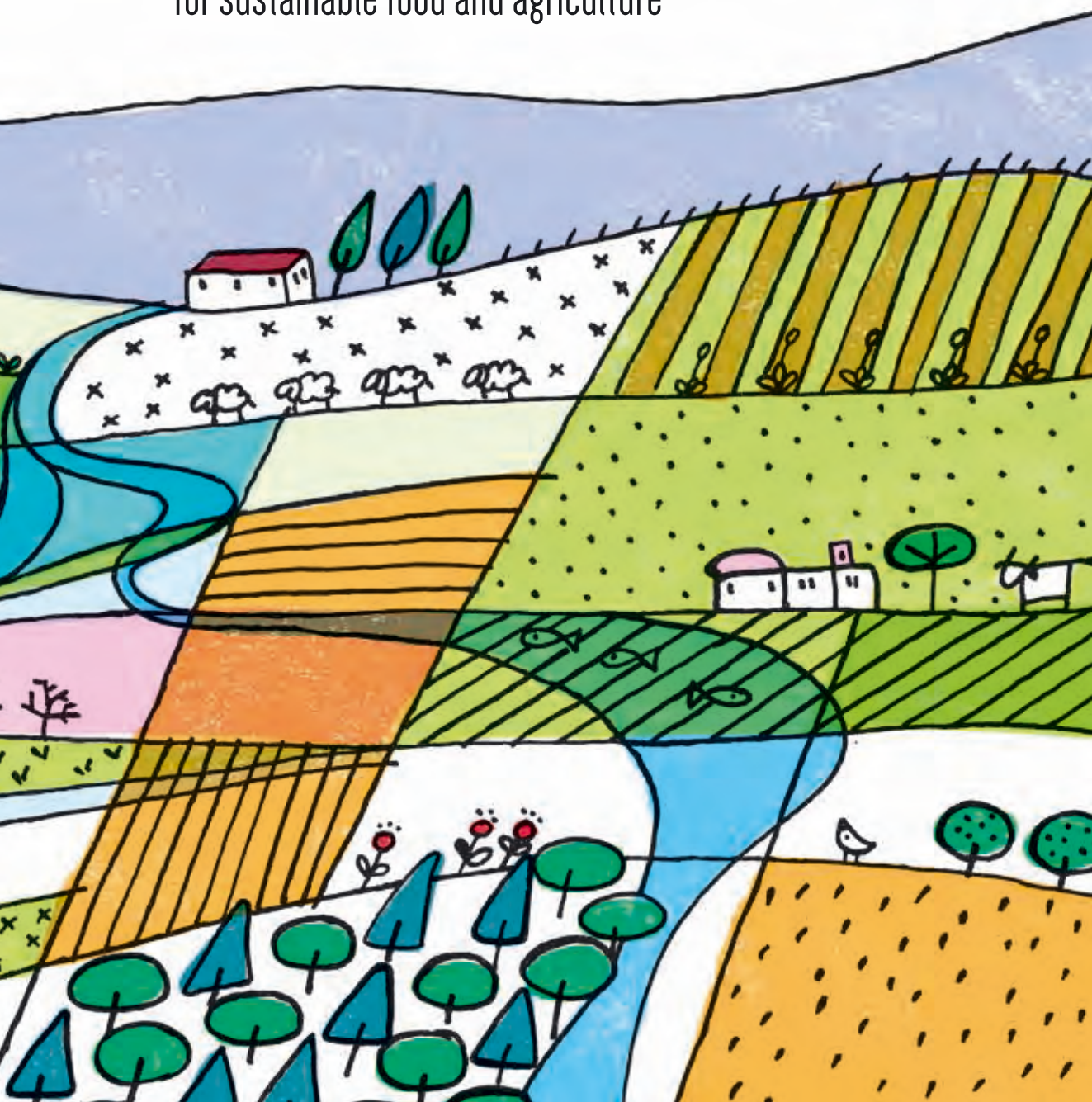
Food and Agriculture Organization
of the United Nations

LANDSCAPES FOR LIFE

Approaches to landscape management for sustainable food and agriculture



LANDSCAPES FOR LIFE

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Food and Agriculture Organization
of the United Nations
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INTRODUCTION

The adoption of the Sustainable Development Goals (SDGs) established a vision for the future, which is as transformational as it is ambitious. They represent a determined agenda, intended to address an unprecedented confluence of pressures on human development and the global environment. Perhaps most importantly, the SDGs represent a strategy that is "integrated and indivisible", explicitly recognizing that shifting the course of human history onto a sustainable pathway will require new thinking in how we tackle complex problems which transcend sectors and scale.

This vision for integration is also at the heart of FAO's strategy for sustainable food and agriculture. While the principles of boosting the efficiency of food systems, conserving natural ecosystems, improving livelihoods and well-being, enhancing resilience, and promoting good governance are central to this strategy, it is also recognized that they cannot be achieved in isolation from each another.

The ecosystems which provide the foundation for sustainable agriculture in productive landscapes and seascapes are being degraded, and their integrity disrupted, at unprecedented rates. The global food supply and the livelihoods of the

Main messages

- People, knowingly or not, shape the landscapes they live in.
- Landscapes or territories are characterized by a set of physical, environmental, human, economic, institutional and cultural resources that jointly constitute their assets and potential.
- Working at landscape – or seascape – level allows issues to be addressed in a multifaceted way, integrating domains, involving stakeholders and working at different scales – tackling the underlying causes of degradation and food insecurity and not just the symptoms.
- Production landscapes are multifunctional and provide different goods and services to different stakeholders. Managing ecosystems and socio-economic issues at landscape scale supports the integration of social, economic and environmental objectives.
- Working with stakeholders in the landscape supports building resilience in social-economic and ecological systems and enhances capacity to withstand stresses and shocks, including from the likely future impacts of climate change.
- Ecosystem degradation is both a cause and an effect of poverty and food insecurity. Restoration of healthy and productive landscapes is a key element of rebuilding livelihoods and providing sustainable development opportunities, both in rural and urban/peri-urban areas.
- Farmers, land and water users and other natural resources managers play a central role in shaping and contributing to the health of the rural landscape. Integrated approaches such as agroecology harness biodiversity and ecosystem services, creating synergies to increase productivity and sustainability.
- Many sustainable practices have benefits on and beyond the farm. The transition to these sustainable practices requires additional effort from farmers, pastoralists, fisherfolk and foresters, who need to be supported in this process.
- Different policy, governance, and financing instruments exist which can be utilized to incentivize the transition to sustainable practices within production landscapes.

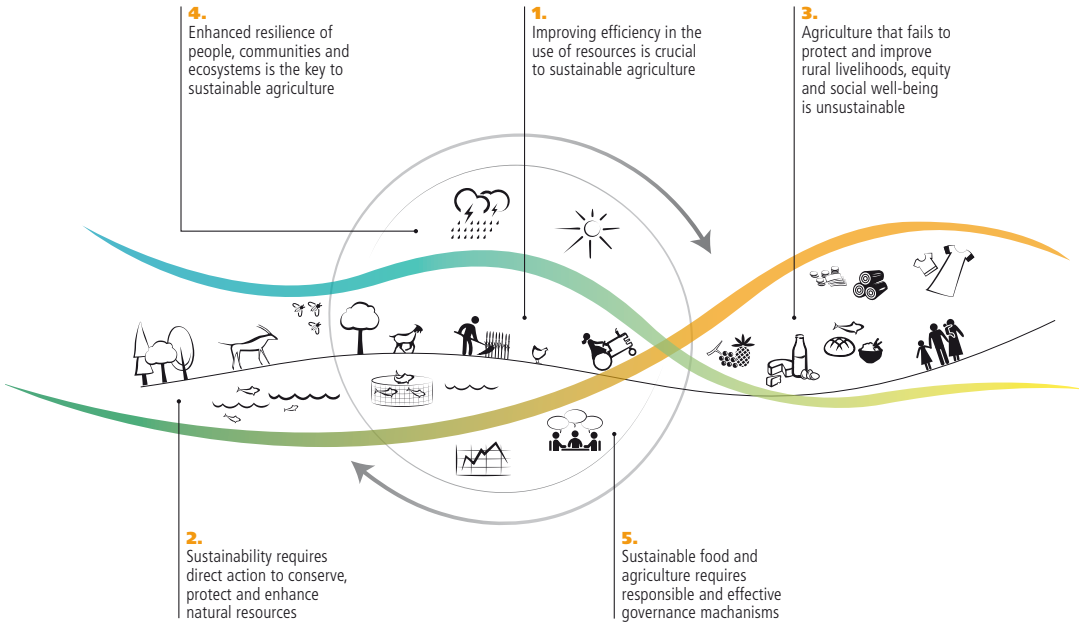

Figure 1. FIVE KEY PRINCIPLES FOR SUSTAINABLE FOOD AND AGRICULTURE (FAO, 2014).

people managing these landscapes will depend, among other aspects, on our ability to strengthen the resilience of these systems, restore degraded lands, stabilize watersheds, maintain soil quality, improve ocean health, and manage freshwater habitats and coastal areas.

Landscape and territorial approaches that focus on people and their aspirations are among the most effective ways to address development needs while restoring and protecting natural resources. The rationale for applying integrated approaches at landscape scale is three-fold: landscapes offer a platform that is comprehensive in scope across sectors and domains, addressing issues at their appropriate scale, thereby improving the likelihood of project success and sustainable outcomes.

They help in addressing and negotiating externalities occurring well beyond traditional interventions at farm and community level. Finally, these approaches contribute towards building resilience in social-ecological systems enhancing their capacity to withstand stresses and shocks, including from the likely future impacts of climate change.

Many landscape approaches have been developed to address specific needs. What follows is an overview of the key practices, which FAO has developed that support integrated approaches in production areas. These approaches originate from all parts of the organization, and relate to restoration, marine and coastal

management, reversing land and soil degradation, incentives for ecosystem services, and many other areas which contribute to enhancing the capacity and resilience of productive landscapes. While many of these approaches are not necessarily new, what is unique is that they are all fundamentally people and livelihoods focused. They are centred primarily on addressing the needs of farmers and other resource managers within a broader governance framework, while consistently focused on supporting sustainable food and agricultural systems. ■

INTEGRATION MATTERS

Agriculture, intended in the broad sense as productive systems of crop, livestock, forestry, fisheries and aquaculture – and the resource base upon which it depends – will undergo an unprecedented transition by the end of the century. Between 2013 and 2050, food production must increase by almost 50 percent globally in order to provide sufficient, good quality food for almost 11 billion people. Competition for land, food, energy, infrastructure, and habitation needs will continue to intensify within finite production areas. Yet in many of the most affected regions the natural resource base of soils, water, land, and ecosystems upon which food production depends is under stress, degraded, or already significantly depleted.

In the context of FAO's mission to eradicate hunger, landscape approaches across diverse production and conservation areas have often proved useful for developing and maintaining sustainable agriculture and food systems that reconcile production needs and the ecosystem functions and services that support them at multiple scales.

Landscape approaches are essential to support sustainable food and agriculture and build resilient and productive social-ecological systems. These approaches protect vital ecosystem services and sustain livelihoods, tackling food security challenges while adapting to the likely future impacts of climate change.

Implementing landscape approaches that integrate different sectors and interests is a knowledge-intensive and long-term process requiring the deployment of best practices for crop, livestock, forestry, fisheries and aquaculture. It also requires understanding of the functions of ecosystems, water and nutrient cycles, land management practices, and on the interaction between all these processes.

