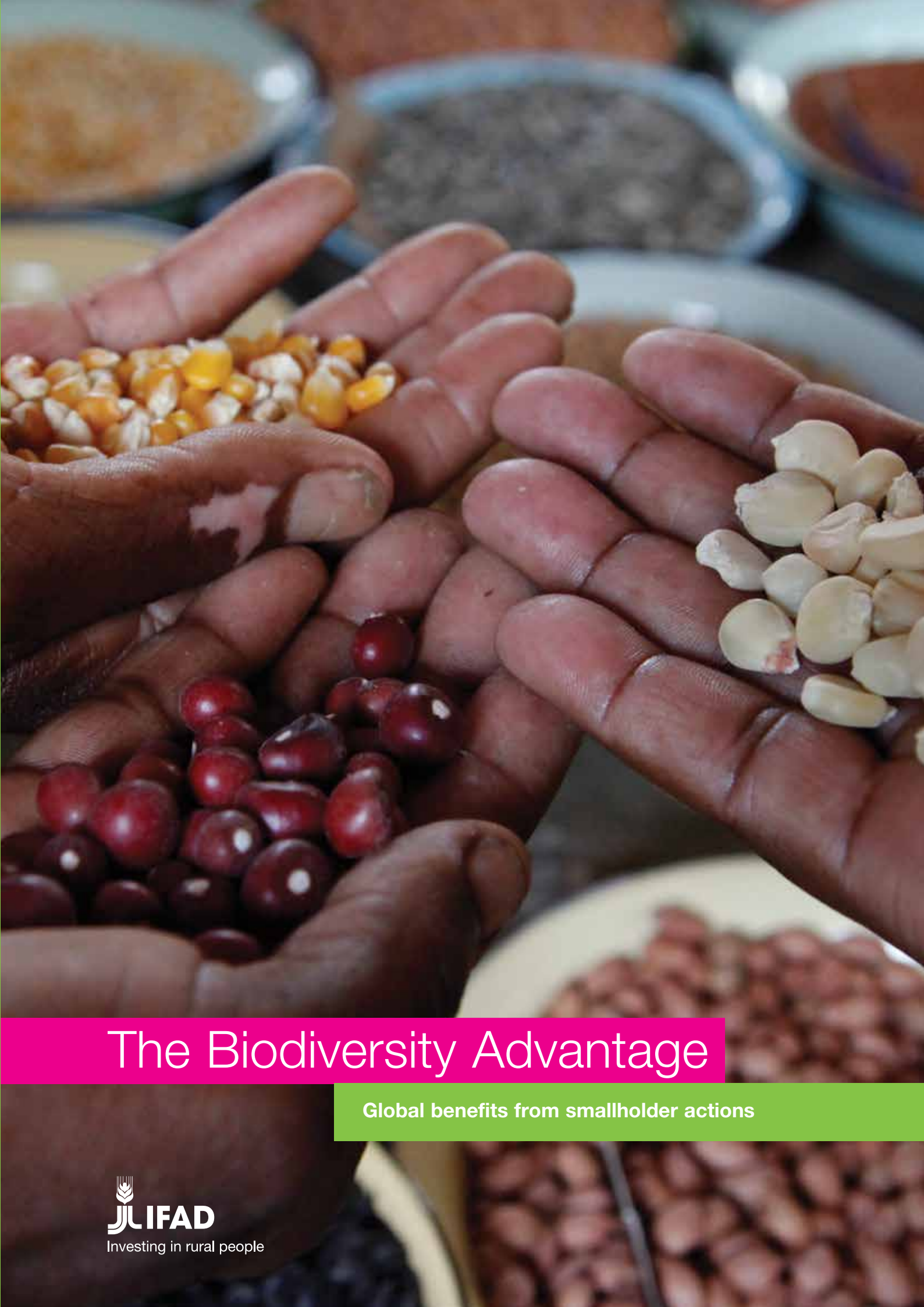


The Biodiversity Advantage

Global benefits from smallholder actions

IFAD
Investing in rural people

"Biodiversity is the very backbone of life. Functioning ecosystems support life, and if we do not pay attention to preserving the world's biodiversity, there is nothing "sustainable" about development. Agricultural biodiversity, in particular, can improve productivity and nutrition, enhance livelihoods, respond to environmental challenges, and deliver food security. At IFAD, we know that poor rural people, including indigenous peoples, are not only dependent on biodiversity, but also they are important custodians of it."

Margarita Astralaga, Director of Environment and Climate Division, IFAD.

The Biodiversity Advantage

Global benefits from smallholder actions

IFAD
Investing in rural people

Acknowledgements

This review was prepared by the IFAD Environment and Climate Division based on project documentation and other materials listed under References.

Prepared by: Soma Chakrabarti, Independent Consultant.

Internally reviewed by the following at IFAD: Estibalitz Morras Dimas, Environment and Climate Change Portfolio Officer (Environment and Climate Division); Wafaa El Khoury, Lead Technical Specialist, Crops and Farming Systems (Policy and Technical Advisory Division); Annabelle Lhommeau, Country Programme Manager (Djibouti); Sheila Mwanundu, Lead Technical Specialist (Environment and Climate Division); Rikke Olivera, Senior Technical Specialist, Natural Resource Management (Policy and Technical Advisory Division); Jacopo Monzini, Senior Technical Specialist, Climate Change, and Environment and Natural Resource Management (Near East and North Africa); Oliver Page, Regional Climate and Environment Specialist (Latin America and the Caribbean); Eric Patrick, Adaptation Specialist (Environment and Climate Division); Naoufel Telahigue, Regional Climate and Environment Specialist (West and Central Africa); Steve Twomlow, Regional Climate and Environment Specialist (East and Southern Africa).

Editorially reviewed by Brian Thomson, Senior Knowledge Management and Communications Specialist (Environment and Climate Division).

