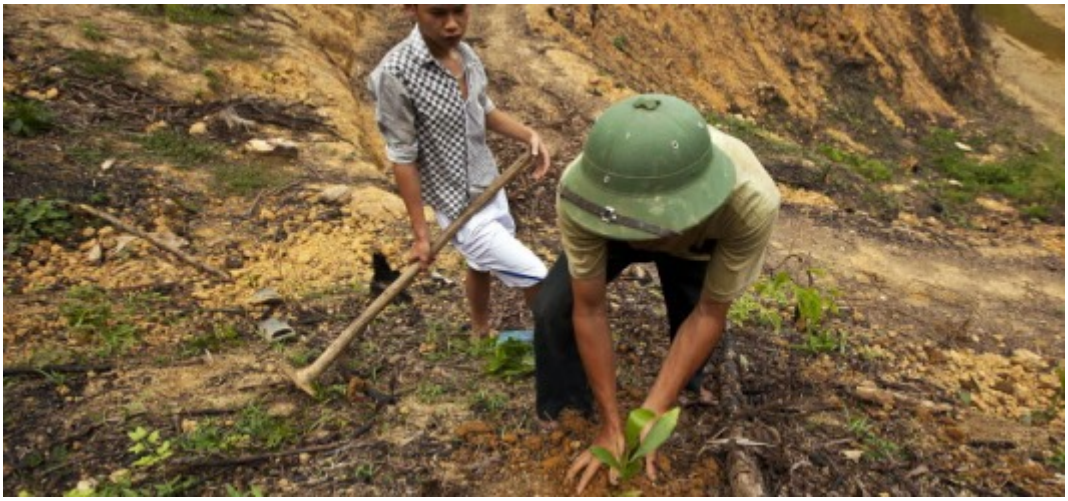
Forest and Landscape Restoration

Basic knowledge



This module is intended for people involved in the restoration of forest cover at the landscape scale. It sets out the main steps involved in planning forest and landscape restoration, including decisions on the types of intervention to be used, where to intervene in the landscape, and how much restoration might be undertaken to achieve local-to-national objectives. The module reviews some of the technologies and institutional arrangements that are likely to be needed, and financial aspects. It provides links to tools for, and case studies of, effective restoration and rehabilitation efforts at the landscape scale.

The aim of forest and landscape restoration (FLR) is to develop diverse, productive and multifunctional landscapes that are resilient in the face of economic fluctuations and climatic change. FLR shifts the emphasis away from simply maximizing tree cover towards re-establishing multiple ecosystem functions in previously degraded landscapes, striving for a balance between restoring environmental services and improving the productive capacity of land for agriculture, forestry and other land uses.

FLR differs from site-level forest reforestation because it explicitly seeks to restore ecological processes such as hydrological and nutrient cycles, soil development, and wildlife population dynamics that operate or are only effective at a larger – or “landscape” – scale. This is the reason that the term “restoration” is used in preference to “reforestation”.

FLR is more than a technical approach; intrinsic to it is the involvement of landholders and other stakeholders in participatory decision-making processes. It makes use of collaborative approaches to harmonize the many land-use decisions of landholders with the aims of improving both ecological integrity and economic outcomes and enhancing the socioeconomic development of local communities.

Because the knowledge and expertise of individuals is a key resource for landscape restoration, it is particularly important that women and men can equally make a contribution. If landscape planning is to be effective, it must incorporate women’s as well as men’s concerns. Yet a real knowledge gap remains, as women are often excluded from participatory processes.

Landscape approaches involve landholders, political leaders and other stakeholders but very few of them are female. This means women are not able to participate in decisive discussions; yet, evidence shows that successful landscape approaches rely on the active participation of communities, the private sector, and other actors, including women.

Decisions on how FLR is implemented necessarily depend on the extent and nature of land degradation and the resources available, as well as the biophysical characteristics of the landscape mosaic. They also depend on the aspirations and needs of stakeholders and a range of social, economic and environmental factors.

1. People undertaking FLR should consider four key questions:
2. How much restoration is needed in a particular landscape?
3. What type of restoration should be done at each location?
4. Where in the landscape should those interventions be carried out?
5. How should such a restoration programme be organized, funded and managed?