FAO has developed and field-tested a number of tools that can be deployed at multiple levels. The tools and the case studies presented in this publication illustrate how FAO implements different approaches to support the transition to sustainable agriculture. Improved practices are identified and deployed in FAO field programs such as watershed management, forest and landscape restoration, ecosystem approach to fisheries and aquaculture, agroecology, incentives for ecosystem services, as well as mainstreaming ecosystem services and biodiversity into agriculture production practices and policies.

Integrated approaches are based on the fact that activities and processes that influence the use of natural resources in a specific area are multiple: some local (e.g. rural communities producing food) while others originate far away from where the effects are felt (e.g. use of water upstream, conservation policy).

The rationale for applying integrated approaches and working at a landscape level is that: it is more comprehensive in scope across domains, addressing issues at their specific scale, and thereby improving the likelihood of project success and sustainable outcomes – particularly from negative externalities occurring outside of traditional interventions at community or watershed level. ■

BUILDING RESILIENT ECOSYSTEMS FOR FOOD SECURITY AND LIVELIHOODS

The resilience of agriculture, livestock, forestry and fisheries systems is directly dependent on the quality and function of the ecosystem services upon which they rely. Farmers, pastoralists, fisherfolk and forest dwellers are among the first to suffer from the negative effects of a degrading environment and discontinued ecosystem services such as depleted water resources, loss of habitats and consequent lack of services such as pollination, soil health, primary productivity, resilience to changes and to pests and diseases.

FAO has also focused much of its work on the interlinkages between biodiversity, ecosystem services and food and agriculture and experience has shown that:

- Practices such as forest restoration and sustainable forest management support air and water purification, carbon sequestration and storage;
- Sustainably managed agricultural lands, forests and watercourses reduce risks and damage from floods, storms, tsunamis, avalanches, landslides and droughts;
- Sustainable land management practices and properly managed permanent

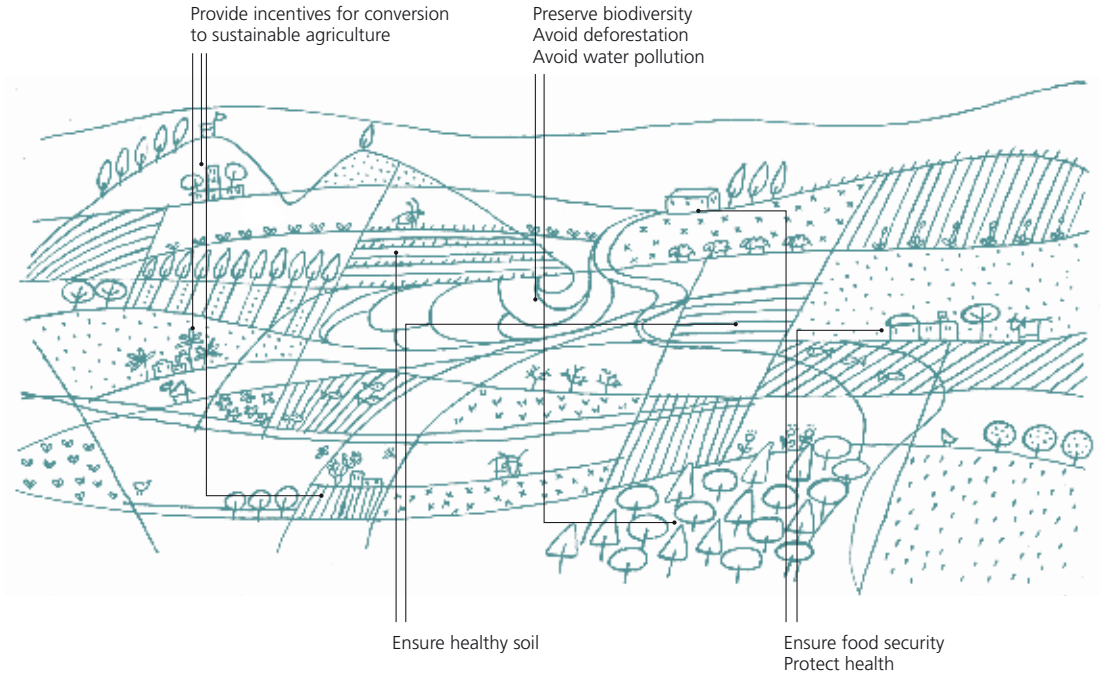

Figure 2. SOME EXAMPLES OF THE DIVERSE MANAGEMENT NEEDS AND OBJECTIVES IN A LANDSCAPE.

vegetation cover which promote nitrogen fixation processes strongly contribute to combating soil erosion and maintaining soil health and fertility;

- Sustainable livestock browsing and grazing support balanced ecological mosaics, ecosystem diversity, nutrient cycling, and the dispersal of seeds, also supporting resilience, primary productivity, and protection from pest and disease among other things;
- Integration of fisheries practices in irrigation and other water systems supports good management of watercourses and water bodies, primary productivity in freshwater ecosystems, protection from waterborne pest and disease, nutrient cycling and water purification.

Negative interactions at the landscape level such as deforestation, land degradation and impact of floods and landslides can affect productivity and lead to reduced livelihoods. However, it is possible to support positive interactions such as sound land cultivation practices on slopes that prevent soil erosion.

Another example of improving the benefits from ecosystems in production systems is that of integrated fish production and irrigation systems. Virtually any water body will harbour a variety of fish, amphibians, crustaceans, molluscs and insects, many of which are consumed as food by local people. Rice and fish have

been dietary staples for many of the world's people for millennia. The ability of aquatic species to colonize inundated freshwater areas, even seasonal ones, is impressive, particularly in Asia, and the benefits from integrated management approaches to ecosystems and people are extraordinary.

Effectively integrating the benefits of ecosystem services in planning improved agriculture, livestock, forestry and fisheries requires careful understanding of the ecological context, the existing socio-economic conditions, the governance systems and locally available planning instruments. There are no blueprint approaches or silver bullets that would work everywhere.

AGROECOLOGY

FAO's framework on agroecology provides ways to benefit from ecosystems services and improve resilience and sustainability of production systems in the landscape. It builds upon the Save and Grow and the Sustainable Food and Agriculture frameworks (FAO, 2011 and 2014), and recognizes ten elements derived from the literature and multi-stakeholder dialogues on agroecology. The ten elements of agroecology are: efficiency, diversity, synergies, balance/regulation, recycling, co-creation of knowledge, human and social value, circular economy, culture and food traditions, land and natural resources governance. These ten elements cut across the environmental, social and economic dimensions of sustainability, as outlined by FAO's common vision for Sustainable Food and Agriculture, and take full advantage of the interlinkages between sectors and the ecosystems.

FAO WEB-BASED TOOLS SUPPORTING LANDSCAPE MANAGEMENT

Sustainable Forest Management toolbox – a web platform collating a large number of tools, case studies and other resources, to support the work of forest owners, managers and other stakeholders for the implementation of sustainable forest management. http://www.fao.org/sustainable-forest-management/toolbox/sfm-home/en/

Agroecology Knowledge Hub – a web-based portal containing scientific information, best practices and policy information related to the role of agroecology in diversifying agricultural systems and landscapes, building resilience to climate change, increasing soil health and fertility and optimizing maintenance and use of biodiversity in agricultural systems. Additionally, an AgroecologyLex was developed to gather related policies and legislation. http://www.fao.org/agroecology/en/

Ecosystem Approach to Fisheries Toolbox – an instrument designed to guide users through each of the four main management-planning steps and activities of the ecosystem approach to fisheries. The toolbox also supports decisions on the most appropriate tool(s) for each step given the type of fishery, their resources and capacity. http://www.fao.org/fishery/eaf-net/toolbox/en

Pastoralists Knowledge Hub – a community of practitioners, policy makers, experts and scientists sharing knowledge, ideas and innovative thinking on livestock management and relative ecosystem services. http://www.fao.org/pastoralist-knowledge-hub/en/

Technologies and practices for small agricultural producers TECA – a web platform collecting practical information on agricultural technologies and practices to support the work of small producers in the field. The platform can also help interaction with people or groups with similar interests to discuss sustainable solutions, technologies and practices in crop production, forestry, livestock, fisheries, marketing etc. TECA technologies are tested and/or adopted by small producers, are easy to replicate, and are expected to increase production in a sustainable way. http://teca.fao.org/

Knowledge Tank for agriculture sectors' adaptation to climate change – a FAO–UNDP web-based initiative presenting key tools and knowledge resources to stakeholders working in areas of climate change adaptation, resilience and disaster risk reduction in agriculture sectors (including forestry and fisheries). http://www.fao.org/in-action/naps/knowledge-tank/en/

Handbook for participatory socio-economic evaluation of pollinator-friendly practices. The handbook is designed for farmers, forest dwellers, and other agroecosystem managers to distinguish, evaluate, appreciate and demonstrate the positive impact of pollinator-enhancing practices on their livelihoods. http://www.fao.org/3/a-i2442e/i2442e00.pdf

Guidelines for the economic valuation of pollination services at a national scale. The tool offers an economic valuation of insect pollinators at a national or larger scale following both a technical approach and an economic and social assessment. http://www.fao.org/3/a-at523e.pdf

FAO APPROACHES TO LANDSCAPE MANAGEMENT

Landscape approaches systematically consider the situations, needs and objectives of the multiple sectors and diverse stakeholders in an integrated way. For this reason, they can be used to optimize land use and management practices to contribute to local, subnational and national goals and thereby to help achieve multiple Sustainable Development Goals. Landscape approaches inherently focus on upscaling and therefore facilitate the targeting and homogenization of policies and achievement of the required results.

FAO has developed extensive experience in implementing landscape approaches in land, aquatic and marine environments in support to farmers, pastors, fisherfolk and foresters addressing diverse issues occurring in the same area. These approaches are considered key instruments to develop synergies between different sectors, addressing diverse drivers of change and including multiple ecosystem services and their users.

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FAO IN ACTION
Watershed management in Morocco

FAO supported the Kingdom of Morocco's High Commission for Water, Forests and Desertification Control to combat desertification and poverty through watershed management in degraded forest landscapes under arid and semi-arid conditions. Multi-stakeholder collaboration and dialogue between actors, institutions, sectors and scales were actively promoted resulting in the joint formulation and validation of a collaborative watershed management plan for the Oued Outat watershed, an area of 18 000 ha located in the Province of Midelt in the Middle Atlas.

The agreed plan includes actions to rehabilitate degraded areas, to promote more sustainable practices for forest, rangeland, agricultural and livestock production and management, to improve local infrastructure, to develop capacities and to diversify existing production systems for enhanced generation of employment and income from natural resources, mainly honey and medicinal plants, and handicraft production. Pilot activities under these components have been implemented, facilitating the adoption of improved natural resource management techniques (reforestation and rehabilitation of degraded forest and rangeland areas, construction of small dams to control water flow, gully treatment, soil and water conservation, water collection) among the 5 000 inhabitants of the watershed. Practices were identified, field-tested and validated in a participatory action–research process facilitated by FAO, combining traditional knowledge and scientific advice and fostering mutual learning and understanding. Joint field visits were organized where local actors met and discussed with technical staff from line-agencies (e.g. forest, water, agriculture, environment, and hydraulics) to agree on priority interventions.

A broad range of government institutions and other partners at the national, provincial and communal level (e.g. the Ministry of Agriculture and Marine Fishery, the Interior Ministry, the Social Development Agency, and the Moulouya Hydraulic Basin Agency) were involved in the process and played an essential role in terms of technical and financial support to local stakeholders and implementation of small/medium civil works and infrastructures. The capacities of seven women's associations were strengthened to improve the production and marketing of small-scale livestock breeding and local handicrafts.