© 2016 by the International Fund for Agricultural Development (IFAD).

The opinions expressed in this publication are those of the authors and do not necessarily represent those of IFAD. The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of IFAD concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The designations "developed" and "developing" countries are intended for statistical convenience and do not necessarily express a judgement about the stage reached by a particular country or area in the development process.

All rights reserved.
Cover photo: ©Oxfam Novib/Shepherd Tozvireva

ISBN 978-92-9072-702-6
Printed November 2016

Table of contents

Boxes

Figures

Acronyms

ASAP	Adaptation for Smallholder Agriculture Programme
CBD	Convention on Biological Diversity
CBINReMP	Community Based Integrated Natural Resources Management Project (Ethiopia)
DECOFOS	*Proyecto de Desarrollo Comunitario Forestal de los Estados del Sur* (Community-based Forestry Development Project in Southern States (Campeche, Chiapas and Oaxaca, Mexico)
CENESTA	Centre for Sustainable Development
GEF	Global Environment Facility
ICARDA	Center for Agricultural Research in the Dry Areas
MPA	marine protected area
PRAREV	*Programme d'appui à la réduction de la vulnérabilité dans les zones de pêche côtière* (Programme to reduce vulnerability to climate change and poverty of coastal rural communities, Djibouti)
UNEP	United Nations Environment Programme
WFP	World Food Programme

Introduction

Biodiversity is about more than plants, animals, and micro-organisms and their ecosystems – the Convention on Biological Diversity (CBD, 1992) recognizes that it is also very much about people and our need for food security, medicines, fresh air, shelter, and a clean and healthy environment. Biodiversity is also essential for the maintenance of ecosystem-based services, such as the provision of water and food for human, animal and plant life.

When we make an effort to conserve biodiversity, we are helping to maintain critical global biological resources to meet our needs today as well as those of future generations. Biodiversity conservation is therefore central to achieving recent global commitments for sustainable development under "Agenda 2030", adopted by the United Nations in 2015. The International Fund for Agricultural Development (IFAD) recognizes that losing biodiversity means losing opportunities for coping with future challenges, such as those posed by climate change and food insecurity.

Why biodiversity is important to smallholders

Poor rural people depend on natural resources for their livelihoods, relying on a range of natural assets from their ecosystems and biodiversity for food, fuel and much else. Productive and sustainable agricultural systems need clean water, healthy soil, and a variety of genetic resources and ecological processes. Biodiversity is also important for enhancing the resilience of poor farmers and indigenous peoples to climate change, pests, diseases and other threats.

The productivity of agricultural ecosystems depends on numerous species, such as soil micro-organisms, pollinators and genetically diverse crops. Agricultural ecosystems also provide habitats for many wild plant and animal species. While protected areas and buffer zones help maintain biodiversity, many are also essential for maintaining the livelihoods of local people. Reconciling conservation efforts with human needs is a major challenge that demands innovation and solutions tailored to local circumstances.

Yet many smallholders with whom IFAD works are already reporting impacts on their ecosystems and biodiversity that sustain agricultural production and rural livelihoods (IFAD, 2010, 2011). Today, IFAD recognizes that biodiversity loss is one of the main threats to smallholders and their communities – without biodiversity, livelihoods are not sustainable and food security and nutrition for the entire planet is weakened (IFAD, 2016a); climate change is in turn also a serious threat to biodiversity. Box 1 expands on the threat of biodiversity loss to smallholder livelihoods.

IFAD is guided by a global convention to conserve, sustain and share biological diversity

The CBD entered into force on 29 December 1993 with three main objectives: to conserve biological diversity, sustainably use its components of biological diversity, and promote the fair and equitable sharing of benefits from genetic resources. The Aichi biodiversity strategic goals were adopted in 2010 (see Box 2) and are underpinned by specific targets.

The CBD and Aichi targets have framed IFAD's work with smallholders and their environment. The annex summarizes how case studies in this report align with specific targets under Aichi strategic goals. The full IFAD portfolio over the years has contributed to most of these, often in partnership with the Global Environment Facility (GEF) and through grants as well as loan finance.

Box 1. Loss of biodiversity threatens smallholder livelihoods

Ecosystems, biodiversity, and the associated goods and services on which poor rural people rely are under increasing pressure. The Millennium Ecosystem Assessment reports that approximately 60 per cent (15 of 24) of key ecosystem services are degraded and used unsustainably, with the natural resources critical to agricultural production and livelihood security for the world's poorest people in rapid decline. Global agriculture is the most significant driver of biodiversity loss, through land conversion, monoculture and excessive use of pesticides. Twenty-two per cent of all plant species face extinction, with 75 per cent of crop diversity lost from 1900 to 2000. Today, just some 15 crop plants provide 90 per cent of the world's food energy intake, rendering the global food system highly vulnerable to shocks. Rapid biodiversity loss, coupled with impacts on ecosystem functions and on the goods and services they provide, is undermining poor rural people's resilience and their ability to escape from and remain out of poverty.

Source: Environment and Natural Resource Management Policy. IFAD, 2011.

Box 2. Aichi biodiversity strategic goals

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use.

Strategic Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity-building.

Source: CBD website. Accessed September 2016.

IFAD and biodiversity

Between 2010 and 2015, IFAD dedicated just over 11 per cent of total investments to environment and natural resource management (ENRM), including biodiversity specifically. This term is taken by IFAD to mean *"The use and management of the natural environment, including natural resources defined as raw materials used for socio-economic and cultural purposes, and ecosystems and biodiversity – together with the goods and services they provide"* (IFAD, 2011). The underlying concept is one of sustainability – ensuring that the use of natural resources benefits the poor through supporting livelihoods and income opportunities without degrading those resources. This is distinct from a more traditional understanding of natural resource management simply as production systems deriving from the use of natural resources.