The amount of restoration
required in a landscape depends on the extent and condition of degraded former forestlands, agroecosystems and natural forests. FLR is not about maximizing tree cover but about meeting demand for forest goods and environmental services; it explicitly seeks to avoid further land degradation and the loss of natural forest, and any restoration should be balanced with other land uses, such as agriculture. A question that should be posed is, “Can a forest be restored in such a way as to complement agriculture, and even help increase food production, rather than competing for land?”

The optimal type of restoration
is likely to vary across a landscape, with different approaches used in different locations. In some places, trees might be planted in commercially oriented plantation monocultures, while efforts elsewhere might focus on restoring the original forest ecosystems (an approach referred to here as *ecological restoration*); crucially, the combination of restoration activities across a landscape should increase productivity and the provision of environmental services while serving the needs of people living in the landscape. Other restoration efforts might involve the re-introduction of some (but not necessarily all) the forest tree species originally found in the landscape (often referred to as *rehabilitation*), or various forms of agroforestry. Figure 1 presents a typology of possible restoration interventions.

The location
of an FLR intervention is influenced by considerations such as the location of the most degraded areas in the landscape and where in the landscape restoration is most needed or would be most efficient in removing impediments to ecological functioning. Examples of high-impact locations are steep, eroding slopes; riparian areas; corridors between natural forest remnants; and buffer areas around residual forest patches. The location of an intervention may also be influenced by social or demographic factors, economic factors such as access to markets (which will be a determinant of the profitability of products produced in the restored area), and local, subnational or national priorities.

The planning and organization
of FLR is more complex than site-level forest restoration or rehabilitation. FLR has a political dimension because it often operates across political jurisdictions (e.g. local government boundaries) and because it has implications for the production of food and wood products as well as for the provision of environmental services such as clean water and carbon storage and the meeting of cultural and recreational needs. FLR interventions aimed at changing the nature and composition of a landscape mosaic is likely to benefit some landholders and disadvantage others. Stakeholders other than landholders, such as downstream water users who stand to benefit from improved water quality, may also have an interest in the outcomes of FLR interventions. The best way of ensuring that decisions on land-use management – including those related to FLR – are broadly acceptable to diverse stakeholders is to engage those stakeholders in the decision-making process. FLR proponents should reconcile subnational or national objectives (e.g. for watershed protection or biodiversity conservation) with the goals of local communities and individual landholders. A judicious mix of top-down and bottom-up planning and management is likely to be needed.