The existing methods, techniques and tools are being further adjusted and refined to make them more efficient, applicable in less time and less costly to allow for internalization of the approach in the policies and strategies of the High Commission. The good practices and the management model is being expanded and scaled up with financial resources from Switzerland. The watershed management plan for the Oued Outat is being implemented combining Swiss funding with national co-funding from all the implementation partners.

WATERSHED MANAGEMENT

Watershed management is one of the more traditional and recognized landscape approaches utilised throughout the world. This approach has a long history of addressing complex problems and providing solutions to support integration and collaboration across sectors, scales and actors, balance competing needs to generate simultaneous benefits for people and environment. It follows the principles of common concern entry points, multiple scales, multifunctionality and multi-stakeholders.

FAO defines a watershed as the geographical area drained by a watercourse, and watershed management as any human action aimed at ensuring the sustainable use of watershed resources. Watershed management is predominantly relevant for upland areas, where smallholder agriculture, forestry and animal husbandry are the prevailing land use systems and where human action has an impact, positive or negative, on downstream areas.

Watersheds follow the principle of multifunctionality and provide a wide range of ecosystem services and goods, such as freshwater, timber, food, fibre and medicinal plants. They are often interrelated with mountain areas and have a high share of terrestrial biodiversity, store water, carbon and minerals, support nutrient cycling, and regulate water flows, climate and fresh air. However, watersheds and mountains often present fragile ecosystems, highly susceptible to erosion, landslides and other natural hazards, which make them a priority area for strengthening resilience to change.

FAO's work in watershed management stems from the experience accumulated over several decades, and is largely based on the following key principles:

- Treat underlying causes (not just symptoms).
- Generate scientific evidence (do not rely on common myths).
- Adopt an integrated approach (multi-sector, multi-stakeholder and multi-scale).
- Ensure holistic planning and implementation (watershed management plan).
- Seek innovative low-cost solutions and co-financing.
- Ensure that institutional arrangements are in place.
- Combine bottom-up and top-down processes.
- Combine traditional knowledge and technical advice through action research.
- Reflect upstream–downstream linkages and compensate off-site effects.
- Strive for gender balance in decision-making.
- Include capacity development at all levels.
- Instil a flexible, adaptive long-term approach to planning and financing.

Strong evidence from field experience is needed to continuously influence policy dialogue, update decision-making and investment priorities at the national level. However, incorporation and institutionalization of successfully tested practices, approaches and collaboration models in national policies, strategies and programmes and adoption of a countrywide watershed investment framework to achieve transformational change in the longer run is largely the responsibility of government authorities.

CLIMATE-SMART AGRICULTURE (CSA)

Climate-smart Agriculture (CSA) pursues the triple objectives of increasing productivity and incomes, enhancing resilience of livelihoods and ecosystem services and reducing and removing greenhouse gas emissions from the atmosphere. CSA involves actions both on-farm and beyond the farm that incorporate technologies, policies, institutions and investment.

CSA develops effective adaptation options, including estimates of the potential reduction in greenhouse gas emissions (or increased carbon sequestration) and costs and barriers to the adoption of such options. CSA supports the development of required policy and institutional processes, strengthening local institutions and empowering farmers.

See the new climate-smart agriculture sourcebook at http://www.fao.org/climate-smart-agriculture-sourcebook/en/

SYSTEM FOR EARTH OBSERVATION DATA ACCESS, PROCESSING AND ANALYSIS FOR LAND MONITORING – SEPAL

SEPAL is a cloud-based computing platform introduced by FAO for fast access and processing of remotely sensed data sources designed to assist national land surface monitoring and reporting for Reducing Emissions from Deforestation and Forest Degradation, Forest Conservation, Sustainable Management of Forests and Enhancement of Carbon Stocks in Developing Countries (REDD+) mechanism. The SEPAL platform can track changes in land use over time and be used to support decision-making processes on best land use practices and strategies at local level. It can further support countries to establish and maintain an autonomous national satellite land monitoring system capable of producing the information required to make consequential decisions about land management; decisions that promote sustainability and can potentially mitigate the effects of global climate change on society.

The SEPAL platform is available at https://sepal.io/

OPEN FORIS

Open FORIS is an FAO-led initiative to develop, share and support specialized software tools required by countries and institutions to implement multi-purpose forest inventories. It is a set of free, open-source software tools that facilitate flexible and efficient data collection, analysis and reporting. These tools are used to support countries in gathering, producing and disseminating reliable information on the state of forest resources that is vital for decisions on land use and ecosystem management. Open FORIS addresses cross-cutting needs through a set of highly flexible, easy-to-use software tools. Through FAO's global network of partners and experts, tools are designed, tested, applied and improved to ensure they are relevant and provide real value to beneficiaries.

The Open FORIS set of tools is available at http://www.openforis.org/

TERRITORIAL DEVELOPMENT

The specificity of the territorial development approach is to have economic and social aspects as entry points to address inequalities and other issues affecting food security and livelihoods. It recognizes that social and geographic inequalities exist because the socio-economic and policy dynamics of cities, regions, and countries are different from each other and often unique to a particular geographic area. In some cases, the variety of economic, political and social situations in different geographical areas is not systematically taken into account in food security and poverty reduction policymaking, resulting in a disjunction between decision-making at the central level and implementation at the local level, as well as between the anticipated and actual outcomes of strategies and policies.

The territorial approach proposes a framework that recognizes that each locality or territory has a set of physical, environmental, human, financial, institutional and cultural resources that jointly constitute its asset endowment and development potential. Because each geographic area is unique, the outcome of a policy implemented in one area will not be the same as the outcome in another area, in terms of both the direction (positive or negative) and magnitude of the impact. For example, if a government decides to expand its social protection policy on child undernutrition to a new district, the outcome of the policy will depend on a number of factors, such as the infrastructure (roads, clinics, schools, etc.) and services (access to water, etc.) present in that area.

For development strategies to be effective in achieving food security, nutrition and rural poverty reduction objectives under a territorial approach, five prerequisites, must be considered, namely: institutions and multi-level governance, information, inclusion, innovation and investment.

Key constraints identified to the implementation of territorial approaches are:

- Sectoral interventions to address food security and nutrition still predominate. As a result, opportunities for promoting off-farm income and employment beyond agriculture in rural areas are often underexploited.
- Important dimensions of food security such as health and nutrition are usually addressed through social policies and interventions, which are disconnected from economic development policies. As a consequence, the economic development impact of social policies is weakened by their failing to exploit synergies with the growth agenda.
- Inadequate availability of sub-national data. Regional and local statistics and indicators are generally poorly developed and in some cases absent altogether, which undermines the possibility of developing territorial monitoring systems and evidence-based policies.
- The territorial approach is not always fully understood at the decentralized level. In some cases, it is confused with the issue of "regionalization" of

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FAO IN ACTION

Improving governance of collective lands in semi-arid pastoral systems in Southwest Angola (RETESA)

In semi-arid southwest Angola, the capacity of ecosystems to provide valuable services is under great pressure due to changes in managing common natural resources (mostly pastures and water), as well as from the effects of climate change, causing land degradation. The poor conditions of the land are also associated with the loss of traditional practices of pasture management, including the lack of strong and functional customary institutions. In addition, the increase in human and animal population intensifies the pressure on communal pastures, thus provoking conflicts between farmers and herders.

The project aims at strengthening capacities at different levels, from local to provincial, to prevent and reverse land degradation in the region, and cope with climate change. The objective is to contribute to the design and implementation of territorial development plans negotiated and agreed between the different actors for an integrated management of natural resources combining the peasant and pastoral sectors.

In line with the approaches used for Integrated Landscape Management, the project promoted a multi-stakeholder dialogue on resource management opportunities through local adaptation of the Green Negotiated Territorial Development (GreeNTD) approach: a multidisciplinary and multilayers approach combining a set of well-established participatory tools.

Six territorial development plans supporting the restoration of the multifunctionality of the area and its ecosystems have been implemented. These cover different levels (from local to regional) and different purposes (e.g. enhancing management practices of smallholder agro-pastoralists, prevention/resolution of conflicts, managing the transhumance route). The plans were negotiated also through the recovery of traditional decision-making spaces such as the traditional "Jango Pastoril" which has been rehabilitated after a long period of being neglected and with the support of information collected through tools such as the Land Degradation Assessment in Dryland Areas (LADA).

sectoral policies. In other cases, it is confused with local development without considering the key role of the multi-level governance component of territorial policies and processes. As a result, capacity development programmes are necessary to raise awareness and planning capacity.

SUSTAINABLE LAND MANAGEMENT

Sustainable land management (SLM) includes a range of complementary measures that are adapted to the biophysical and socio-economic context for the protection, conservation and sustainable use of resources (soil, water, biodiversity). Promising SLM options are available to sustain the productive utilization of different land use types within the landscape.

The interaction between land components, within any given landscape, and the influence of climate and human activities determine the productivity and sustainability of the land use system. Selecting proper land-use types and implementing sustainable land management practices (favourable human activities) will enhance sustainability and efficient use of resources. Land resources planning tools and approaches help the decision makers and land users to choose an appropriate land use and to adopt SLM practices that support landscape management.

FARMER FIELD SCHOOL (FFS)

Farmer Field Schools (FFS) is a participatory process designed to support farmers, pastoralists, foresters and fisherfolk to identify and apply improved or better-adapted techniques in the field. The process is based on a season-long, field-based platform for a group of farmers that tests and compares local practices with integrated practices developed elsewhere and adapts new ideas to the local context.

Experimental plots are set up in each FFS, and agro-ecosystem analysis is conducted regularly by the participants to assess and critically analyze all different elements in the field and to debate on the optimal decision for that moment in time. Participatory processes and continuous interaction with the community ensures that activities reflect local priorities and opportunities. The FFS also aims to strengthen group cohesion by ensuring effective participation of all in the process of learning, and by including group dynamics activities. Towards the end of the FFS, the group will have gained technical skills, and will have created a basis for further collaboration and action to continue to improve production at individual and community level.

The FFS approach has expanded since its start in Asia to many regions and ecosystems covering a growing number of commodities and topics of interest for local communities, from farmers to agro-pastoralists. It has proven to be extremely effective in integrated projects, with different stakeholders and complex multidisciplinary elements involved.

THE WOCAT-LADA-DESIRE TOOL FOR MAPPING LAND DEGRADATION AND SUSTAINABLE LAND MANAGEMENT

This tool is based on a Questionnaire for Mapping Land Degradation and Sustainable Land Management to streamline methods to map and document land degradation and land improvement at a national scale. The tool allows visualization of the distribution and characteristics of land degradation and conservation, SLM activities for a district, a province, a country, a region, or ultimately worldwide. The final output are maps of land degradation status, causes and impacts, and conversely the conservation status and impacts for major land use systems in the area.

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FAO IN ACTION

Transboundary Agro-ecosystem Management Project for the Kagera River Basin (Kagera TAMP)

This GEF-funded project adopted an integrated ecosystems approach for the management of resources in the landscape and generate local, national and global benefits such as restoration of degraded lands, carbon sequestration and climate change adaptation and mitigation, protection of international waters, agrobiodiversity conservation and sustainable use and improved agricultural production, and leading to increased food security and improved rural livelihoods.