In its new Strategic Framework, IFAD has recently renewed its commitment to enhancing biodiversity alongside increasing agricultural productivity and lowering greenhouse gas emissions from agriculture while contributing to poverty reduction (IFAD, 2016a). IFAD's commitment to "multiple benefits" requires multiple approaches, and its ENRM Policy sets out some of the main ones with regard to biodiversity as part of an integrated approach:

- Promote reduction in agricultural land conversion and negative environmental externalities associated with agricultural production
- Seek complementarities with national and international initiatives for biodiversity conservation
- Introduce an ecosystem approach
- Enhance incentives for conservation and use of local agrobiodiversity through value chains
- Make agriculture more resilient to extreme and changing climatic events
- Avoid depleting microorganism, animal and plant genetic resources (IFAD, 2011).

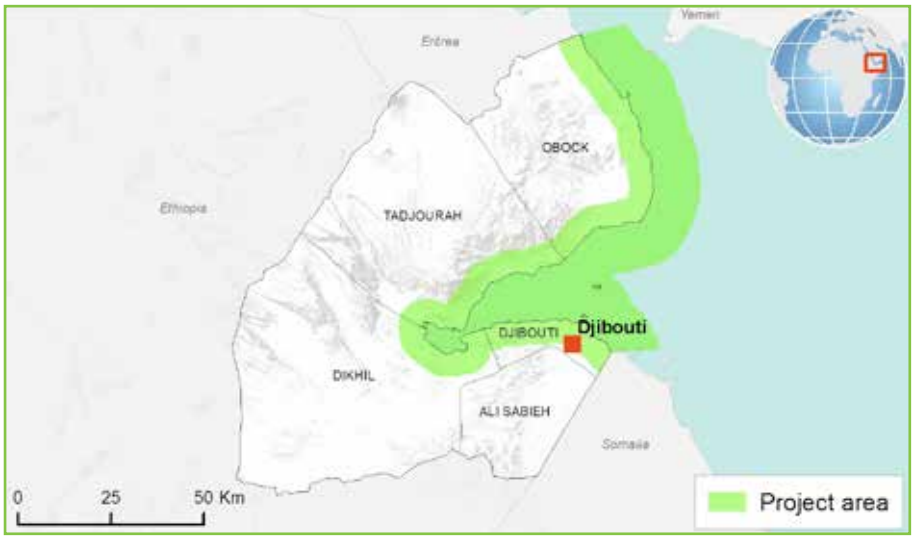
In summary, IFAD focuses not only on biodiversity conservation, but also its sustainable use and management. More recently, attention to biodiversity, including ecosystems, forest resources protection and enhancement, has been mainstreamed into IFAD's Social, Environmental and Climate Assessment Procedures. A "guidance statement" on biodiversity and protected area management provides context as well as concrete guidance on how we need to address biodiversity issues in IFAD-supported projects.

In the next few pages, the case studies from Djibouti, Ethiopia, Iran, Mexico and Sao Tome illustrate how our work contributes to the Aichi strategic goals in different ways, as well as follows the approaches set out in relevant IFAD policy.

©IFAD/Franco Mattioli

Djibouti: Marine ecosystems and sustainable fishing livelihoods

Project area



Quick facts

Project name	Programme to reduce vulnerability to climate change and poverty of coastal rural communities (PRAREV)[1]
Dates	2015-2021
Target audience	107,000 people
Financing	IFAD, including ASAP, WFP, Government of Djibouti, smallholders

Development challenge

Djibouti boasts a coastline of over 350 kilometres on the Red Sea, rich marine ecosystems, and great biodiversity in its mangroves, coral reefs and seagrass beds. But things are changing. A detailed vulnerability assessment carried out in Djibouti, using an innovative methodology for coastal multi-hazard assessment, the "coastal hazard wheel",[2] found that large stretches of the coastline face significant ecosystem disruption related mainly to coral reefs and mangroves. Other stretches of the coast are exposed to gradual inundation and saltwater intrusion. These coastal ecosystems are being undermined by a combination of human and environmental factors; recurrent droughts and conflict have contributed to increasing human pressures from people moving to coastal areas. Rising temperatures and sea levels resulting from climate change are likely to exacerbate these processes with further dramatic consequences for ecosystems.

Nearly half of Djibouti's coast has a very high/high hazard of ecosystems disruption.[3] For example, temperature increases cause coral bleaching as well as reduce biodiversity. Mangroves, which are well known to be rich in biodiversity and a natural "shield" against tides and erosion, are also under threat because of both climatic and anthropogenic variables.

All this has serious consequences for people. Sea level rise and extreme weather events such as storms and floods damage coastal infrastructure, including production and processing equipment for fish, and fishers lack the equipment and skills to keep up with the induced changes.

Climate change is causing long periods of drought and reduced rainfall, as well as increasing temperatures along the coastal region. This affects groundwater recharge, which is the main source of freshwater in the country. The combination between rising sea levels and reduced groundwater recharge is leading to an increase in the intrusion of seawater, which affects the quality of water.

1 Acronym for project name in French: *Programme d'appui à la réduction de la vulnérabilité dans les zones de pêche côtière.*

2 See "Application of the Coastal Hazard Wheel methodology for coastal multi-hazard assessment and management in the state of Djibouti" (Appelquist and Balstrøm, 2014).

3 Very high, 41 per cent; high, 7 per cent; moderate, 11 per cent; low, 41 per cent. Source: Evaluation carried out during project design.

