level, the core policy framework needs to take into account:

- the compatibility and coordination of policies for agricultural development, forest, water, climate, biodiversity conservation and food security, as well as other national priority areas for development;
- environmental legislation that acknowledges the potential multiple benefits of climate-smart development, recognizes the rights of farming and pastoral communities, and regulates agricultural production systems and reduces production losses in these systems from mining, tourism, urbanization, fuel production (e.g. fuel wood), energy sources and other demands; and
- the removal of public subsidies and incentives that harm biodiversity and agricultural production (e.g. subsidies that encourage degradation of land, water and vegetation).

A good example of a method for designing multisectoral climate-smart policies is the use of the scenario thinking and planning approach. FAO has implemented a scenario-thinking approach in Central Asia to assist in the assessment and rethinking of future multisectoral policies in a changing environment (see Case Study A3.6, Scenario thinking and the water-energy-food nexus in Central Asia). The scenario-thinking approach brings together a broad range of actors to discuss, clarify and revisit a range of environmental and socio-economic issues and ideally, to arrive at a common vision for the landscape. The FAO Mitigation of Climate Change in Agriculture (MICCA) Programme, together with the Kenya's Climate Change Unit of the Ministry of Agriculture, Livestock and Fisheries, The World Agroforestry Centre (ICRAF) and The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) developed a landscape-based consultative process whose overarching recommendations are an example of potential root based policy contribution (see Case Study A3.7, Evidence and policy implications of climate-smart agriculture in Kenya, and Case Study A3.5, Capacity development at multiple-levels for effective implementation of sustainable land management.

Harvey *et al*. (2014) have proposed a summary of barriers to the integration of adaptation and mitigation goals and activities to create climate-smart landscapes and potential solutions (see Table A3.2).

Table A3.2. Barriers to the integration of adaptation and mitigation goals and activities to

create climate-smart landscapes and potential solutions (adapted from Harvey et al., 2014)

Barriers	Solutions
POLICIES AND INSTITUTIONS	
- Adaptation and mitigation agendas are addressed through different policies; discussed in policy debates that rarely linked or coordinated; and led by distinct ministries and engaged in by different constituencies - Policies supporting conventional agriculture practices predominate over those supporting climate-smart agricultural strategies - Policy planning is short-term, whereas the integration of adaptation and mitigation goals requires long-term planning	- Develop national strategies and action plans that build on potential synergies related to adaptation and mitigation in agriculture and the reduction of emissions from deforestation and forest degradation, for example National Adaptation Programmes (NAPAs), National Adaptation Plans (NAPS) Nationally Appropriate Mitigation Actions (NAMAs) and REDD+. - Secure high-level commitments to support conservation agriculture, agroforestry, and other climate-smart practices - Promote multistakeholder planning at the local, regional and national level, and in the private sector - Raise awareness among policy makers and other decision-makers about agricultural systems that meet climate change adaptation and mitigation goals - Promote landscape governance and resource tenure reforms that facilitate and provide incentives for landscape management - Strengthen local institutions and extension and advisory services - Clarify agriculture's role within the context of REDD+ and UNFCCC decision-making processes - Undertake participatory capacity needs assessments to identify strengths, gaps and actionable recommendations for improvement owned and driven by national stakeholders. (See module C1)
FINANCE AND INCENTIVES	
- Adaptation and mitigation funds typically come from different sources and are not coordinated - Competition for funding between mitigation and adaptation activities - Difficulties in access to capital and technical information by agricultural producers, particularly smallholder producers, to adopt new practices and diversify agricultural landscapes	- Develop more diverse funding approaches (e.g. eco-certification schemes, incentives or payments for ecosystem services, philanthropic investments, government and private funding) to support climate-smart agriculture, and modify the design of these instruments to ensure they are well integrated - Ensure carbon finance initiatives promote the adoption of best practices that combine climate change adaptation and mitigation goals - Encourage donors (e.g. bilateral and multilateral organizations, private sector, foundations) to invest in climate-smart agricultural systems - Promote strategies that include adaptation as a precondition for obtaining carbon finance for mitigation and conversely, and support mitigation activities in adaptation projects, by engaging, for example, with the Forest Carbon Partnership Facility (FCPF), REDD+, the Clean Development Mechanism (CDM) or the private sector. - Ensure that agriculture is eligible for support from both existing and future climate change funding mechanisms
RESEARCH, TRAINING AND TECHNICAL CAPACITY	