Charcoal exploitation and resulting deforestation by the rural population and from expanding urban areas due to the lack of alternative fuels is a massive challenge in the Kagera Basin as throughout sub-Saharan Africa. Population growth and dependence on natural resources for rural livelihoods also lead to increasing land fragmentation, overexploitation and conflict over resources. Such conflict over land resources involved pastoralists and subsistence farmers. Exclusion of pastoralists from more productive grazing land resulted from expansion of cropping and tree planting and irrigation in valley bottoms, leading to stronger demand over increasingly scarce water and fuel resources. When land becomes unproductive, people – especially youth – are often pushed into internal or cross-border migration.

The project involved actors at all levels to adopt improved practices for the management of soil, water, vegetation and the diverse ecosystems based on a suitable institutional and policy framework. It promoted i) enhanced regional collaboration, information sharing and monitoring; ii) enabled policy, planning and legislative conditions; iii) increased stakeholder capacity and knowledge at all levels for promoting integrated agro-ecosystems management; iv) adopted improved land use systems and management practices generating improved livelihoods and environmental services.

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FAO IN ACTION

Enhancement of disaster risk reduction and management capacities and mainstreaming climate change adaptation practices into the agricultural sector in the Western Balkans

Reducing the impact of natural hazards on the agriculture sector, in particular floods, landslides and droughts, in the Western Balkans is crucial given the expected increase in the frequency and severity of extreme weather events due to climate change. The agriculture sector is highly climate sensitive and people highly dependent on the sector and its services for their livelihoods are highly vulnerable. Significant deforestation and land degradation has occurred throughout the Western Balkans region, which has resulted in substantial soil erosion due also to the mountainous terrain, in combination with heavy rainfall and floods.

A climate change adaptation integrated approach at the landscape level is considered when identifying good practices and technologies for disaster risk reduction in agriculture. So, besides the ability to reduce the adverse impacts of natural hazards and climate change, increased productivity and incomes and to enhance carbon sequestration and storage are also considered, such as promoting agro-forestry, mulching and afforestation that likewise contribute to climate change mitigation.

The good practice and technology options for disaster risk reduction in agriculture have been identified through literature reviews, local experts and stakeholder consultations and are being tested along one cropping cycle as well as through one-off training sessions for the demonstration of relevant equipment, in some cases (Serbia) with the support of Farmer Field Schools (FFS).

In Serbia, the use of subsoiler to reduce the impact of floods and droughts, the application of lime to enhance drought tolerance and increase soil fertility and soil health, crop rotation and intercropping to increase crop diversification, pest control and management are some of the disaster risk reduction practices and technologies that are currently being tested.

FOREST AND LANDSCAPE RESTORATION

Restoration activities play a key role in maintaining biodiversity in agricultural landscapes, enhancing carbon sequestration in biomass and soils and contributing to climate change adaptation through increased resilience.

FAO's Forest and Landscape Restoration Mechanism (FLR Mechanism) supports countries to coordinate and facilitate the development and implementation of projects, programmes and related activities in order to significantly contribute scaling-up, monitoring and reporting on FLR activities to a level needed to meet the Bonn Challenge, CBD Aichi Biodiversity Targets, in particular the Aichi Biodiversity Target 15, and the Land Degradation Neutrality Targets.

The programmes established under the FLR contribute to improved resilience, productivity and socio-economic value from restored forests and landscapes, benefiting human well-being, local livelihoods and the environment.

The FLR Mechanism primarily supports countries in the implementation of activities focusing on:

- governance, institutional support and enabling environment of FLR;
- facilitating the access of national institutions to sustainable financing for FLR (public, private and/or climate financing instruments such as the Green Climate Fund) and;
- pilot actions focused on the implementation of innovative models, potentially replicable in other regions within each selected country, and implemented in synergy with other existing FAO projects and/or in partnership with other Global Partnership on Forest and Landscape Restoration (GPFLR) members.

THE MOUNTAIN PARTNERSHIP: MULTI-STAKEHOLDERS PLATFORM FOR THE PROTECTION OF MOUNTAIN ECOSYSTEMS

FAO hosts the Mountain Secretariat (MPS), a UN voluntary alliance of over 300 governments, subnational authorities, intergovernmental organizations and major groups (e.g. civil society, NGOs and the private sector) working together to protect mountain environments and improve the lives of local communities. Launched in 2002, the Mountain Partnership addresses the challenges facing mountain regions by tapping the wealth and diversity of resources, knowledge, information and expertise, from and between its members, in order to stimulate concrete initiatives at all levels that will ensure improved quality of life and environments in the world's mountain regions. To protect mountain ecosystems and ensure their ability to provide essential ecosystem services for highland and lowland communities, the Mountain Partnership unites partners, promoting action at international, national and local levels. An example of this was the advocacy campaign conducted by the Mountain Partnership Secretariat (MPS), alongside numerous Mountain Partnership members, to ensure the inclusion of mountains in the Sustainable Development Goals (SDGs). The MPS also worked together with FAO to develop one of the official indicators for measuring progress towards target 15.4. Indicator 15.4.2, the Mountain Green Cover Index.

Mountain Partnership website: www.fao.org/mountain-partnership/en/

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FAO IN ACTION

Restoring degraded lands to productive ecosystems enhancing farmer's nutrition and income – A local landscape approach in Southeastern Petén, Guatemala

FAO and partners supported the country's commitment to restore 1.2 million hectares of degraded lands by 2020. Through its Forest and Landscape Restoration Mechanism (FLRM), FAO aims to regain the functionality of degraded ecosystems not only through forest-based restoration options but also improving local livelihoods by enhancing crop diversity, food production and the creation of value chains for the rural community.

FLRM is using locally developed agroforestry systems as a tool to restore degraded areas. These systems combine local tree species with an understory of shrubs and crops. A particularly promising system uses the indigenous tree "ramón" (*Brosimum alicastrum*) together with the N-fixing trees *Leucaena leucocephala* and *Gliricidia sepium*. It also includes a variety of indigenous species for nutritious foods such as maize, "chaya" (*Cnidoscolus chayamansa*), cassava, "macal" (*Xanthosoma sagittifolium*) and banana. By imitating the structure of a forest and providing a major source of food the system creates a habitat for wild animals. Through the restoration activities the pollinator's population have recovered due to the higher diversity of insects – for instance, cassava plants support, among several other species, Melipona bees and bumblebees.

Cultural values form part of the sustainable land management in Petén. The agroforestry practices include traditional knowledge of the Maya Q´qchi culture. The ramón tree is considered a holy tree in the Maya culture and is an important component in local communities' traditions.

Step by step this local initiative shows how to convert unfertile land into a productive environment for food production, while developing a functioning ecosystem, and value chains for local communities.

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FAO IN ACTION

Cross-sectoral taskforce for agriculture and natural resources in Rwanda

In order to meet Rwanda's commitment for "border-to-border" restoration on 2 million hectares of land, in the context of the Bonn Challenge in 2011, an assessment has been carried out to identify and map areas and landscapes with the most urgent restoration needs. Through this process, more than one million hectares of land have been identified as suitable for agroforestry in Rwanda. Different kinds of agroecological practices on all types of cultivated and pasture areas at the landscape level will be central to Rwanda's national restoration strategy, enhancing a number of ecosystem services such as resilience to climate change, soil fertility, erosion control, water quality and availability, and on-farm productivity.

FAO played an instrumental role to the setting up of a multistakeholders taskforce on agriculture and natural resources that focuses mostly on upscaling approaches that will improve agricultural productivity while restoring degraded landscapes and ensure delivery of ecosystem services throughout the country, with a particular interest on agroforestry. The programme also aims at establishing connections across agriculture and natural resources institutions at central (policy) and district level and on the ground, to catalyze coordination across key stakeholders at the landscape level from both sectors, strengthen their capacities, and help them to leverage finance to support wide-scale restoration efforts locally and at national level.

The taskforce will also contribute to embed landscape approaches and the main principles outlined in the agroforestry strategy in the Forest Investment Program and Pilot Program on Climate Resilience, now under development with the support of World Bank and African Development Bank that represent major potential vehicles for wide-scale implementation of a landscape management and activities supporting restoration.

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FAO IN ACTION

Sustainable financing for Forest and Landscape restoration – National Forestry Fund in Lebanon

In recognition of the significant value of Lebanon's forests and in response to the persistent threats they face, the Government of Lebanon has committed to a range of strategic objectives to protect them and further harness opportunities provided by the forest sector. Two programs specifically guiding these efforts are the National Forest Program (2015-2019) and the 40 million Trees Program (40-MTP). An approach that integrates interests and actors at landscape level was developed in order to bring stakeholders together but also to effectively mobilize the funds to implement the program. This approach will also bring to scale multiple benefits – both environmental and socio-economic – of landscape restoration and reforestation and create a durable impact on the ground.

To support achieving the objectives of these two programs and increase the forest cover from 13 to 20 percent by 2030, efforts to establish an efficient and effective national institutional mechanism in the form of a Lebanese National Forestry Fund (NFF) are ongoing. This initiative will be endowed with multiple sources of funding, including from national budgets, Official Development Assistance and dedicated multi- or bilateral funding streams to pursue identified forest-related activities. In line with the objectives of the NFP and 40-MTP, five priority areas are recommended for NFF investments: nurseries, planting, maintenance, R&D and forest services.

In terms of utilization, funding from the Lebanese NFF will be accessible to a broad range of beneficiaries: the State, municipalities, the private sector, NGOs and academia. The governance of the Fund endeavours to involve all key stakeholder categories, thus aiming to better integrate various current and future initiatives under a coherent framework. Another unique feature of the Lebanese NFF, with regard to capitalization is its potential to receive funding from the private sector through specific mechanisms.

Finally, the activities implemented through the Fund are long term, spanning over a period of 15 years, and will be central to ensure restoration of degraded landscapes at scale, as well as for the implementation of ILM throughout the country.

LIVESTOCK ENVIRONMENTAL ASSESSMENT AND PERFORMANCE (LEAP) PARTNERSHIP

FAO hosts the Secretariat of the multi-stakeholder Livestock Environmental Assessment and Performance (LEAP) Partnership, a group of international experts with various backgrounds (ecology, life cycle assessment, livestock production systems) who share views and develop principles for the assessment of livestock impact on biodiversity. These principles are relevant to a variety of stakeholders and their objective is to guarantee a minimum level of soundness, transparency, scientific relevance and completeness in livestock supply chain assessments. The methodologies produced by LEAP provide principles for the quantitative assessment of biodiversity and the development of evidence-based practices and policies, they also identify possible synergies between biodiversity conservation, productivity gains and other environmental benefits.

Learn more on the LEAP at http://www.fao.org/partnerships/leap/en/

THE ECOSYSTEM APPROACH TO FISHERIES AND AQUACULTURE

These approaches are holistic strategies for managing capture fisheries and aquaculture that integrate their ecological, socio-economic and institutional dimensions and facilitate sustainable use of natural resources and integration with other sectors. The EAF and EAA implement a landscape approach, characterized by addressing food security and livelihoods in an integrated way across sectors and involving all stakeholders in freshwater, coastal and marine ecosystems. They also enhance adoption and implementation of the FAO Code of Conduct for Responsible Fisheries (CCRF).

The EAF process takes into account the interactions between fisheries and ecosystems, and the fact that both are affected by natural long-term variability as well as by other, non-fishery uses. Most importantly, the approach aims to ensure that future generations will benefit from the full range of goods and services that ecosystems can provide by dealing with issues in a much more holistic way, rather than by focusing on only certain target species or species groups, as has often been the case until now.