©IFAD/Ilaria Firmian

Project responses

PRAREV is working to protect Djibouti's coral reef system and mangroves, and expand options for sustainable livelihoods, especially for women and youth. One component focuses on assessing the impact of climate change on coastal habitats and marine ecosystems while supporting the resilience of marine and coastal areas, including maintaining water quality. Specific actions include the following:

- A coastal zone co-management system and participatory plans are being developed to restore coastal habitats affected by climate change; these will engage and benefit communities through employment linked to rehabilitation, including women's groups.
- Long-term monitoring for coastal ecosystems is important. Monitoring of marine biodiversity encompasses coral reefs, endemic species, preservation of sea turtles, and marine protected areas; mini-observatories will be equipped to do this.
- Policy contributions include a review of current laws relating to marine protected areas (MPAs) and advocacy with competent authorities, including the Directorate for the Environment and Sustainable Development (French acronym, DEDD) of the Ministry of Habitat, Urbanism and Environment, to promote their application on the ground. Studies on mangroves, including the highly degraded Godoria mangroves and the status of coral formations, have been finalized and presented to all stakeholders. The studies are important not only as baselines for the project, but also as national baselines on key coastal ecosystems.

- Capacity development in conservation and sustainable fishing for fishers and local communities includes a focus on avoiding overfishing, and respecting the minimum size of fish caught and protected species. Training at the Centre for Development Studies and Research (French acronym, CERD)[4] also builds national capacities in assessing inventories of fish stocks and understanding the dynamics of fish populations, water quality and coastal biodiversity. Furthermore, recognizing the importance of investing in people over the longer term, the project will also invest in masters' programmes for two CERD staff. CERD staff will also be learning on the job through their contribution to project-supported studies, such as the impact of climate change on marine ecosystems in terms of fish stocks.
- Vulnerable people relying on degraded coastal resources will be supported through climate resilient infrastructure. PRAREV will invest in renewable energy equipment, ice plants and coolers/insulated containers to improve the conservation of fish products. This will help to protect fisheries value chains affected by climate change.

Biodiversity and environmental impacts

The following impacts are expected:

- Over 200 hectares of mangroves rehabilitated (including 15,000 plants produced/replanted in special nurseries) and coral reefs in 15 sites located within the MPAs – vital for fish stocks – will be protected. The project will work with the World Food Programme (WFP) to deliver "food for work" for local communities working to conserve mangroves.
- Climate change adaption strategies will be integrated into three national policy areas (poverty reduction strategy paper, national adaptation programme and fisheries policy).
- Coastal dwellers will be sensitized to the importance of coral reefs and mangroves, and local communities will be trained and organized to carry out climate-resilient activities and natural resource management.
- Management of climate risk in coastal zones will be improved, including a fully functional comanagement system for MPAs. Three MPA co-management plans integrating climate change aspects are also to be completed, engaging around 5,000 people.
- Monitoring over the long term of rural coastal ecosystems will be improved, including fish stocks, fish species and their habitats. Updated biomass statistics and a marine ecosystem database will be produced; also, importantly, staff technical capacities will be strengthened.

4 *Centre d'études et de recherche pour le développement.*

Socio-economic impacts

Project expected impacts on livelihoods include:

- Coastal communities including many women will have access to climate-resilient infrastructure.
- Communities suffering from climate change impacts on their freshwater resources are expected to benefit from 30,000 cubic metres a day.
- PRAREV will explore the economic potential of harvesting seaweed, resulting from higher seawater temperatures.

©IFAD/Wairimu Mburathi

Ethiopia: Exclosure zones for inclusive livelihoods from improved biodiversity

Project area

Quick facts

Project name	Community-Based Integrated Natural Resources Management Project (CBINReMP)
Dates	2010-2017
Target audience	450,000 households
Financing	IFAD, GEF, Government of Ethiopia, Spanish Fund, smallholders

Development challenge

For local communities in Ethiopia's Lake Tana catchment area, livestock provide an important livelihood source. However, their need for pasture and a lack of appropriate institutional arrangements to manage rangelands sustainably have led to overgrazing and communal pastures becoming very degraded as a result. The sheer intensity of grazing can leave lands barren and devoid of vegetation, resulting in extensive soil erosion and greatly reducing the productivity of the land.

Compounding this effect is the lack of land tenure security that is brought about by government-controlled land rights; this leads to significant pressure on common pastures. Desertification is accelerated, together with a loss of biodiversity – for local communities, a healthy biodiversity has more than a purely aesthetic value. Without it, the overall reduction of productivity means less good quality pasture for their livestock; similarly, they need agricultural biodiversity in order to maintain access to quality feed over the longer term. A lack of biodiversity, therefore, sparks and entrenches local communities further in a cycle of poverty.

Project responses

The Community-Based Integrated Natural Resources Management Project (CBINReMP) aims to improve household incomes and food security as a result of sustainable land management and improved ecosystem integrity.

One of the CBINReMP components, "community-based integrated watershed management", aims at promoting sustainable natural resource management within the Lake Tana watershed through a mix of approaches, including participatory watershed, pasture and forest management, soil and water conservation, and biodiversity and ecosystem conservation. The Ethiopian Biodiversity Institute leads on this last area, and activities promote the conservation of agrobiodiversity and ecosystem integrity so as to minimize the loss of local varieties of agricultural field crops. The project also supports land registration (see photograph of "green book"), so that local communities have secure tenure and an incentive to invest in sustainable land management.