The FLR options framework

The FLR options framework

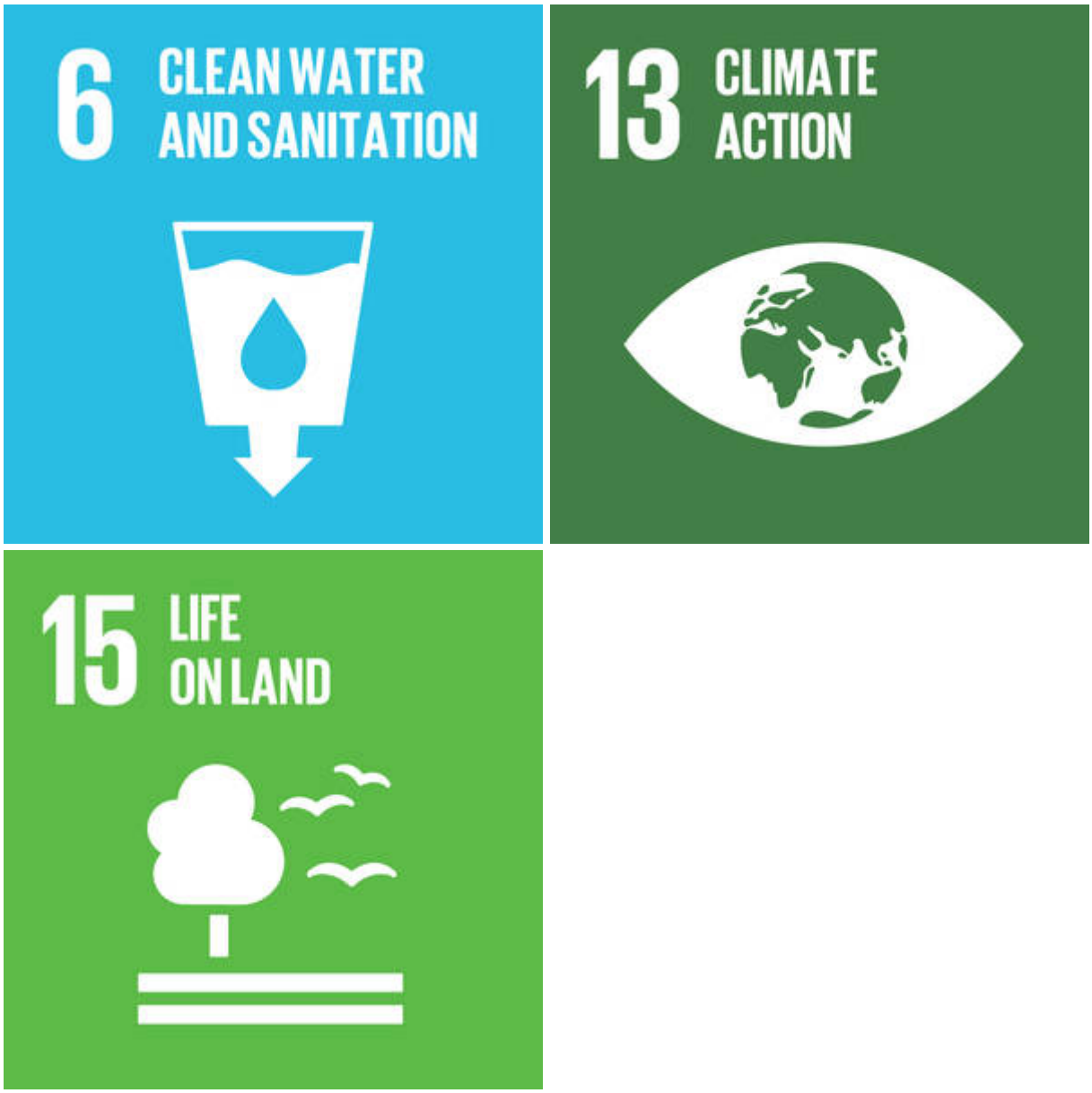
Land Use	Land sub-type	General category of FLR option	Description
Forest land Land where forest is, or is planned to become the dominant land use → Suitable for wide-scale restoration	If the land is without trees, there are two options:	1. Planted forests and wood-lots 	Planting of trees on formerly forested land. Native species or exotics and for various purposes, fuel-wood, timber, building, poles, fruit production, etc.
		2. Natural regeneration 	Natural regeneration of formerly forested land. Often the site is highly degraded and no longer able to fulfil its past function – e.g. agriculture. If the site is heavily degraded and no longer has seed sources, some planting will probably be required.
	If the land is degraded forests:	3. Silviculture 	Enhancement of existing forests and woodlands of diminished quality and stocking, e.g., by reducing fire and grazing and by liberation thinning, enrichment planting, etc.
Agricultural land Land which is being managed to produce food → Suitable for mosaic restoration	If the land is under permanent management:	4. Agroforestry 	Establishment and management of trees on active agricultural land (under shifting agriculture), either through planting or regeneration, to improve crop productivity, provide dry season fodder, increase soil fertility, enhance water retention, etc.
	If it is under intermittent management:	5. Improved fallow 	Establishment and management of trees on fallow agricultural land to improve productivity, e.g. through fire control, extending the fallow period, etc., with the knowledge and intention that eventually this land will revert back to active agriculture.
Protective land and buffers Land that is vulnerable to, or critical in safeguarding against, catastrophic events → Suitable for mangrove restoration, watershed protection and erosion control	If degraded mangrove:	6. Mangrove restoration 	Establishment or enhancement of mangroves along coastal areas and in estuaries.
	If other protective land or buffer:	7. Watershed protection and erosion control 	Establishment and enhancement of forests on very steep sloping land, along water courses, in areas that naturally flood and around critical water bodies.

Figure 1. Illustrative typology of possible restoration interventions, responding to various

contexts.

Source: Maginnis et al. (2014).

Forest and landscape restoration contributes to SDGs:



In more depth

General context

Considerable reforestation in the last 100 years has been aimed at creating industrial timber resources, but two changes are under way. One concerns the purpose of reforestation: rather than simply producing forest products such as timber, reforestation is increasingly targeting the delivery of environmental services(1). The second change concerns scale: in the past, reforestation was seen mostly as a national responsibility. Recently, however, the very large area of degraded land worldwide has prompted international bodies to call for ambitious global restoration programmes. At the same time, there is increasing recognition of the role that individual farmers and other smallholders can play in reforesting some or all of their lands – in addition to the role previously played by governments and corporations.