Barriers	Solutions
- Declines in financial support for agricultural research, extension services, and university programmes limit of transition to climate-smart practices - Limited quantitative evidence on potential co-benefits and trade-offs between adaptation on mitigation actions	- Develop tools for policy makers and other decision-makers to visualize the potential outcomes of different agricultural strategies on mitigation and adaptation, food production, energy, income, and other related objectives - Promote research and development on climate-smart agriculture by universities, state and federal research, and extension services - Provide evidence of where and when linking climate change adaptation and mitigation is more beneficial and cost-effective than separate interventions - Develop indicators to measure the adaptive capacity of agricultural communities, institutions of production systems, and the impacts of different management practices on productivity, sustainability, food security, incomes, biodiversity conservation and ecosystem services
SOCIO-ECONOMIC ISSUES	
- Poverty, culture barriers, limited educational opportunities, a lack of institutional capacities, and insecure land tenure have an impact on the effective adoption of different agricultural practices and land-use decisions by farmers - Farm subsidies and national policies do not provide incentives to producers to adopt climate-smart agriculture practices and adopt landscape approaches - High investment costs, risks for food security and household well-being, and lack of knowledge and technical support limit farmers' participation in climate-smart agriculture initiatives	- Promote national-level policy and institutional changes to ensure that farmers have the resources and technical capacities to adopt climate-smart agriculture practices - Encourage and support landscape-level governance systems and tenure arrangements that allow for the integration of climate change adaptation and mitigation strategies - Encourage donors to support local efforts, especially farmer-led initiatives, that integrate adaptation and mitigation efforts

Assessment for climate-smart planning and decision-making

Expanding landscape management approaches so that they become significant on a global scale will require tapping into multiple sources of knowledge (i.e. scientific, traditional and indigenous knowledge). It will be critical to share knowledge and expand the knowledge base about the multiple uses and users of ecosystems and natural resources. Strengthening institutional capacities for undertaking negotiations and joint strategic planning is also essential. Participation and social inclusion are key principles when carrying out assessments to foster country ownership and commitment, and are crucial ingredients to achieve desired changes.

Right from the outset, all stakeholders should come to common agreement on the short and longer-term objectives to be met, and understand the potential broader impacts of the proposed management interventions. Lessons also need to be learned from the results of previous interventions.

It is also necessary to clearly measure, monitor and demonstrate the multiple benefits of promoting landscape-scale interventions and establishing climate-smart production systems. Monitoring objectives must be locally defined, and cover metrics related to productivity and livelihoods, biodiversity and ecosystem services. When embarking on a landscape plan that aims to address multiple objectives, the principles and processes of monitoring should be agreed upon at the beginning through a consultative, participatory process. The tracking of multiple dimensions of change is very important element in the shift away from sectoral goals (Scherr, Shames and Friedman, 2012).

Successful monitoring depends on a set of inexpensive and user-friendly integrated metrics that can track the full range of benefits from climate-smart landscape initiatives for the range of stakeholders. These integrated metrics would monitor not only carbon storage, but also the water quantity and quality, biodiversity, and other sociocultural services that are components of a climate-smart landscapes and local livelihood systems. Ideally, the tracking should include the assessment of synergies developed over the course of the landscape intervention (Duguma *et al*., 2014b). The results of monitoring, particularly on the status of potential compensation measures, the distribution of benefits, and the impacts on rights and conflict resolution, will need to be transparent and easily accessible to all stakeholders (Shames *et al*., 2011).

FAO has carried out participatory land resources management and livelihoods assessments using the Driving forces, Pressures, States, Impacts and Responses (DPSIR) framework (FAO, 2011b). DPSIR, which is a causal framework for describing the interactions between society and the environment, has been used in more than 25 countries to analyse, using both scientific and traditional knowledge, the status and trends in land management at the local and national levels (see Case Study A3.4 on the step-by-step landscape approach to prioritize sustainable land management investments and Case Study C1.3 on participatory stakeholder capacity assessment to strengthen individual and institutional capacities for adaptation in the Lao People's Democratic Republic).