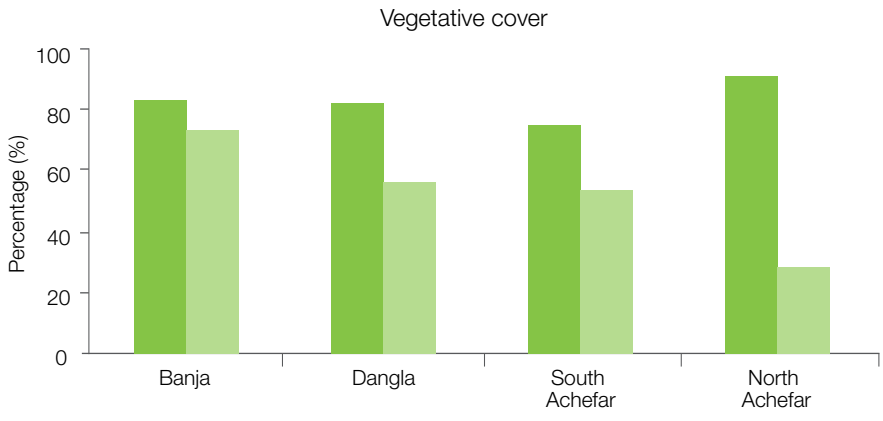
An important strategy is the implementation of "exclosure zones"; these are areas of highly degraded communal land where livestock grazing has been regulated by community agreements and soil conservation practices are implemented. The idea behind this practice is to improve the productivity of the land and sustainably increase natural resources for local communities. Exclosure zones are enforced

in the project areas through community by-laws, which state that after a growing season, farmers can cut fodder by hand and carry it home for their livestock. This "cut and carry" system has the benefit of reducing trampling and overgrazing. It also helps to encourage behavioural change in community members, towards stall feeding rather than grazing. Exclosure zones also use a "social fencing" system, in which infringements are punished with monetary fines and there is no physical fencing. This makes the practice cheap and appealing to users. Without the grazing pressures arising from open grazing systems, degraded lands and soils begin to renovate themselves. But do these exclosure zones actually work? Do they enrich local resources, or simply reduce land availability still further for farmers? Project biophysical assessments aimed to answer some of these questions.

Biodiversity impacts

- Biophysical assessments of the exclosure zones show increased biodiversity in grassland in exclosure zones when coupled with a cut and carry system and implemented over a large area. When it comes to woody species (over 1 metre in height), the assessment showed greater biodiversity as well as greater density per hectare across all exclosure zones compared with open grazing areas.
- Water infiltration and vegetative cover have both also increased; see Figures 2 and 3.

Figure 1: Vegetative cover in Lake Tana catchment exclosure zones and open grazing areas, April 2016



	Banja	Dangla	South Achefar	North Achefar
Exposure	82,700	81,600	75,000	91,000
Open grazing	72,670	56,000	53,000	27,670

Figure 2: Comparison of vegetative cover of exclosure zones and open grazing areas, North Achefar, Ethiopia

Open grazing area

Exclosure zone

The biophysical assessments, therefore, show that exclosure zones do limit available grazing land, but at the same time, render it more productive for livestock holders.

- Four gene banks, each representing a different specialization in indigenous species and located in different agroecological zones, will be in place by the end of 2016. The gene banks are staffed by technicians and will provide seed security and conservation of the landrace[5] at the local level, whereby if drought or any other hazards devastate the seeds, they can offer farmers an alternative seed source so as to minimize the impacts on farmers' livelihoods. The gene banks build on the successful experiences of the Ethiopian Biodiversity Institute; similar gene banks are currently operating with the active involvement of local communities in other regions of the country. Experience between these gene banks will be shared. The community is central to the success of the gene banks, and technical training on community gene bank management was therefore provided for almost 600 people. Awareness-raising of the initiative in the wider community and community seed multipliers complement the gene banks.
- With regard to *in situ* conservation,[6] seven sites have been selected, including in forests, demarcated and inventories of local species completed; management plans are also being developed for these sites. The Ethiopian Biodiversity Institute will link with Bioversity International to learn from best practices in the formulation of this kind of management plan and therefore

5 These are dynamic populations of a cultivated plant that has a historical origin, distinct identity and lacks formal crop improvement; they are often genetically diverse, locally adapted and associated with traditional farming systems (Camacho Villa et al., 2005).

6 This refers to the *"conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties".* The CBD (Article 8) states that this is a primary conservation strategy. Source: CBD, 1992.

©William Critchley

develop further institutional capacities in this area. These sites will also foster the evolution of the indigenous varieties over time, including those with particular resistance to climate change. The model for participatory forest management developed by the project is now being scaled up beyond the target areas.

- 19 wetland management plans have been developed to date. Bahir Dar University has led on these, and the project has financed an initial pilot project on fish ponds as part of an overall strategy to strengthen the link between wetlands conservation and income generation.
- The project aims to sequester 70,000 tons of carbon in cropped soil forests and pastures.
- In June 2015, Lake Tana was registered as a UNESCO Biosphere Reserve, an important step towards preserving the biodiversity in this ecosystem. The project is now exploring opportunities to build on its contribution to this achievement, and promote the area as a biosphere reserve with opportunities for poor rural communities to make a living in a sustainable way.

Socio-economic impacts

- The certification of land has increased tenure security, particularly for women and the most vulnerable households; as well as the expected benefits in terms of productivity, this has also led to increased willingness on their part to invest in sustainable land management practices.

- For local smallholders, an effective "cut and carry system" and exclosure zones have together led to an increase in fodder for their livestock, thereby increasing incomes and enhancing livelihoods.
- Access to clean and safe water has improved as a result of better-quality soil, brought about by enhanced vegetation and biodiversity; spring waters that had long been dried up have returned to project areas. Communities in isolated villages now also have access to clean water sources during the dry months.
- If exclosure zones are implemented correctly and local communities are educated and supportive of the principles, the apparently paradoxical practice of decreasing grazing lands to enhance livelihoods is indeed effective.
- Income-generating activities were supported for women, landless and near landless youth based on common interest groups, resulting in enhanced livelihoods and providing additional incentives for communities to adopt sustainable land management practices.