The change in emphasis and scale mean that the reforestation methodologies used in the last 100 years to create industrial timber resources will not necessarily be appropriate in the future. There is an increasing need for timber, food security, clean water, biodiversity conservation, cultural and recreational opportunities, and poverty alleviation. Reforestation efforts must be capable of responding to all these in the face of climate change, which will likely have major impacts on the ways in which landscapes are managed.

(1)In this module, the term "reforestation" is used to describe the process of re-establishing tree cover on land deforested by other activities, such as agriculture, and not the silvicultural process of regenerating forests after standard harvesting operations.

The importance of forest and landscape restoration

FLR differs from other large-scale reforestation approaches because it involves a wide variety of reforestation methods within a landscape mosaic and because it explicitly seeks to restore key ecosystem functioning and achieve multiple objectives at the landscape scale. The reforestation approach used at a given site depends on local socioeconomic and environmental conditions and objectives. FLR in a given landscape may involve combinations of monocultural and multi-species planted forests, forests established through natural regeneration, and the improved management of existing natural and semi-natural forests. FLR offers a way of balancing the production of economically useful forest products with conservation benefits, because trade-offs are easier to make at the landscape scale than at a single site.

Main principles and approaches to implementing FLR

FLR is necessarily the result of a planning process. It requires acceptance that there is a variety of legitimate stakeholders (not all of whom are landholders), who must arrive at a shared vision of landscape restoration. The box sets out principles for undertaking the FLR planning process.

Principles for reconciling forest restoration with agriculture, nature conservation, and other competing land uses

***Identify all stakeholders*:** most landscapes have many stakeholders, who may differ in their values and aspirations. Ways should be sought to identify these stakeholders and involve them in negotiations.

***Find entry points of common concern*:** negotiations between planners and stakeholders must be based on trust and shared objectives.

***Clarify rights and responsibilities*:** the rights and responsibilities of all stakeholders need to be recognized and accepted by all parties; access to a fair system of justice is necessary for adjudicating on disagreements.

***Look for productive forms of restoration*:** FLR must be profitable for those who implement it, and funding mechanisms may be needed (e.g. to compensate landholders for the environmental services they provide).

***Foster resilience*:** actions should be promoted that enable the early identification of risks and threats and which facilitate responses that ensure that social and ecological systems can cope with and recover from perturbation.

***Develop negotiated and transparent processes*:** FLR will be most successful when it is developed transparently and subject to fair negotiation, requiring a shared overall vision and governance structures that have legitimacy among all stakeholders.

***Strengthen stakeholder capacity*:** stakeholders may need assistance to build capacity to participate effectively and to accept their roles and responsibilities.

***Work at multiple scales*:** context and scale are important and must be taken into account in planning.

***Seek multifunctionality*:** landscapes can produce a wide range of goods and environmental services and support diverse values. Trade-offs will usually be needed, however, to reconcile the ways in which the needs, preferences and aspirations of different stakeholders are managed.

***Undertake participatory and user-friendly monitoring*:** information derived from a variety of sources should be shared transparently to allow mutual learning and to build and maintain trust.

***Practice continued learning and adaptive management*:** environments vary in both space and time, and adaptive management is needed to cope with unexpected ecological and economic events.

Source: Based on Sayer (*et al*.) 2013.

The basic elements of the FLR approach
are set out below. Although characterized as steps, in practice the approach involves an ongoing process of adaptive management.

1. Develop a landscape view of the problem and the scope for forest restoration

This step involves gathering and sharing relevant biophysical and socioeconomic data about the landscape and the ways in which it is being used. This might include information on existing land uses, the natural vegetation cover (including sites with high biodiversity value), and deforested areas with opportunities for natural tree regrowth and reforestation through planting. Other important information might relate to land ownership (including where there are ownership disputes), areas where agriculture is marginal or degradation severe, and the success or otherwise of previous reforestation, natural regeneration, agroforestry and conservation agriculture measures. Recent trends in land and crop prices might be helpful, for example, in identifying locations where the opportunity costs of reforestation are low or decreasing.