Box A3.5 Metrics and indicators

Landscape approaches are considered an effective way of addressing climate change at multiple scales. However, they also pose monitoring and evaluation challenges. Landscape approaches require metrics and indicators for assessing the synergies that have been built among activities addressing multiple goals and the progress that been made toward reaching climate-smart agriculture objectives. These metrics and indicators are needed to determine whether the impacts of climate change have been addressed and justify the effectiveness of the landscape management approaches in supporting climate-smart agriculture.

As indicated in module C9 on monitoring and evaluation, each intervention will need to design a specific and appropriate system of parameters and methods for carrying out quantitative and periodic assessment of processes that need to be measured, and the procedures for implementing these assessments and interpreting their results. This activity will help measure performance and highlight areas for improvement.

In the application of integrated landscape management, beneficiaries must be able to undertake their own assessment of their own individual needs and the needs of the wider community. Landscape approaches requires the beneficiaries to be part of assessment activities, so that they have the necessary data and information that allow them to engage as equals in negotiations and decision-making processes.

Decision-making processes that can contribute to mainstreaming climate-smart practices involve management planning at the landscape level to reach social, economic and environmental targets. Diverse groups and institutions need to work together to develop strategies for increasing farm incomes and diversifying agricultural economies. At the same time, efforts need to me made to ensure that natural resources are used efficiently and that ecosystem functions and services are sustained over the long term. One of the primary benefits of coordinating efforts at the landscape level is the integration of decision-making processes that can support the achievement of wider objectives and national targets, including the SDGs.

In Rwanda, FAO has supported the monitoring of climate-smart interventions using local assessments to determine the benefits derived from incentives or payments for ecosystem services. Negotiations and strategic planning processes can be facilitated through the development of databases that integrate local and scientific information, as well as socio-economic and biophysical data on the state of land resources (e.g. soil, water and biological resources), the various drivers of change, climate information, and the impacts of interventions. An example of such an assessment is given in Case study A3.8, Hydrological monitoring helps scaling up watershed services incentives in Rwanda.

Equitable climate-smart landscapes

Often, stakeholders have different visions and understanding of landscape planning and goals, and different entry points and priorities (e.g. land-use systems, risk aversion, increased productivity). Setting-up a successful negotiation process involves taking note of all stakeholders' interests. This needed to formulate management plans that address land use and resource management, conflict resolution and the minimization of trade-offs. Negotiations should follow procedures and rules that stakeholders have agreed on, and that are enforced by a credible and legitimized third party. This is in line with the Voluntary Guidelines on the Responsible Governance of Tenure. Landscape management is an iterative and evolving process that, through multistakeholder involvement, can help tackle and resolve conflicts and facilitate equitable negotiation processes for minority and disadvantageous groups. It can help reach negotiated agreements that involve all stakeholders. For the process to be easily understood and allow for stakeholder involvement in all phases, it needs to be as clear, simple, practical, coherent and feasible as possible given the available resources. The process should also ensure transparency and accountability, so that all stakeholders can meet their responsibilities.

FAO has developed the Green Negotiated Territorial Development (GreeNTD) approach for multistakeholder engagement to foster a progressive consensus that can ideally lead to a holistic, and negotiated vision for territorial development at multiple scales (FAO, 2016b). The GreeNTD approach promotes a decision-making method that contributes to levelling the power asymmetries among different stakeholders, particularly women, minorities, youth and other marginalized groups.

A rapidly growing number of researchers have been analysing whether conflicts can be affected by climatic change. Hsiang *et al*., 2013, have found strong causal evidence linking climatic events to conflicts. Although there has been increased attention and commitment towards empowering women and improving gender equality with regard to access to health and social services in territorial development interventions, the results that have been achieved in translating these commitments into standards and operational practices has been modest. This aspect of development is particularly important in efforts to address climate change because the sensitivity and adaptive capacity of individuals and societies are largely shaped by roles, responsibilities and entitlements associated with various markers of social identities and power relations, including, gender, ethnicity, age, socio-economic class, and caste (Carr and Thompson, 2014).