©IFAD/Robert Grossman

Iran: Agricultural biodiversity and farmers' knowledge for crop adaptation to climate change

Project area

Quick facts

Project name	Using Agricultural Biodiversity and Farmers' Knowledge to Adapt Crops to Climate Change (IFAD grant)
Dates	2010-2014
Target audience	500 poor farmers/pastoralists in marginal environments affected by climate change, producing feedstock as well as cash crops; women in target areas
Financing	IFAD, Global Crop Diversity Trust, smallholders

Development challenge

In Iran, as in many countries around the world, the planting of a limited variety of improved crop varieties in the place of traditional ones has resulted in a loss of crop genetic diversity from farmers' fields, where there is often no system to conserve and use local germplasm. Rural income disparities have been heightened in some countries, as larger producers are more easily able to adopt new technologies, while poorer farmers are often left behind. New technology is important, but the value of traditional knowledge and seeds of local landraces held by farmers is often overlooked (IFAD, 2011).

The reality of climate change means that farmers need access to seeds that are well adapted to increased climate variability and associated changes in the environment. Research also shows that the decrease in crop genetic diversity in the agriculture practised in more developed countries causes a severe threat to food security. In contrast, the conservation of biodiversity is a key part of the culture and risk management strategy for nutrition and food security of many communities in developing countries (Ceccarelli, 2009).

Traditional varieties, or "landraces", are a valuable source of new genes because they have evolved through a combination of adaptation to local environments and generations of farmer selection. It is widely recognized that traditional varieties often have much greater resilience to drought and other stresses, though yield less in favourable conditions. A related advantage for farmers in harsh climates is that they often do not need chemical pesticides and fertilizers, and less water.

However, this rich genetic diversity within traditional varieties is being steadily eroded, resulting in a major loss of the world's agrobiodiversity. National and international gene bank collections play an important role in avoiding the loss of landraces. On the other hand, by "freezing" seeds in gene banks they also "freeze" their evolution, and farmers are less likely to use them as they have less access. A lack of sufficient information on the characteristics of landraces is regularly cited as one of the constraints for their further development and use. Another factor is that evaluation of these varieties is often for traits that have not been selected in consultation with farmers, but decided by scientists without access to farmers' knowledge.

Box 3. Evolutionary plant breeding

In evolutionary plant breeding, crops with a high level of genetic diversity are subjected to the forces of natural selection. In a cycle of sowing and re-sowing seed from the plant population year after year, those plants favoured under prevailing growing conditions are expected to contribute more seed to the next generation than plants with lower "fitness". Thus, evolving crop populations have the ability to adapt to the conditions under which they are grown – variable and unpredictable environments. This resilience of evolving plant populations is seen as a major advantage under the predicted threats faced by agriculture, such as climate change.

Source: Adapted from "Evolutionary Plant Breeding in Cereals – Into a New Era" in *Sustainability* (T.F. Göring et al., 2011).

Although farmers possess considerable knowledge about landraces, this knowledge is rarely documented and is in danger of being lost because it is usually found with the eldest members of communities. Today, many scientists and policymakers advocate that, together with conservation in gene banks (*ex situ*), landrace diversity should also be conserved in their original locations (*in situ*), where plant populations can continue to evolve and benefit small farmers.

Project response

The grant was implemented by the Centre for Sustainable Development (CENESTA),[7] supported by the International Center for Agricultural Research in the Dry Areas (ICARDA), the Rice Research Institute of Iran, the departments of agriculture in project provinces, as well as farmers and their associations. The project built on the participatory plant breeding of barley, cereals, rice and wheat initiative in Iran, which started in 2006. To this methodology, the new grant introduced the concept of evolutionary plant breeding in order to rapidly increase agricultural biodiversity; see Box 3 for more about this approach. Again, a key ingredient was the introduction of farmers' experiences, so that the "evolution" is based on both science and the field, and becomes "evolutionary participatory plant breeding".

In evolutionary participatory plant breeding, farmers use the best seeds from a field trial with different varieties for the next planting season to create variety mixtures that were regulated. After only one season in Iran, this approach had yielded better results than choosing and cultivating only one line. It is this mixture that farmers reported as critical to greater resilience because of the increased diversity of genes, which gives mixed varieties an ability to evolve and adapt to different pressures.

7 CENESTA is a not-for-profit civil society organization that aims to re-empower indigenous peoples and local communities in Iran and beyond by promoting and supporting appropriate recognition of indigenous peoples' and community conserved territories and areas that emphasize nature conservation, community rights and sustainable livelihoods. CENESTA is a member of the International Union for Conservation of Nature, and it is accredited to the three Rio multilateral environmental conventions.

The goal of this follow-on project was to increase the climate change resilience of particularly poor and small farmers by increasing the adaptation of important food and feed crops to climate change through increasing agricultural biodiversity, indigenous knowledge and farmer participation. The initiative put farmers at its heart, and participatory plant breeding continued to be an important strategy. This again involved farmers in selecting seed varieties from gene bank collections, trialling them in their own fields, and evaluating their effectiveness. Iranian farmers initially evaluated landraces of barley and wheat from the ICARDA gene bank in their own fields, while scientists and facilitators documented farmers' knowledge and measured agronomic characteristics.

Farmers' experience with these trials stimulated their interest in extending the same approach to rice. Rice is a priority because it is one of the few crops in Iran where women farmers play a central role, and also because there is a premium for quality. Meetings between rice breeders and rice farmers helped them to begin working together, so that farmers could express their preferences. Even though participatory plant breeding has been practised for only about 20 years and by relatively few groups, the effects on both biodiversity and crop production are impressive (Ceccarelli, 2009).

The importance of heeding farmers' voices proved critical. For example, they raised two major problems that they felt needed to be overcome with regard to developing resilience in crops: water scarcity and strong winds. This important insight led to various rainfed varieties of wheat being trialled, with only 3-5 irrigations in the dry conditions of Garmsar, as compared with the more usual 10-12 irrigations. Furthermore, in order to withstand the strong winds that shatter barley heads, several varieties were deliberately harvested late so to identify the more resistant types. In Kermanshah, farmers planted evolutionary populations of wheat and barley in areas affected by mixed stresses, such as drought, strong wind, light soil, and low and high temperatures.