The main objective of EAF and EAA is to address sustainability issues at ground level by involving stakeholder participation, creating ownership and facilitating behavior changes of coastal communities, private sector and governments through improved understanding of ecosystems carrying capacity (including social elements) and the need to balance the socio-economic, the environmental and the governance objectives in the planning and management of aquatic resources.

FAO has developed an EAF toolbox to guide users through the main EAF management planning steps and activities using simplified text and clear instructions.

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FAO IN ACTION

Integrated Management of Lagoon Activities (IMOLA) in Thua Thien Hue (Viet Nam)

In Viet Nam's Thua Thien Hue Lagoon, general environmental degradation has been widespread since the nineties, as a consequence of rapid and unregulated development of aquaculture. Such practice resulted in a depletion of the fish stock, decrease in aquatic biodiversity and productivity, loss of income opportunities, shortage of protein supply, and food insecurity.

In the early 2000s, the FAO IMOLA project implemented field studies, Geographic Information Systems analysis and carried out a broad stakeholder consultation with the affected communities. As a result, conservation areas were established and assigned to locally created fisherfolk associations for management, control and monitoring.

Farmers received advanced aquaculture training and pilot models, including integrated fish and fish/shrimp polyculture, clam farming, frog and eel culture, were implemented as part of the training.

The dissemination of improved fisheries, afforestation and other landscape management practices, along with the full involvement of fisherfolk and local institutions, promoted the recovery of aquatic ecosystems and increased production.

The newly created fishery associations were mandated by law to apply environmental and resource management, in partnership with local authorities, which contributed to the long-term success of the project.

In 2017, about ten years after the project commenced, the number of protected areas established and co-managed by local fishery associations increased from 10 to 25. Awareness of the benefits received by the lagoon communities is also steadily improving.

The afforestation of Ru Cha wetland forest pioneered by the IMOLA and its newly planted expansion is now a protected area and is a tourist attraction with pathways, a worship heritage station and an observatory.

Fisheries associations are continuing the co-management of the lagoon water surface and resources which ensured sustainable fisheries operations over the years.

The area-based management system introduced by the IMOLA project is still followed as the conceptual basis for fisheries resource management and still operates effectively.

AQUACULTURE ZONING, SITE SELECTION AND AREA MANAGEMENT UNDER THE ECOSYSTEM APPROACH TO AQUACULTURE (EAA)

Aquaculture is one of the fastest growing food production activities in the world. FAO's Ecosystem Approach to Aquaculture (EAA) further develops the concept of sustainability in aquaculture planning and management into a strategy that supports the integration of aquaculture into the wider landscape with respect to its multifunctionality and the needs of other stakeholders. Spatial planning for aquaculture zoning, site selection and area management are essential elements to any sustainable aquaculture programme. It considers the social, economic, environmental and governance objectives in light of supporting sustainable development. The EAA offers an appropriate framework to develop management plans for aquaculture management areas (AMAs) that go beyond individual farms.

The appropriate allocation of zones to aquaculture by national or local governments with important stakeholder participation, fed by relevant information and supported by relevant regulations supports avoidance of disease spreading and spillage of environmental pollution through over concentrated development facilitates, it further supports its integration into the landscape where other uses, including ecosystem conservation, may also be present.

The aquaculture zoning tool is available at http://www.fao.org/3/a-i5004e.pdf

INTEGRATED CROP–FISH IN IRRIGATION SYSTEMS

In recognition of the increasingly diverse and extended demands for water from irrigation systems, new ideas on integrated approaches and multiple-user types to conventional thinking on irrigation management are being developed. Despite historical precedents and efforts, the potential for the integration of fish production (capture fisheries and aquaculture), into irrigation systems has yet to be fully met, and a more continuous learning and adaptation process would need to be established. These underutilised opportunities for integration could significantly increase local food security, incomes and livelihood diversity. The development of fisheries in irrigation schemes is a particularly attractive option in situations where it offers additional production at low or no additional water service cost.

To re-examine this potential, the concept of the Extended Command Area (ECA) expands the conventional definition of an agriculture irrigation command area. The reason for this expanded definition is that all elements of an irrigation system, from upstream dam storage to downstream drainage areas, offer opportunities for increasing fish production. The ECA includes irrigation canals, trap ponds, field crop areas, wetlands, seepage areas and is also extended downstream to include delta and coastal areas that may support important capture fisheries or sites for aquaculture and that can be influenced, (positively or negatively) by upstream irrigation scheme operation and management. Many of these opportunities for fish production may be realized at little or no cost to the main irrigated crop and are a supplement to that crop. In an idealized landscape, different sources of irrigation water can coexist (dam water, river water and tubewell water) and all have some potential to support fisheries-based livelihoods.

It should be recognized that conventional approaches to fisheries management, that focus on fish stocks in isolation, are unlikely to prove successful

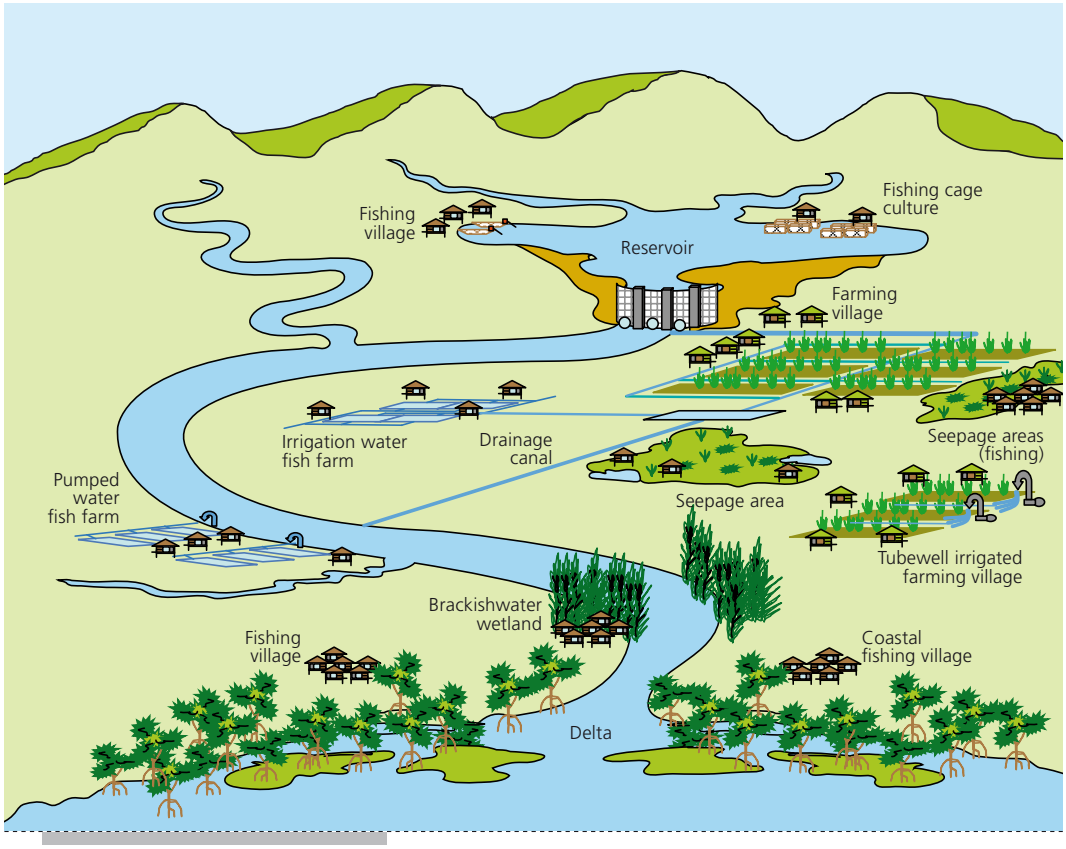
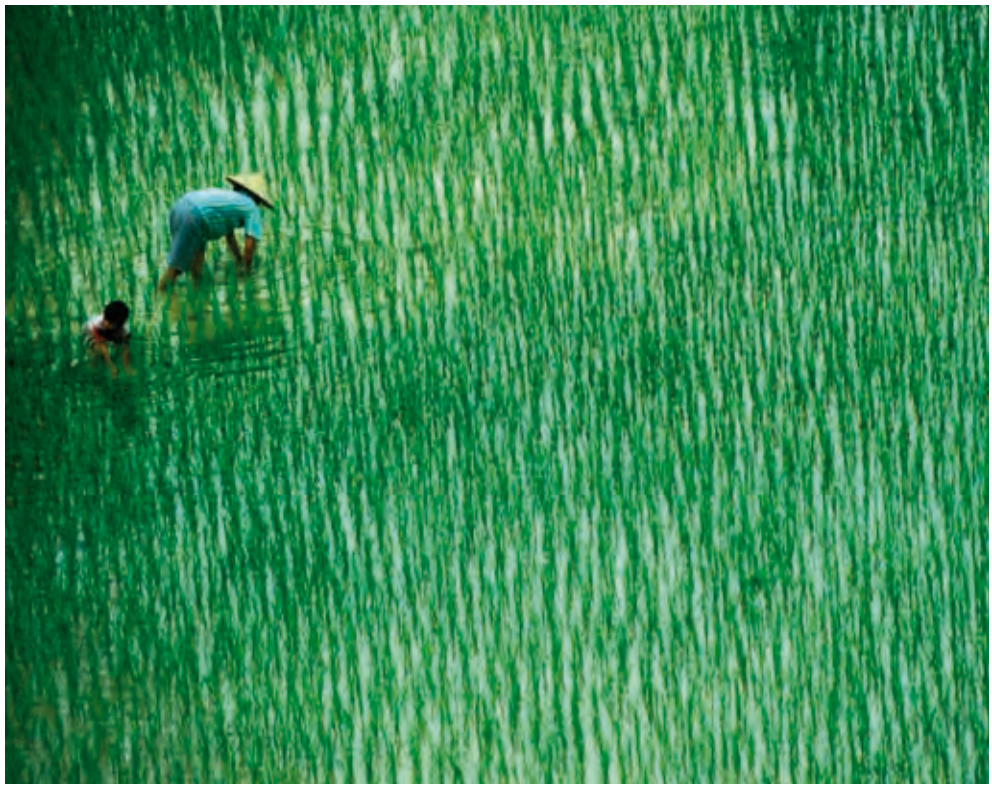


Figure 3. AN IDEALIZED GRAPHIC SHOWING THREE SOURCES OF IRRIGATION WATER which could be also used to develop fisheries or aquaculture activities: dam water, river water and tubewell water.

in promoting the closer integration of fisheries in irrigation schemes. What is required is a holistic approach at the landscape level that aims to achieve sustainable fisheries management in an ecologically diverse and multi-stakeholder environment.

Planning tools, including the Ecosystem Approach to Fisheries (EAF) and the FAO Mapping System and Services for Canal Operation Techniques (MASSCOTE) irrigation modernization approach are practical planning approaches to engage stakeholders in a more holistic and integrated approach to irrigation management.

The MASSCOTE is an eleven-step process that assesses and prioritises the irrigation conditions that require improvement, starting with a Rapid Appraisal Procedure, (RAP), allowing for a sound diagnosis of the current performance of the irrigation system. Improvement in accuracy and access to water-use data achievable under MASSCOTE also resonates with fisheries management objectives in irrigation schemes.



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FAO IN ACTION

Integrated landscape management in Asian rice systems

To meet the expected increase of food demand in 2035, there is a need for an estimated additional 114 million tons of rice, but Asian rice farmers are facing a lack of land, labour and water. FAO developed the Regional Rice Initiative in Indonesia, The Philippines and the Lao People's Democratic Republic. Under the initiative, rice farmers and producers are applying innovative and sustainable rice farming practices through the effective provision and utilization of rice ecosystem services and goods.