2. Group engagement to identify possibilities

This step involves bringing stakeholders together to identify how and where forest restoration might be worthwhile and to develop landscape restoration scenarios. Stakeholders may include landholders and local communities, downstream water users, industries dependent on forest resources, the residents of nearby towns, municipal, subnational and national governments, and civil-society organizations. These various stakeholders should be brought together to share background information and explore ways in which FLR might be undertaken in different parts of the landscape and the partnerships and trade-offs this might necessitate. Representatives of governments and non-governmental organizations might be able to advise on methodologies, potential markets for forest goods and environmental services, and sources of financial assistance. Landholders might be best-placed to identify locations where the opportunity costs of restoration would be lowest and to indicate the need for compensatory payments.

3. Decision-making and priority-setting

There is likely to be a wide range of views among stakeholders on restoration options, the relative importance of the various economic, social and environmental factors at play, and the priorities for FLR action. Accommodating and reconciling such differences may require the formation of new – or the modification of existing – planning and management institutions and a potentially lengthy participatory decision-making process.

4. Implementation

Implementation can commence once agreement has been reached on future restoration options. It may occur over several years, and it may be modified over time in light of experience and the monitoring of ecological, social and economic outcomes.

5. Monitoring and adaptive management

Given the dynamic nature of landscapes and their interconnected ecosystems, FLR needs to be flexible and informed by experience and information. Unexpected outcomes (e.g. difficulties in matching species with sites, nutritional deficiencies, and the occurrence of pests, diseases or wildfires) need to be detected and the approach duly modified. There may also be changes in attitudes among stakeholders, with some becoming more enthusiastic for FLR and others less so. Changes may occur in economic and political circumstances that affect the FLR process.

The monitoring programme should be capable of identifying such challenges and allowing the development of responses. Monitoring can be expensive, and the programme needs to be designed carefully. An overly ambitious monitoring programme may be hard to sustain, while a

superficial programme may provide insufficient information. The best form of monitoring is one that generates answers to specific questions. Table 1 provides examples of questions that a monitoring programme might seek to answer; it is not intended to be definitive, and the nature of any monitoring programme should reflect local objectives and circumstances.

Table 1. Examples of questions that a forest and landscape monitoring programme might seek to answer

Goal	Relevant questions
The forest and landscape restoration (FLR) plan is being implemented	Is the restoration programme being implemented as planned? Are areas of natural forest regrowth protected? Are planted seedlings protected from weeds, herbivory and fire? Are survival and growth rates of all planted species acceptable?
Functional outcomes are being achieved	Are the remaining natural forests protected? Is FLR limiting soil erosion (relative to unforested areas)? Is FLR improving water quality and dry season flows? Are populations of native wildlife species maintained, and are these species able to move across the landscape between forest patches?
Livelihoods are being improved as a consequence of the FLR plan	Has FLR affected agricultural production? Is household food production stable (or even increasing)? Are household incomes improving? Are land prices stable, decreasing or increasing? Are forest goods and environmental services generating incomes for households? Are patterns of land ownership stable? Are conflicts over land rights increasing or decreasing?
Governance arrangements to sustain FLR remain in place	Do all stakeholders remain supportive? Are FLR planning groups/institutions viable, and is the community continuing to accept their decisions? Are dispute-resolution procedures in place? Are government agencies and staff supportive (especially those operating at the local level)? Is there still a need for external support and funding of FLR, or is this dependency declining?

Many tools exist for assessing the status of landscape degradation, identifying restoration opportunities, and monitoring the progress of FLR (see Tools).

Key questions and action areas
How to identify restoration opportunities and priorities

Most agricultural landscapes contain mosaics of productive and less-productive lands, and some of the latter may be marginal for agriculture. But which of these less-productive or marginal lands should be targeted for restoration, and how can they be prioritized? Should priority be given to an eroding hill slope, or to a shrinking wildlife habitat? Such decisions will depend partly on the willingness of landholders to undertake restoration on their lands, and priority-setting will also need to take into account factors such as the costs and benefits of restoration in particular locations, equity, and practical considerations. The best way of resolving complex questions on FLR is to involve all relevant stakeholders in the decision-making process.

What are the enabling conditions for restoration?

FLR is most feasible when it benefits landholders, but disincentives often exist that limit these benefits and therefore the attractiveness of restoration. Disincentives may include a lack of land tenure, agricultural subsidies favouring current agricultural practices, limitations on the harvesting and sale of forest products, and excessive taxes and fees on the transportation of forest products to market. A lack of markets for environmental services may also be a disincentive. The best way of encouraging landholders to participate in FLR is to remove disincentives, thereby enabling growers to benefit directly and increasing the recognition of tree-growing (and other FLR practices) as a legitimate and valuable land use.