Biodiversity impacts

- A population of crops, which already have started to become better adapted to marginal conditions, high temperatures and drought have been made available to 500 farmers. Part of the collection of Iranian barley and wheat traditional varieties stored at ICARDA was repatriated and 160 accessions of each of the two crops were successfully multiplied in Garmsar (barley) and Kermanshah (wheat) in 2011. Part of this work was supported by a grant from the Crop Diversity Trust. In 2013, the work on rice started with mixtures of seed from Iranian landraces released by the Ministry of Agriculture and over 200 Iranian rice landraces from the International Rice Research Institute. In 2014, the first mixture of rice was cultivated in two farmers' fields in Mazandaran province, and the landraces of Iranian rice were multiplied at the Rice Research Institute of Iran.

Box 4. Women empowered by evolutionary and participatory plant breeding of wheat

Local artisanal bakery managed by women farmer-bakers in Semnan province and providing employment for them and three men. It produces traditional bread with evolutionary participatory plant breeding mixtures. This group confirmed that mixtures not only bring greater yield stability, but also better aroma and bread quality. These women are also connected with farmers in other provinces to exchange the best varieties for making bread, as well as baking techniques. Consumers repeatedly report not only better flavour, but also benefits for those with gluten intolerance. This experience has been repeated with similar results in Kermanshah province.

- The experience of rapidly boosting resilience and achieving stable yields by using evolutionary plant breeding and farmer experiences has been documented and widely shared. For example, in Iran there have been national news broadcasts and many workshops. At the international level, CENESTA has also written and presented widely, for example, at the Commission on Genetic Resources for Food and Agriculture in Rome (2013).

Socio-economic impacts

- Women's empowerment has improved due to an active focus on finding ways to benefit them. Although the introduction of cash crops and mechanization has led to women gradually virtually disappearing from agriculture, they are still very much present in rice cultivation in the provinces bordering the Caspian Sea, and rice varieties were therefore included in the field trials. Women were also engaged in discussions on rice quality. This project particularly worked to involve women with regard to bread quality, as many carry out small-scale breadmaking. They took part in discussions regarding wheat and flour quality, and helped to choose the wheat varieties and create wheat mixtures that gave them the best bread quality. See Box 4.
- Farmer empowerment has increased more broadly as a result of being able to have better crop yields, choose what to grow, and understand the importance of agricultural biodiversity. Farmers became familiar with various ways of managing agricultural biodiversity and started suggesting new mixtures according to their needs: as a result, there are now many different mixtures of wheat and barley cultivated by farmers.

©IFAD/Carla Francescutti

Mexico: Sustainable forest-based livelihoods to prevent habitat loss

Project area

Quick facts

Project name	Community-based Forestry Development Project in Southern States (Campeche, Chiapas and Oaxaca) (DECOFOS),[8] including "Mitigating Climate Change Through Sustainable Forest Management in the Southern States of Mexico", an IFAD-GEF project
Dates	2011-2016
Target audience	18,000 extremely poor forest households in Campeche, Chiapas and Oaxaca located in the southern states of Mexico
Financing	IFAD, GEF, Government of Mexico, smallholders

Development challenge

Mexico is distinguished as one of the world's "megadiverse" countries, a small group of countries that contain a disproportionately large proportion of the world's biodiversity. This entails considerable national responsibility for conserving this biodiversity for global benefits, as well as balancing this with national development goals.[9] The southern states of Campeche, Chiapas and Oaxaca are among those with the richest biodiversity, ranging from amphibians and birds to ferns to flowering plants (Ministry of the Environment and Natural Resources/*Secretaría de Medio Ambiente y Recursos Naturales*, 2010).

Mexico's rich and varied ecosystems also include precious forest resources, and provide important services to local communities. These include soil protection and climate change mitigation, protection from severe climate events as well as access to water. For indigenous peoples, who form a significant proportion of the populations in these states, these ecosystems also represent an important sociocultural heritage. In total, approximately 15 million people live in Mexico's forested areas, relying on related products for food, building materials, timber and medicinal plants.

These forests are also rich in biodiversity – for example, Mexico is home to over half of the world's species of pine and more than 150 species of oak (Global Forest Coalition, 2008). Mexico also boasts 3 per cent of the world's primary forests (FAO, 2013).

However, Mexico's abundant natural resources and forests are under threat from exploitation and climate change. Deforestation is also a problem. Another threat to biodiversity in Mexico's forests is loss of habitat due to poverty; many Mexicans still live in poverty, sometimes extracting timber and other materials from forests in unsustainable ways that irrevocably damage them (USAID, 2013). An interesting feature of Mexico is that many of the country's forests are under

8 *Proyecto de Desarrollo Comunitario Forestal de los Estados del Sur.*

9 The "Cancun Declaration" in 2002 established the Group of Like-Minded Megadiverse Countries in order to address common issues.

collective management by *comunidades* and *ejidos* (rural communities); however, many are living in marginal conditions and suffering from high levels of outmigration of young people.

Project responses

The project objective is to improve the living conditions of poor and extremely poor people living in forest areas of Campeche, Chiapas and Oaxaca through the development of sustainable and environmentally sound productive activities. The issue of conserving biodiversity has been explicitly mainstreamed into the project, and the main strategy is sensitization and investments in sustainable livelihoods for forest communities.

Target groups include the poorest and most marginalized populations and forest communities with or without land rights. The project aimed to formalize community management of forest resources in a sustainable way, and promote sustainable income-generating activities such as ecotourism and agroforestry. The project has specifically supported indigenous women's groups to market local forest products, such as wood handicrafts and silk garments. Finally, DECOFOS, with GEF support, has also invested in cleaner energy to reduce the pressure on the forest and contribute to climate change mitigation.