Disentangling the complex intersectionality of social inequality and power relations, which can be achieved through the GreenTD approach, is key element in activities to strengthen the resilience of communities and reducing vulnerability, especially for minority groups. An example of FAO work at the landscape scale that is being affected by climate change and conflict is presented, in Case Study A3.9, Mobile pastoralism negotiated vaccination plans enhance landscape-level resilience in Sudan-South Sudan borders).

Water management and the efficient use of water resources are of fundamental importance in designing landscape approaches for implementing climate-smart production systems that can also contribute to avoiding conflicts.

Ecosystem management can also have a key role in this area. Forests and several types of agriculture land management practices, can help store water, reduce run off, protect communities from floods and other extreme weather events. Water management is essential for building resilient production systems and managing the risks associated the impacts of climate change on hydrological regimes and the frequency and intensity of droughts and flooding (see also module B.6). Efficient water resource management involves practices that sustain ecosystem services. These practices need to be based on common agreements among water and land users and other stakeholders on the modalities of use. These agreements will be best achieved through participatory governance processes that are backed up by integrated land-use and resources planning.

Large hydrological units, such as river basins, need a nested planning approach that involve various stakeholders at various scales. This approach involves linking the detailed management plan for local landscapes, which may be a micro-catchment or community territory, to larger catchment or watershed management plans and a multisector and multistakeholder plan for the river basin. Case Study A3.10, integrated watershed management for a climate-smart development in Uganda and Box C5.7 provide an example of an intervention related to water management deigned to achieve climate-smart agriculture that has grown over time to include landscape management at the watershed level.

Financing landscape approaches

To catalyse landscape-scale interventions for climate-smart agricultural development there is a need to increase access to financing. Achieving financial viability for development initiatives that operate at the landscape level requires that the incomes of all stakeholders are sufficiently high to prevent them from engaging in activities detrimental to local ecosystems and sustainable livelihoods. Several options to create these conditions are outlined in more detail in module C.3 on financial instruments.

To implement a landscape approach and provide co-financing to climate-smart agriculture activities, mechanisms should be negotiated among multiple users and directed to multiple sectors. These mechanisms can provide incentives to smallholder producers to overcome barriers to the adoption of more environmentally-friendly and climate-smart practices. Incentives for ecosystem services can provide a spectrum of options, ranging from policy-driven incentives to voluntary ones. Funding in this area can be sourced from existing public programmes, private sector investment and civil society initiatives. Improved cross-sectoral coordination of existing co-financed incentives can provide a package of actions to support short-term transitional needs and the long-term sustainability of climate-smart agriculture production systems.

Incentives for applying the landscape approach to implement climate-smart agriculture interventions can be financial or non-financial. Financial incentives can include payments for ecosystem services (PES) – a mechanism to compensate farmers and farming communities for the lost opportunity costs of maintaining ecosystem services. PES can be used as a market-based innovation to scale up sustainable land management and its components, such as sustainable forest management. PES incentives have the added advantage of increasing the financial attractiveness of alternative practices. Non-financial incentives include capacity development, educational initiatives, the provision of inputs and the development of alternative livelihoods. Improving access to higher-value markets, for example through certification for major agricultural commodities (e.g. coffee, tea and cocoa) provide additional incentives for investments in sustainable agricultural initiatives that protect environmental services.

Several examples of incentive mechanisms of this type already exist in developing countries, such as the Upper Tana Nairobi Water Fund (The Nature Conservancy) in Kenya, the Rio Rural Partnership in Brazil (see Case Study A3.11), Pro-poor Rewards for Environmental Services in Africa (PRESA) Programme (ICRAF) and the Rewards

for, Use of and Shared Investment in Pro-poor Environmental Services (RUPES) in Asia (ICRAF).

There is a need to catalyse landscape-scale interventions by increasing access to finance for climate-smart agricultural development. Incentives for ecosystem services can provide support for an enabling environment to improve the coordination of existing initiatives that can compensate producers for conservation activities. Support for more sustainable, climate-smart production with private sector-led eco-certification initiatives could also be coordinated with large investment programmes to increase access to locally adapted, affordable and high-quality inputs and improve infrastructure (e.g. storage, transport). For climate finance in rural landscapes to be effective, the interventions need to be coordinated with local development activities.