Positive incentives may sometimes be needed to induce change. These might include providing information and knowledge on silviculture and market opportunities (e.g. for wood and non-wood forest products and environmental services), and assistance in accessing markets. In some cases it may be necessary to provide material incentives, such as free seedlings or cash grants, to encourage the uptake of FLR practices and to assist landholders until their FLR efforts begin to provide market benefits.

What institutional settings and governance issues can facilitate FLR?

FLR differs from many previous large-scale reforestation programmes because it necessarily involves a variety of stakeholders, who may have widely varying objectives (and hence differing levels of interest in FLR). Institutions may need to operate at several scales and cross-sectorally to reconcile the views and aspirations of stakeholders and to ensure that FLR efforts are complementary to other national objectives.

A national-level multistakeholder platform or other institutional structure may be needed, perhaps embedded in a forestry or environmental agency. This body should include representatives of sectors such as agriculture, water resources, natural resource conservation, finance and forestry, as well as representatives of relevant national community organizations and the private sector. Its purpose would be to ensure that FLR actions complement and enhance other national objectives, such as food and water security, poverty reduction, conservation, and industrial development. The platform may also serve a function as a means of channelling funding to field practitioners. In Guatemala, for example, an FLR roundtable facilitated an inclusive participatory process to develop a national FLR strategy and is now helping the implementation of the strategy.

Complementary local planning institutions are also likely to be needed, involving, for example, government agencies and producer, community and conservation organizations. Mechanisms linking national and local bodies should be put in place to ensure complementarity between them and that national objectives are addressed and to provide feedback for informing national policies. Capacity building may be required to enable community groups to fully participate in these institutions.

Institutions can be captured by bureaucratic or political elites, and a key task, therefore, is to ensure that members of these bodies are properly representative of all stakeholders and have an effective voice. Measures should be adopted for resolving conflicts within and between the various institutions, ensuring that information is shared between institutions operating at the national, subnational and local levels, and making the institutions accountable to their constituencies for their decisions and actions.

Technologies and approaches for implementing FLR

There are two technologies to consider. The first concerns the type of restoration needed to produce both forest products and environmental services. The second relates to the methods by which stakeholders are made aware of the opportunities provided by FLR and the constraints to implementing it in various parts of a landscape.

There are five basic approaches for restoring forest cover (see also Figure 1):

1. *Restore existing degraded forests* – by minimizing disturbances such as unregulated logging, wildfires and grazing and accelerating recovery by enrichment planting or liberation felling.
2. *Facilitate natural regeneration on deforested former agricultural land* – by, for example, excluding disturbances such as wildfire and grazing, protecting regrowth arising from soil seed pools and old stumps, and enriching new forests with seedlings of preferred species.
3. *Monoculture tree plantations* –commonly involving fast-growing and commercially attractive species and usually the most easily managed of the various restoration alternatives. Monoculture tree plantations are ordinarily harvested and replanted at regular intervals; they may provide certain environmental services (e.g. carbon storage) but are less capable of supplying others (e.g. wildlife habitat). They can be a financially remunerative option for landholders, especially those with access to industrial markets for forest products (e.g. sawmills or pulpmills).
4. *Multi-species plantings* – involving the re-establishment of original species along with certain exotic species (a process sometimes referred to as rehabilitation). This may be the only effective option when sites are so heavily degraded that the original species cannot be re-established on their own or where ecological restoration is precluded for financial reasons. This approach can restore many ecological functions, and it can be attractive to landholders interested in developing agroforestry systems or growing multi-species timber plantations in order to diversify the range of goods and environmental services they produce and to widen market opportunities and thereby reduce economic risk.
5. *Ecological restoration* – in which all original species (trees and other plants) are re-established with the ultimate intention of restoring the original ecosystem. This option usually requires areas of existing natural forest in the landscape to act as an ecological reference point and to provide a source of seeds and wildlife. This is often the preferred option in those parts of a landscape where biodiversity conservation is a main objective.

Table 2 presents a summary of the capacity of each of these options to supply goods and environmental services at sites with and without existing forest cover, and further details are available in the Forest Restoration and Rehabilitation module.

Various forms of agroforestry can be important parts of FLR programmes (see the Agroforestry module). Agroforestry commonly involves

relatively low tree densities and may not always contribute significantly to restoring forest cover. Some agroforestry practices, however, such as those involving the enrichment of fallow areas and other forms of natural forest regeneration, are very similar to forest restoration.