The initiative assists farmers by increasing rice production and improving resource use efficiency, and ultimately improving food and nutrition security. Capacity building for the sustainable intensification of rice production is conducted through farmer field schools (FFS) and has resulted in increased productivity of rice, reduced production costs and increased farm incomes. The Regional Rice Initiative also informs and influences policy processes related to national rice strategies or policies, focusing on the multiple goods and services provided by rice production system and the whole landscape in which it is integrated.

To improve sustainable and efficient production an array of practices has been put in place. These include:

- practices unleashing the co-benefits of integrated systems such as rice–fish, rice–livestock and rice vegetables;
- systems that improve efficiency through the use of ecosystem services such as Integrated Pest Management (IPM) and Trees Outside Forests (TOF);
- multi-stakeholders approaches that benefit from traditional knowledge such as Globally Important Agricultural Heritage Systems (GIAHS); and
- other tools to improve knowledge and management efficiency such as the Mapping System and Services for Canal Operation Techniques (MASSCOTE), and the Analysis and Mapping of Impacts under Climate Change for Adaptation and Food Security (AMICAF).

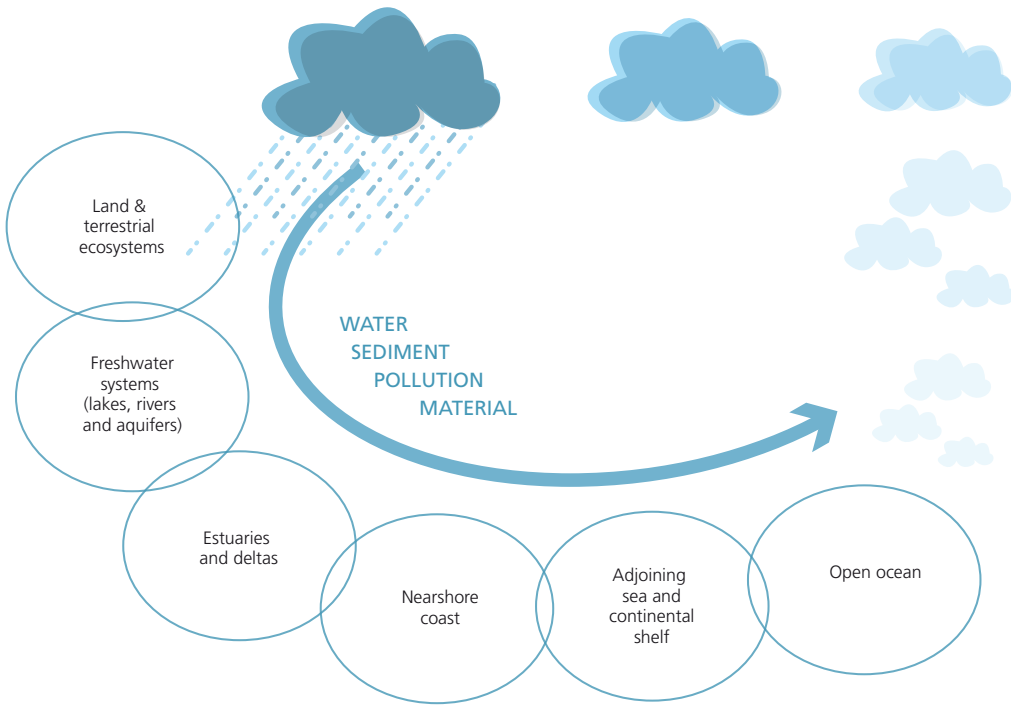

Figure 4. KEY FLOWS OF WATER, SEDIMENT, POLLUTION AND MATERIAL connect geographical segments from Source to Sea. *Source:* Adapted from Granit *et al.* (2017, fig1, p.5) (http://wp.iwaponline.com/content/ppiwawaterpol/early/2017/06/08/wp.2017.126.full.pdf)

The intensification of rice production in Asia has occurred simultaneously with the emergence of aquaculture to produce aquatic foods more intensively than is possible through traditional capture fisheries exploitation. Indeed, in situations where unsustainable agriculture practices, pollution or over-fishing have damaged traditional capture fisheries, many rural people have either turned to aquaculture or now purchase fish from fish farms, to meet their nutritional requirements.

SOURCE TO SEA (S2S): FROM LANDSCAPES TO SEASCAPES

The Source to Sea (S2S) approach recognizes the dynamic links between activities on land, such as agricultural production, and the downstream effects of those activities in often distant coastal and marine areas. It recognizes the increasing pressure on land and water resources, and addresses resulting deterioration through on-farm and site-specific interventions. Improving the management of croplands, livestock and upland forests can have direct, positive impacts not only on farms and

rural communities, but also on biodiversity, the quality of downstream freshwater environments, and ocean health.

The S2S approach is a conceptual model addressing the long-term health of production landscapes. It is also a management framework that respects the characteristic interdependencies between upstream land and water management and downstream quality of deltas and coastal areas. The quality (and quantity) of freshwater flows from upper catchments is a major determinant of the environmental conditions in downstream watersheds, estuaries and coastal waters, interconnected through surface and near shore marine environments. These production areas are often diverse, dynamic, and highly productive ecosystems. The S2S approach is comprehensive in accounting for and addressing the causes and effects of environmental stress in these production landscapes.
Success in implementing the S2S approach is fundamentally based on shared responsibilities in governance, requiring the full participation of all stakeholders. Integrated approaches such as S2S will be crucial in determining whether we can achieve the Sustainable Development Goals (SDGs), particularly our aspirations for eliminating poverty and hunger in all its forms, and enhancing shared prosperity. Water, land, biodiversity, ecosystem services and the economy are the common currency which links nearly every SDG. In particular, abundant, clean freshwater supplies are vital for the production of food and maintaining human and ecosystem health. None of this is achievable without suitable landscape management in the S2S continuum, supporting resilient communities and viable economies while nourishing the planet's life-sustaining ecosystems.

CITY REGION FOOD SYSTEMS

Cities all around the world continue to grow, whether they are mega-cities or smaller urban centres. Food and nutrition security of (poor) urban populations is and remains at risk as a consequence of their lack of access to healthy and nutritious food, of the volatility and rapid increases in food prices and of disruptions in food supply due to natural disasters and climate change effects.

The food provisioning system of any city across the globe, whether small or large, is always a hybrid food system i.e. combining different modes of food provisioning and consumption (institutional, retail, street foods). In all cases however, food systems link rural and urban communities and territories in a region within a country, across regions, and sometimes between continents. Cities and urban food supply systems play an important role in shaping their surrounding and more distant rural areas where land use, food production, environmental management, transport and distribution, marketing, consumption and waste generation is concerned.

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FAO IN ACTION

Valuing coastal ecosystems as economic assets: the importance of mangroves for food security and livelihoods among communities in Kilifi County and the Tana Delta, Kenya

This study was developed as part of FAO's Blue Growth Initiative (BGI) as a contribution to building the resilience of coastal communities and restoring the productive potential of fisheries and aquaculture. The BGI is working in ten countries in Africa and Asia (including Kenya) with activities in support of the management and utilization of marine and coastal resources and habitats, and of the need to reconcile economic growth and food security with ecosystem conservation and sustainable use.

In order to generate information to guide the development of an incentive mechanism for ecosystem services, between 2015 and 2016 FAO requested the University of Nairobi and United Nations Environment Programme (UNEP) to carry out a study to assess the value of mangroves for food security and improved livelihoods among coastal communities in Kilifi County and the Tana Delta. The study investigated four key topics: local-level knowledge of mangrove uses and benefits; ecosystem service values; joint natural resource management experiences; and the need for community-based incentives.

The study combined qualitative and quantitative approaches to assess: the mangrove provisioning services such as fish, firewood, charcoal, timber, poles and honey, as well as potential for carbon sequestration; the community perceptions of the value of key regulating and supporting services, including fisheries nursery and breeding, shoreline protection, flood control and biodiversity services; and recreational values. Data were collected via questionnaire surveys, community focus group discussions, stakeholder consultations, expert interviews and a desk-based literature review.

The economic value of these selected ecosystem services was found to be more than USD 6.5 million per year in Mida Creek and just under USD 3.5 million per year in the Tana Delta. In both Mida Creek and the Tana Delta, regulating and supporting services were found to dominate, accounting for just under 80 percent and 70 percent of the total respectively (6.5 and 2.5 times as much as the value of provisioning services). The differences found between the two study sites (shoreline protection services contribute almost half of the total in Mida Creek, but less than 3 percent in the Tana Delta; fisheries-related services stand out in the Tana Delta) suggest a different intensity of use mainly related to fuelwood, tourism, honey and shoreline protection that are many times higher in Mida Creek. Overall mangroves in Mida Creek (USD 2 000/year) are worth around a third more on a per hectare basis than those in the Tana Delta (USD 1 500/year).

See the full report at http://www.fao.org/3/a-i5689e.pdf

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FAO IN ACTION

Medellin's approach to city region food systems and enhancing rural urban Colombia linkages

The Municipality of Medellin is the second largest city in Colombia after the capital city of Bogota, with close to 2.5 million inhabitants. The city has been innovative in their approach to urbanization and the well-being of its citizens. Food security and nutrition issues have received growing interest from decision makers over the years, which now spread to the public and media of the city and the Antioquia region. In 2009, Medellin became the first city in Colombia with a unit dedicated to Food and Nutrition Security with an annual investment of about 130 000 million pesos (approximately USD 45 000 000). The role of the municipal authorities in public policy on food and nutritional security has been growing – the government of Antioquia also institutionalized the issue of food security and nutrition as public policy in 2003 through the Management of Food Security and Nutrition (MANA) programme.

The city embarked on an appraisal of its City Region Food System (CRFS) coupling it with the existing appropriate framework for action, through an FAO project with technical support from RUAF Foundation.

The city region is defined as a multi-layer area following five different criteria: i) food supply: the municipalities contributing for more than 1 percent to the food to the supply centres; ii) production: municipalities contributing for more than 1percent of the total food production of the Department of Antioquia; iii) proximity: those territories within the Aburrá Valley that currently have agricultural production; iv) potential for agricultural expansion; and v) the political weight of some municipalities of Antioquia that, despite not participating in a significant way in the production and supply of agricultural products for Medellin, are considered important from an institutional point of view, in terms of fostering a territorial inclusion and governance.

Find the toolbox to implement a CRFS assessment and planning process at http://www.fao.org/in-action/food-for-cities-programme/toolkit/introduction/en/

In recent years, the concept of CRFS has emerged as an operational approach to promote the idea of strengthening rural urban linkages and integration of sectors for a more sustainable food system. CRFS is defined as, "…the complex network of actors, processes and relationships to do with food production, processing, marketing, and consumption that exist in a given geographical region that includes a more or less concentrated urban centre and its surrounding peri-urban and rural hinterland; a regional landscape across which flows of people, goods and ecosystem services are managed." (FAO 2015). The CRFS approach seeks to close loops within regional food systems to optimize local resource use through shortened food supply chains, improve human health through access to adequate amounts of nutritious food, diminish redundant trade and associated food miles, stimulate local economic opportunities, and to improve soil quality and biodiversity. CRFS approaches can provide a gateway to improve regional urban-rural food flows with the goal of optimizing physical and human resources within city regions weaving together urban-rural connections to create sustainable socio-economic rural development. A landscape approach for city regions requires multi-level governance, new forms of collaboration, integration across disciplines and sectors, and adaptive innovation (Forster 2014).