There are several opportunities for securing additional private and public climate finance (e.g. domestic and foreign direct investment) and bilateral and multilateral climate change funds and programmes, including carbon markets (see module C.3). For example the AFR100 (the African Forest Landscape Restoration Initiative) is a country-led effort to bring 100 million hectares of land in Africa into restoration by 2030. Initiative 20x20 is a similar country-led effort to bring 20 million hectares of land in Latin America and the Caribbean into restoration by 2020. To harmonize sectoral approaches, climate finance should be linked to agricultural development finance. The implementation of activities to achieve the strategic objectives and priorities that countries have set forth in their NDCs, NAPAs, NAPS and NAMAs can also contribute to landscape-level management. The Green Climate Fund and REDD+ can also support landscape interventions. These national and international policy tools provide the flexibility to fund policy development in support of climate change adaptation and mitigation on a large scale. An example of a success story in this area is presented in Case study A3.11, Financial sustainability for environmental services in Brazil.

Conclusions

Landscape approaches are the most appropriate approaches for supporting the transition to climate-smart agricultural production systems and food systems. Interventions that apply landscape approaches can sustainably improve production, help agricultural communities adapt to climate change and reduce greenhouse gas emissions. Specific strategies and processes that are needed to scale up pilot projects, include raising awareness, boosting partnerships, supporting a system-wide capacity development to strengthen capacities of people and institutions, and creating an enabling policy and business environment.

Landscape approaches for climate-smart agriculture combine agro-ecosystem and governance dimensions and maximize their synergies. They do this by building on multiple natural, semi-natural and agro-ecosystem functions, and applying adaptive management approaches at multiple and nested scales with multiple stakeholders.

It is important to engage in land-use planning at the landscape level and adopt consensus-based and people-centred approaches that foster country ownership and commitment for climate-smart agriculture activities in the field and throughout the broader enabling environment. In order for climate-smart landscape interventions to effectively reduce conflict, enhance equity and sustain ecosystem services, all the agriculture sectors (crop and livestock production, forestry, fisheries and aquaculture) and other sectors (e.g. tourism, industry, mining, urban planning) will need to be engaged in planning processes.

Initial activities will need to focus on strengthening the enabling environment, which include policy, legislative, and institutional settings. This involves the development of a toolset for interventions and awareness-raising activities on the benefits of a wider uptake of climate-smart agricultural landscapes. The mainstreaming of best practices will include policy and institutional actions and the formulation of sustainable finance plans to support the scaling up of these practices and ensure that all stakeholders benefit from more secure livelihoods.

Landscape approaches enable climate-smart agriculture initiatives to improve assessments and decision-making process related to short- and long-term economic, social and environmental sustainability. By applying the landscape approach, the sustainable intensification of production can be achieved, synergies between climate change adaptation and mitigation optimized, and competition over land use reduced. The approach also minimizes trade-offs and other negative externalities. The implementation of a landscape approach, allows interventions to be 'retrofitted' through endogenous monitoring, evaluation and the sharing of lessons learned. Adaptive management and participatory monitoring of the multiple impacts and benefits of managing climate-smart landscapes are essential. Climate change adaptation actions require tracking the impacts of cross-sectoral and multistakeholder efforts at different scales, and continuously adapting them to changing conditions or new information.

There is a need to catalyse landscape-scale interventions by increasing access to financing for climate-smart agricultural development. Incentives and payments for ecosystem services are potential options in this area.

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Acronymns

GreenNTD	Green Negotiated Territorial Development
ICRAF	The World Agroforestry Centre
NAMA	Nationally Appropriate Mitigation Action
NAP	National Adaptation Plan
NAPA	National Adaptation Programmes of Action
NDC	Nationally Determined Contribution
REDD+	Reducing Emissions from Deforestation and Forest Degradation (+ refers to the role of conservation, sustainable management of forests and enhancement of forest carbon stocks)
SDGs	Sustainable Development Goals
UNFCCC	United Nations Framework Convention on Climate Change

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