All the approaches described above might be used in the same landscape mosaic. Each requires detailed knowledge of species and their site requirements, with ecological restoration likely to be the most expensive approach because it often necessitates considerable management inputs (although it can sometimes be achieved relatively cheaply if natural forest regrowth is still possible). Scientific research and on-farm experimentation by individual landholders can both be important in developing appropriate technologies.

Table 2. Types of intervention for restoring forest cover that can be used in forest and landscape restoration

Type of intervention	**Ecological status**	**Capacity to provide goods (e.g. timber)**	**Capacity to provide environmental services**
Restoration of existing degraded forests	Potentially able to maintain much of original biota; self- sustaining	High	High
Natural regeneration on deforested land	Capacity to restore original biota depends on degree of degradation*; self-sustaining	Moderate to high	High
Plantation monoculture	Periodic harvesting means few species of original biota are restored. Needs periodic replanting	High	Varies, and depends on rotation length; often limited
Multi-species plantings	Can include some but not all original biota; may include some exotic species; can be self-sustaining	Moderate to high; best for high-value timbers rather than for commodities such as pulpwood	Moderate to high
Ecological restoration	Former successional trajectory re-established; self-sustaining	Usually limited	High

* Also depends on age and landscape context (especially distance to seed sources in natural forests).

FLR requires effective approaches for informing and involving stakeholders, for example in decisions on which areas of land are to be restored and how it might be done. Some stakeholders may seek quantitative analyses of FLR options, while others may favour more visually oriented tools and practical examples. The former might be produced using computer models and databases of, for example, topography, soils, vegetation, biodiversity and cadastral information. Some models also use economic data such as crop and land prices to generate estimates of costs and benefits (although it can be difficult to quantify the price of environmental services). To date, few such models have been used directly to generate land-use plans at the landscape scale, and their chief value may lie in helping decision-makers explore the implications of competing FLR scenarios.

When large databases are unavailable, such as in many developing countries, visual tools or simple models may be more helpful in facilitating discussions on land-use options. These might include the following:

- simple maps showing the spatial context in which restoration might be done;
- “rich maps”, which are maps drawn by stakeholders based on local knowledge that show areas of local importance and identify restoration options;
- aerial photographs or satellite imagery showing present land-use patterns;
- three-dimensional models (e.g. made of clay) of the landscape, with existing land uses painted onto the surface;
- simple “throw-away” simulation models created for specific situations or landscapes with the assistance of local stakeholders. These can identify entry or leverage points and can be used to examine the implications of different scenarios; and
- demonstration areas where restoration alternatives are developed at an operational scale. These might be located at a range of sites differing, for example, in soil fertility, altitude or degree of degradation.

(See also the Participatory Approaches and Tools in Forestry module).

Private-sector involvement

In most landscapes, patterns of land ownership mean that restoration can only be undertaken with the involvement of the private sector. Some landowners may be willing to participate in FLR because they believe they (and their families) will benefit directly from the sale of forest products or environmental services. Alternatively, landowners may be willing to participate because of the indirect benefits they will receive; for example, landscape restoration may help protect commercial agricultural crops from erosion and thereby make production more sustainable. Large corporate landowners may find FLR attractive because natural regrowth or areas of planted forests prevent erosion on steeper lands or act as firebreaks. Involvement in FLR shows a willingness to help conserve biodiversity and improve local livelihoods,

thereby providing corporations with reputational benefits. But the extent of private-sector involvement will depend on the policy and institutional framework established by governments, including the legal obligations of landowners. Private-sector involvement is often predicated on research previously undertaken by government-funded research that reduces silvicultural and economic risks, thereby making investment more attractive to the private sector.

Financing

Traditional industrial reforestation often involves single sources of finance (e.g. government or corporate), but FLR is likely to involve a variety of funding sources, some of which are associated with markets (aimed at creating new private assets) and others deriving from non-market sources (to create publicly valued goods or services). Government funding is often crucial for initiating FLR projects, but markets can provide powerful incentives for landholders to undertake restoration.

Timber is the main product that has encouraged reforestation in the past, but there is growing interest in markets for environmental services (often referred to as "payments for environmental services" schemes or "rewards for environmental services"). Establishing and supplying such markets is challenging because of the complexities of coordinating restoration among landholders and, in some cases, the reluctance of the users of environmental services to pay for them.