URBAN AND PERI-URBAN FORESTS

The sound management of forests and trees in and around urban areas (i.e. urban forestry) is increasingly being acknowledged as a valuable tool to enhance the sustainability of urban development and to strengthen the resilience of cities to the growing environmental and socio-economic challenges they are facing. In fact, by maintaining the ecological continuum between rural and urban environments, these forests and trees play an important role in the integrated management of the landscape, helping reduce the impact of urbanization on the surrounding natural environment while at the same time preserving the natural ecological processes that support the provision of regulating, supporting and provisioning ecosystem services to cities. These include water quality and availability, air cleaning, biodiversity conservation, carbon storage, pollutants removal, wood and non-wood forest products supply, among others.

Although urban forests are increasingly becoming a key component of urban planning in developed countries, the lack of knowledge, capacity, enabling policy regulations and long-term investment decisions are the main barriers to the implementation of urban forestry in less developed countries. FAO supports a multi-stakeholder process of continuous learning for the development of UPF actions addressed to produce normative and technical tools, make information accessible, share policy expertise, and bring knowledge to the field.

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FAO IN ACTION

Developing a national urban forestry strategy in the Republic of Cabo Verde

In Cabo Verde, most cities do not meet the minimum thresholds of urban green spaces set by the national urban law. This is mainly due to a lack of integrated landscape management plans that can be referenced in urban planning, to the weak capacity of local public institutions in terms of planning, design, and management of the urban and peri-urban forest, as well as to the low level of public awareness of the potential contribution of urban forests towards increased urban liveability.

The main objective of this project is developing an integrated mid-term (20 years) Urban Forestry Management Plan addressing the key priorities identified within the four cities and to be taken as a reference for future scaling-up of the approach to other cities in the country. A national task force involving a broad range of institutions and partners has been created to agree on priorities such as the prevention of extreme climatic events, local mitigation and adaptation to climate change effects, prevention of soil degradation, reduction of watershed degradation, decrease of the impact of flooding events, increase in the local production of wood and non-wood forest products, and increased sense of community.

The Plan also identifies the key interventions needed over the next 20 years in each district of the four cities to reach the minimum rate of one tree per inhabitant. Priority intervention areas were identified through internal discussion (i.e. Analytic Hierarchy Process decision model) and matched with sites suitable for intervention (based on the nature of the site and its level of connectivity with the surrounding landscape).

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FAO IN ACTION

Integrated Landscape Plans developed by small producers, indigenous peoples and local communities in the Plurinational State of Bolivia

The 38 indigenous peoples that make up Bolivia (the Plurinational State of) are among South America's poorest and most forest-dependent people. Half the country's land area (53 million hectares) is covered in forest. The Forest and Farm Facility, a partnership between FAO, IIED, IUCN and AgriCord, hosted at FAO, began operations in September 2014 to analyse and formulate instruments of integrated and sustainable forest management within Bolivia (the Plurinational State of).

To complement this work, support to MINGA, an association of joint working groups on natural resources management, mainly coffee and Chiquitana nut, allowed for the piloting with the DGGDF of Comprehensive Forest and Land Management Plans for communities peasants and indigenous people settled in the Chiquitano forest.

A national manual for the elaboration of PGIBT / POGI (Integral Management Operational Plans) has been approved by the institutions in charge of forest management to help indigenous peoples and local communities participate in the process.

The Bolivian Land Authority (ABT) approved ten Integrated Forest and Land Management Plans in 2016 developed by local communities and indigenous peoples, in collaboration with MINGA.

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FAO IN ACTION

Enhancing biodiversity and nutrition through agroecology in Mali and Burkina Faso

The FAO Multipartner Programme Support Mechanism (FMM) project *"Enhancing biodiversity and nutrition through agroecology in Mali and Burkina Faso"* focused on improving the nutritious and food security status through interventions in science, policy and biodiversity and ecosystem-based activities. The project contributed to the adoption of small-scale agroecological farming systems in Burkina Faso and Mali. It raised awareness on how agroecology can make an important contribution to nutritious and diversified diets through an increased use of biodiversity and the integration of ecosystem services in agriculture at the countries level. It further demonstrated how this contribution can be supported through policy instruments that focus on healthy and sustainable diets, such as food-based dietary guidelines.

Farmers, foresters, pastoralists and future agroecology trainers learned techniques to enhance the sustainability and efficiency of their agricultural practices through improved ecosystem management practices and consequently improved their livelihoods, reducing environmental, social and economic risks.

Factsheets on tree species were developed for agroecological and agroforestry systems in Mali. The project further supported farmer-to-farmer agroecology training, linking the nutrition priorities to ecological production systems. The project supported a series of workshops to give farmers' organisations and other civil society actors the opportunity to discuss which policies were needed to support the agroecological transition in West Africa.

THE GLOBALLY IMPORTANT AGRICULTURAL HERITAGE SYSTEMS PROGRAMME

FAO's Globally Important Agricultural Heritage Systems (GIAHS) programme focuses on the conservation and valorization of specific agricultural systems and landscapes worldwide that have been created, shaped and maintained by generations of farmers and herders based on diverse natural resources, using locally adapted management practices.

The GIAHS programme is designed to respect and protect local knowledge and experience that characterize these areas but also to conserve the unique and ingenious agricultural systems developed that reflect the evolution of humankind, the diversity of its knowledge, and its profound relationship with nature. These systems have resulted not only in outstanding landscape, maintenance and adaptation of globally significant agricultural biodiversity, indigenous knowledge systems and resilient ecosystems, but also guarantee food and livelihood security for millions of poor and small farmers in a sustainable manner.

The main objectives of GIAHS are to leverage global and national recognition of the importance of agricultural heritage systems and institutional support for their safeguard; capacity building of local farming communities and local and national institutions to conserve and manage GIAHS; generate income and add economic value to goods and services of such systems in a sustainable fashion; and to promote enabling regulatory policies and incentive environments to support the conservation, evolutionary adaptation and viability of GIAHS.

With the implementation of these plans, the local communities and indigenous peoples will manage the natural resources and guarantee a sustainable landscape approach, producing livelihoods and income. These plans are good examples of an integrated sustainable management of the territory which increases the productivity of people's forests and lands, and contributes to climate change mitigation and adaptation. Appropriate financial support from climate change initiatives, would allow this approach to be replicated at a larger scale.

GLOBAL LIVESTOCK ENVIRONMENTAL ASSESSMENT MODEL (GLEAM)

GLEAM is a modelling framework that simulates the interaction of activities and processes involved in livestock production and the environment. The model was developed to assess livestock production and its interactions with the environment at different landscape levels: (sub)national, regional and global scale. GLEAM can support assessments of interventions in the areas of land restoration. It can calculate changes in stocking rates, pasture areas and meat and milk production which can support the forecast of expected outcomes in specific landscape features such as pasture diversity, biodiversity conservation or ecosystem services such as soil retention/erosion. GLEAM can be used to assess the quantity and quality of feed needed under different scenarios of development, including crop-livestock integration through the use of crop residues and manure for fertilization or to support measures for the integration of sectors within the landscapes and the achievement of co-benefits.

The GLEAM is available at http://www.fao.org/gleam/en/

COLLABORATIVE PARTNERSHIP ON SUSTAINABLE WILDLIFE MANAGEMENT (CPW)

The CPW, established in 2013 during CITES CoP16 in Bangkok, is a voluntary partnership of 14 international organizations, with mandates that vary from achieving food security (FAO) to promoting sustainable hunting (CIC), from representing indigenous peoples (IIFB) to biodiversity conservation (CBD), which strive to promote the sustainable use and conservation of wildlife resources.

In view of its ecological, social and economic value, wildlife is an important renewable natural resource, with significance across such activities as rural development, land-use planning, food supply, tourism, scientific research and cultural heritage.

When sustainably managed, wildlife can provide continuous nutrition and income, and make a considerable contribution to the alleviation of poverty as well as to safeguarding human and environmental health.

The Partnership provides a platform for addressing wildlife management issues that require national and supra-national responses and also works to promote and increase cooperation and coordination on sustainable wildlife management issues among its members and partners.

Sustainable wildlife management involves the sound management of wildlife species and their habitat over time, taking account of the socio-economic needs of different stakeholders. To achieve this, an integrated landscape approach that involves land users within a wildlife habitat and other user groups needs to be applied. Furthermore, relevant measures and effective policies that control the impact of land users' activities on wildlife resources and habitat should be put in place.

The Partnership promotes knowledge sharing and distribution of sustainable wildlife management practices and equitable and effective governance of wildlife to ensure that the values of wildlife are recognized and incorporated into decision-making at all levels. The work has been done through four thematic priorities:

1. Wildlife, Food Security and Livelihoods: Provision of knowledge and support for members and countries to address bushmeat and other issues related to wildlife, food security and sustainable livelihoods.
2. Human-Wildlife Conflict: Improved understanding of the direct and underlying causes of such conflicts in the different regions of the world; dissemination of successful response mechanisms.
3. Illegal/Unsustainable Hunting: Support development of strategies, policies, and management systems that contribute to legal and sustainable hunting; support for appropriate efforts to combat poaching and other forms of illegal hunting.
4. Partnership Coordination and Outreach: Establishment and consolidation of the CPW; building understanding, conveying common messages on issues of global relevance related to sustainable wildlife management.

Read more about the Collaborative Wildlife Partnership at http://www.fao.org/forestry/wildlife-partnership/en/

INCENTIVES FOR ECOSYSTEM SERVICES (IES) – A FINANCING MECHANISM FOR LANDSCAPE MANAGEMENT

Farmers play a key role in managing natural resources across the landscape. Sustainable practices are tried and tested but the transition to and implementation of these sustainable practices, requires additional effort from farmers. Up-front financing, land and labour during establishment, inputs, seeds, technology, risk of poor performance and tenure insecurity may all deter farmers from long-term sustainable investments in managing their lands better.

IES from agriculture integrates packages of public and private measures to support farmers in the adoption of sustainable agricultural practices that benefit the environment and protect long-term food security. This combination of incentives

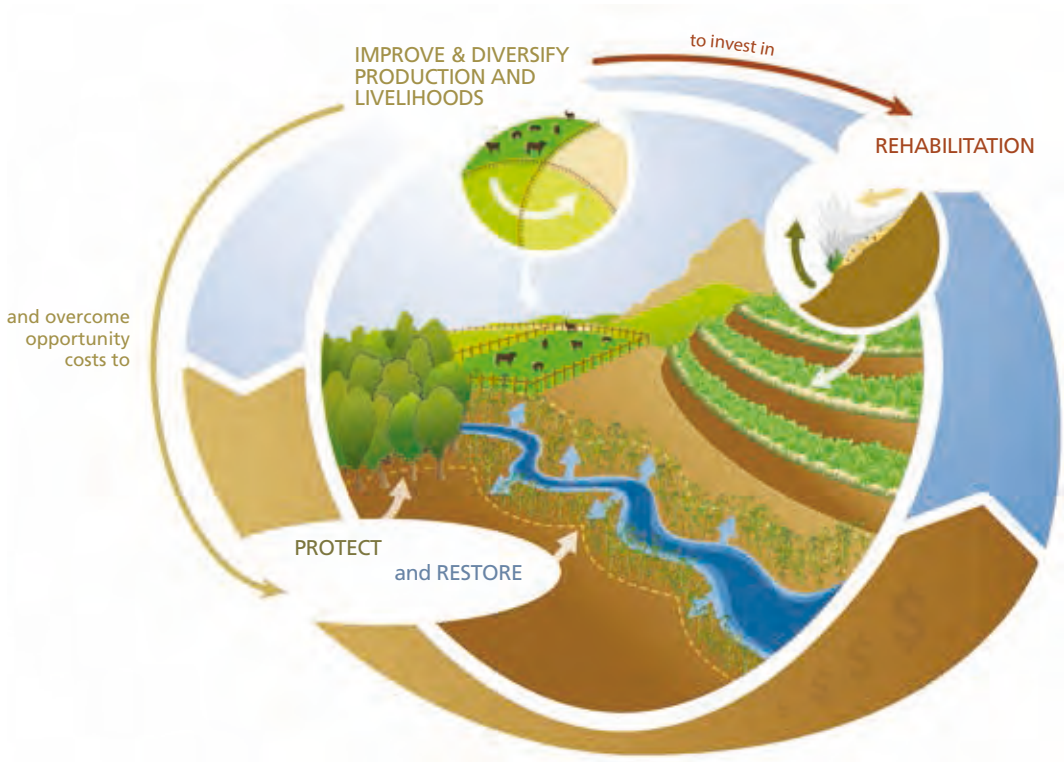

Figure 5. HOW MULTIPLE ISSUES ACROSS THE LANDSCAPE can be addressed using incentives to support farmers in an integrated approach.

brings farmer to a new balance, where environmental benefits can be provided without competing with production, but rather as a basis for long-term food security (Fig. 5). Incentive examples include helping to overcome short-term needs such as improved seeds, organic fertilizer and irrigation to support improved productivity, to release land from cultivation to rehabilitation or conservation. Another example is how improved crop storage and processing facilities coupled with improved access to markets can render sustainable practices worthwhile in the long term (Fig. 6).

A combination of best practices at landscape level can help to rehabilitate and protect ecosystem services and generate economies of scale. Examples include aggregating farmers to more easily access markets or selling the hydrological benefits of practices that integrate ecosystem services adopted catchmentwide to water users. As many of these sustainable practices have benefits beyond the farm, these linkages become clearer in a landscape approach and can capture funding from other sectors, to support sustainable agriculture choices.

There are a variety of programs offering incentives from policy-driven investments to fulfil mandatory regulations, such as taxes and charges, to private

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FAO IN ACTION

Incentives for ecosystem services within the project "Manejo de los Recursos Naturales de Chimborazo" – PROMAREN (Ecuador)

The PROMAREN watershed management project aims to design and field test a mechanism to ensure the continuous flow of environmental services to downstream areas and populations through a combination of compensation measures.

A baseline study enabled a systematic assessment and economic valuation of current and potential environmental services generated in upper and intermediate areas of the Rio Blanco watershed (one of the five project watersheds) to identify possible action for compensation mechanisms.

As a result, a number of innovative and complementary pilot compensation schemes have been designed and are being progressively applied along different types of user categories and related measures. These include:

- Fostering forest protection and conservation activities by promoting access to funds made available by the national Socio Bosque scheme;
- Engaging the private sector, including the hydro-electric company and local industrial infrastructures (e.g. flower nurseries), through payments for the use of water resources stored in the dam;
- engaging rain-fed agricultural producers and local administrative bodies in formal contracts aimed at protecting their private forest land upstream in exchange for crop production inputs and storage equipment in downstream areas (e.g. certified potato seeds and storage silos);
- negotiating and agreeing with irrigation user groups a progressive increase of water charges and increasing awareness of required water saving techniques;
- facilitating a review of national legislation to allow users of fragile upper "*paramo*" protected areas to get access to and market wild vicuña wool;
- investing part of local governments (*provincia*, *municipio* and *paroquia*) financial resources available for infrastructural investments in protection infrastructures in the upper areas.

Additional incentive measures are being explored to address the newly established peri-urban irrigation schemes and the potable water company supplying Riobamba provincial capital.

Figure 6. THE LANDSCAPE APPROACH AT FARM LEVEL: combinations of practices ranging from conservation to income generation.

strategies for saving production costs (water quality protection programmes) or opening new markets (certificates/standards), and voluntary investments on social and livelihood benefits (CSR programmes, NGO and CSO investments, de-linked from farmers environmental performance). While these are usually applied in isolation, under a landscape approach they could all support the sustainable management of agro-ecosystems, by increasing policy coherence and aligning investments.

FAO works to map the existing range of incentives and support policy dialogue at country-level to improve institutional coordination in the implementation of public programmes, and facilitate compatible and responsible private sector investment.

CONCLUSION

FAO has developed a rich repository of well-established practices and tools addressing key elements of the integrated landscape approach, many of which have been presented in this publication. These are often available in the form of guidelines, case studies, web portals, knowledge hubs, or toolboxes. The organization also hosts a number of expert technical and scientific fora and multistakeholder platforms, all contributing to knowledge creation and awareness raising relevant to integrated landscape management.

Going forward, FAO will continue to leverage this growing repository of experience through a collaborative, cross-sectoral initiative integrating existing knowledge products and ongoing technical work related to integrated management and restoration of landscapes and seascapes. This effort will build upon existing knowledge platforms that have been developed to facilitate access to a comprehensive database of tested, peer-reviewed resources (both within and outside FAO) that support integrated approaches to the management of land, freshwater and ocean/coastal resources, restoration of degraded (or fragmented) ecosystems,

and the development of new knowledge products and awareness raising material for both policy makers and practitioners.

Essential to the success of ongoing efforts to expand the knowledge base for integrated landscape management approaches will be strengthening country efforts through facilitating system-wide capacity development in moving from sectoral-based approaches towards long-term, multi-disciplinary collaborations for achieving both food security goals as well as sustainable development outcomes. Landscape initiatives are complex, typically involve many different stakeholders and sectors, and require real commitment at all levels. Adequate timeframes, commitments from stakeholders, and targeted investments are needed to achieve results.

We move forward in implementing these approaches, our work must also be informed by evidence. FAO and partners may need to strengthen their efforts towards refining metrics that analyse both biophysical and socio-economic data, as well as existing governance structures and drivers of change. Stakeholders must be empowered to contribute to the knowledge base emerging from the efforts in which they are involved. This will ensure reliability in data collection, information accessibility, and the transparency of results. These responsibilities do not reside solely with a single organization, but are increasingly shared across many organizations active in this field.

Finally, we must continue to refine our research and the evidence base on ecosystem services and natural capital, particularly with regard to effective incentive structures for farmers, land and resource managers, and other stakeholders to more fully embed nature-based solutions into sustainable agriculture, forestry, fisheries and other production activities within the matrix of integrated landscape approaches. Improved effort should also be devoted to the understanding of the social and cultural importance of sustainable agriculture (including traditional crop, livestock, forestry, fisheries and aquaculture systems). Furthermore, we need to more consistently communicate with country stakeholders, policy makers and donors related to our findings on the importance of maintaining or restoring ecosystem functions at the appropriate landscape scale, to build resilient and productive social-ecological systems for food security and livelihoods. ■

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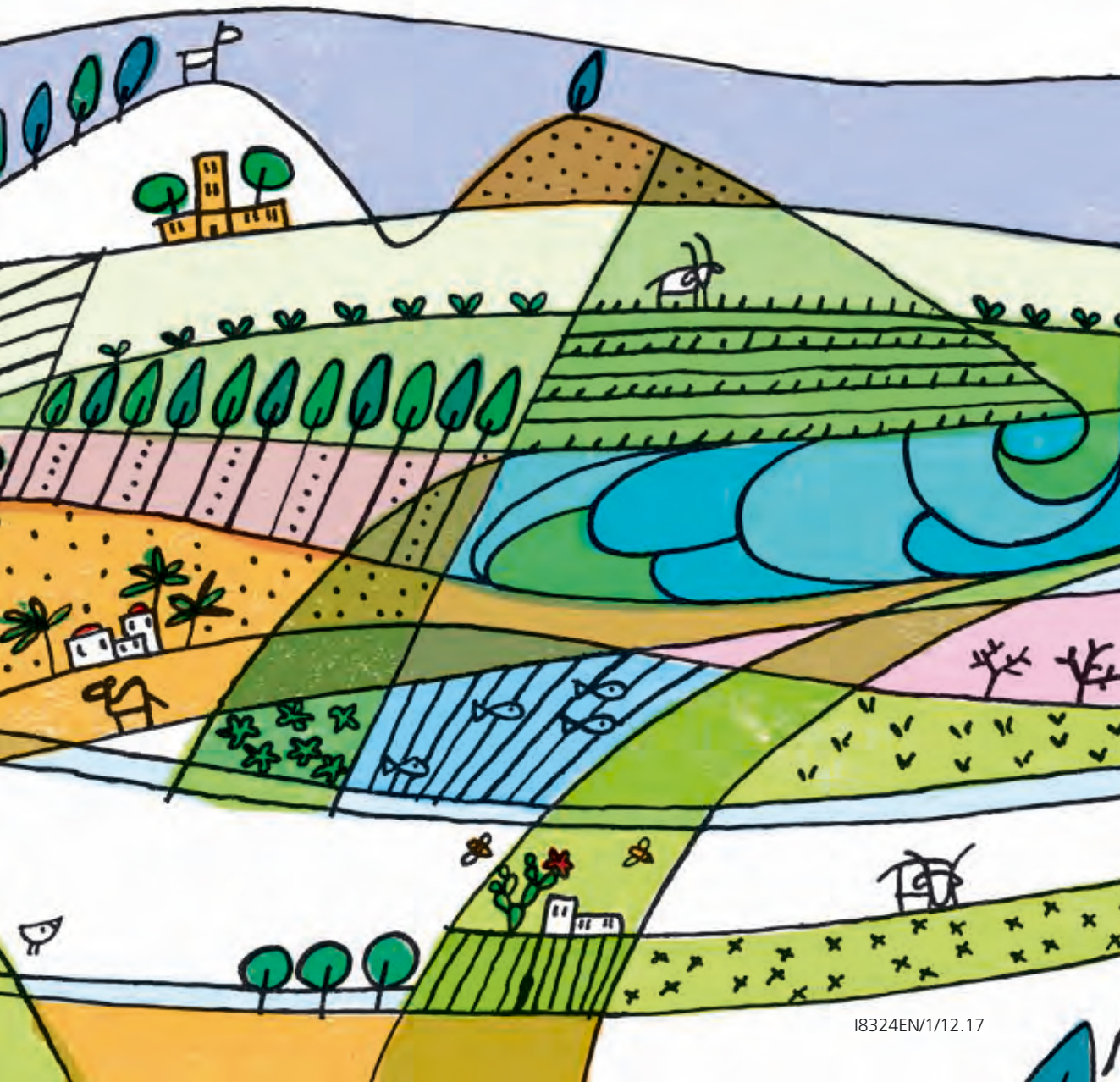
FAO is leading efforts to improve food security and nutrition through integrated approaches on the ground. These initiatives are based on the resilience and social equity of communities, and preserving the natural resource base upon which all food production depends. We know we can meet the challenge of ending hunger, and support sustainable livelihoods of people and communities who produce food. However, to be successful we must simultaneously address challenges that are both natural resource-based and socio-economic in nature, the origins of which may stem far from affected communities. This requires integrated investments at scale and across domains. This publication presents FAO's key initiatives in support of the landscape approach, and represents an important step in consolidating these knowledge resources in support of country commitments to the Sustainable Development Goals.



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