Markets alone may be insufficient to fund FLR, and directed financial subsidies or incentives may be necessary to overcome the opportunity costs. Some such subsidies may derive from government, but international development assistance may also have a role to play, channelled through governments or non-governmental organizations.

Environmental funds (such as national forest funds or the Green Climate Fund) can be key sources of financing for FLR. They are diverse, with differing geographical scopes and investment targets, and their capital may derive from a wide range of sources – private, public, national or international, and any combination of these. Many environmental funds are short-term, however, compared with the long time horizons usually involved in FLR.

Impact funds (funds that seek outcomes for the financial, environmental and social triple bottom line) are becoming important investors in FLR. Examples include the EcoBusiness Fund, the Moringa Partnership, the Althelia Climate Fund, and Permian Global; see here for a detailed overview of existing impact funds.

Innovative financing tools such as crowd-funding platforms may be an additional means of obtaining funding for FLR. Examples of crowd-funding platforms for FLR include Stand for Trees and Mirlo Positive Nature.

Building "marketplaces" to enable the fruitful meeting of investors and project developers and promoters can be important in promoting sustainable financing for FLR.

Public policymakers from developed and developing countries at all levels (i.e. national, subnational and local) have the opportunity to play leadership roles as FLR financing champions. Even though they do not control private capital, they can support resource mobilization by:

- integrating FLR into government budgets and public investment funds, and ensuring that these financing instruments do not cause negative impacts in landscapes;
- mobilizing official development assistance (ODA) funds for FLR and adapting the wide range of ODA instruments to FLR;
- promoting FLR as a solution for climate-change mitigation and adaptation and targeting climate finance windows. Policy advocacy in the development of the Adaptation Fund and the Green Climate Fund (among others) may help increase funding for FLR;
- developing monitoring systems for FLR expenditure and data collection mechanisms on the costs and benefits of FLR investments;
- designing, adapting and implementing adequate national and local financing mechanisms for FLR, such as national forest funds. Local funds can drive direct FLR implementation at the subnational level;
- using such financing mechanisms to implement public incentives schemes, such as payments for environmental services. A long-term self-sustaining financing strategy may involve coupling public incentives schemes with investment in sustainable value chains;
- increasing engagement in public–private partnerships, especially with pioneer private impact funds for FLR and other innovative initiatives such as layered funds that can benefit from the support of governments and public institutions. Public funds are particularly relevant for the readiness phase of FLR investments;
- building legal and regulatory frameworks that make landscapes "ready for investments" and attract the right set of investors to FLR interventions;
- establishing risk-mitigation mechanisms as a key factor in engaging FLR investors at scale; and
- promoting partnerships and alliances at the local, subnational and national levels and contributing to international FLR initiatives.

Extension and capacity development

Reforestation of any kind may be a novel land-use option in many agricultural landscapes, especially where landholders have historically been involved in tree-clearing. Extension foresters may be needed to promote the idea and build the capacity of landholders to establish trees and benefit from doing so. But landholders may also need assistance to recognize the roles of other stakeholders and to benefit from participation in local FLR management institutions. At the same time, many government officers and agencies may need training to recognize the role of other stakeholders and to understand that FLR should not be imposed in a top-down process but must be participatory.

Farmers, who usually comprise the majority of landholders and, in developing countries, are mostly smallholders, should be primary targets of sensitization processes. The most effective way to ensure that farmers want to participate in FLR is to integrate messages on improving agricultural productivity with those on sustainable land management.

Two channels are commonly used to address farmers: extension agents and farmer field schools. Ensuring that agricultural extension agents are willing and able to introduce and support FLR technologies, which they may view as outside their domain, is crucial. Farmer field schools are used to train farmers in agricultural practices and have the potential to disseminate FLR technologies.

Further Learning

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Credits

This module was developed with the kind collaboration of the following people and/or institutions:

Initiator(s): David Lamb

Contributor(s): Cesar Sabogal - FAO, Forestry Department

Reviewer(s): Doug McGuire, Christophe Besacier - FAO, Forestry department; John Parrotta - USFS; Ronnie de Camino - CATIE; Hans Vellema, Maartje de Graaf, Ambar Hernandez - Tropenbos International; Stephanie Mansourian, John Stanturf - SER

This module was revised in 2017 to strengthen gender considerations.

Initiator(s): Gender Team in Forestry

Reviewer(s): Cristophe Besacier, Doug McGuire - FAO, Forestry Department