Biodiversity impacts

- One of the first activities was a participatory study to establish areas for community forest management. A collaboration agreement with the Secretariat of Environment and Natural Resources (SEMARNAT, which functions as Mexico's Environment Ministry) supported the authorization of community forest management programmes developed on the basis of these studies. These programmes included biodiversity conservation dimensions and forest certification processes.
- Further studies were carried out on restoring degraded areas and to identify alternative productive activities within forest ecosystems through establishing units of forest germplasm and nurseries for around 1 million native plant seedlings in order to contribute to removing greenhouse gases.
- Communities that depend on forest resources for their livelihoods were sensitized to the importance of these resources and the broader ecosystem for their well-being as well as that of future generations. Workshops on the sustainable use of forests and plants reached over 10,000 people (a third of whom were women). Specifically, groups charged with forest monitoring activities and community workers have been trained. María Ofelia Cauich, one of the indigenous women's group members from Campeche confirms, *"We have been taught to love the environment. To love the place in which we live. And to be proud of what we are."*
- The project has contributed to a significant "natural asset improvement and climate resilience", receiving the top rating from IFAD evaluators. Over 60 local development plans incorporating natural resource management and climate change dimensions were formulated by community organizations, and half have been implemented so far. These plans were used to mobilize

project investments in the improvement of natural resources for community food security in a sustainable way, such as through the practice of agroforestry. Over 160 agroforestry plots have been established over more than 1,200 hectares with locally appropriate combinations of forest trees, fruit trees and agricultural crops, and benefiting over 2,600 people. These plots alone have contributed to the removal of 12,700 tons of carbon dioxide from the atmosphere. The project has also exceeded its target for the number of community forest organizations effectively implementing climate change mitigation and adaptation actions – in February 2016 about 55 per cent were doing so.

- Agroforestry and other activities have contributed to the removal of just over 58,000 tons of carbon dioxide equivalents from the atmosphere.

Socio-economic impacts

- With the support of external actors, community groups were supported to carry out participatory context analysis, including:
  - stakeholder mapping (people with and without *ejido* rights, women, youth, private companies, public entities, local governments)
  - mapping of natural resources, including where they are located, their potential uses and potential income-generation activities
  - local decision-making processes
  - regulatory frameworks related to the use of forest resources at the local, state and national levels.

These capacities are important to enable communities to drive their own development in a sustainable manner. They were further strengthened with field trips to gather related data and jointly identify potential areas for conservation, housing, and where infrastructure needs to be improved. Over 170 local organizations now have improved management capacities.

- Support for rural microenterprises has created economic opportunities from forest resources. Almost 100 families were supported to formulate business plans, 60 per cent of them increased their household income by just over 30 per cent, and over 53 per cent have access to productive infrastructure. Service providers, including NGOs and universities, have been supported to improve their business development capacities in order to better serve poor rural entrepreneurs.
- Women have been empowered in various ways. For example, the project has already exceeded the 20 percent target for community organizations to have women leaders – 33 per cent have women in management. Women also increased their incomes by 10 per cent from implementing business plans supported by the project. In each project area, women have different approaches to income generation. In Campeche, non-timber forest products make a particularly significant contribution to household income-generation activities. Handicrafts are produced with leftovers, such as tree bark and small pieces from wood producers that are not sold on the market.

In Oaxaca, in the community of Santo Domingo Xagacia, the production of cultivated silk has been passed down by generations of women. DECOFOS has supported the whole production process from mulberry production to feeding silkworms, weaving and dyeing, as well as establishing a charter for the women's group.

In Chiapas, southeast of San Cristobal de las Casas, this Tzeltal village is well known for its local pottery. Indigenous women design their clay handicrafts in the traditional way; after drying them naturally, they create a wood fire around them rather than using a furnace.

DECOFOS has promoted efficient furnaces, designed by local artisan women. These furnaces use 40 per cent less wood, thereby reducing greenhouse gas emissions and contributing to forest conservation.

"The most important part is training and supporting these women, so they are empowered and more economically secure"
Aldonza Garcia, the DECOFOS project coordinator.

©IFAD/Susan Beccio

Sao Tome and Principe: Lifting livelihoods in buffer zones

Project area

Quick facts

Project name	Integrated Ecosystem Approach to Biodiversity Mainstreaming and Conservation in the Buffer Zones of the Obo and Principe Natural Parks, an IFAD-GEF intervention within "Participatory Smallholder Agriculture and Artisanal Fisheries Development Programme" (PAPAFPA) and subsequently the "Smallholder Agriculture Project" (PAPAC)[10]
Dates	2012-2017
Target audience	44 communities
Financing	IFAD, GEF, Government of Sao Tome and Principe, smallholders

Development challenges

In the Gulf of Guinea, separated from the African continent by a deep ocean, lie the islands of Sao Tome and Principe. Although one of the poorest countries in the world, the country is rich in globally outstanding ecosystems. They are home to high numbers of endemic species, and there is an estimated 40 square kilometres of primary forest on Principe, and 240 on Sao Tome.[11] The Obo and Principe Natural Parks were established in 2006 in order to conserve this natural heritage, and today they cover a third of the country.

But Sao Tome's forests have been severely degraded. Trees are being felled for construction and commercial purposes, and forested areas are being exploited for fuel by poor people without alternatives. Linked to this, there has been an escalation in the use of chain saws in wood processing, which causes massive waste. In addition, food crops are replacing trees on mountain slopes, thereby increasing the incidence of erosion and further degrading the forests. Coastal mangroves are also highly threatened habitats, yet these fragile ecosystems are among the most biodiverse in the country and provide critical services, including natural protection against coastal erosion and spawning grounds for fish and other marine species. Inevitably, the reduction of fish stocks in turn has a negative impact on the livelihoods of artisanal fishers. Mangrove degradation often leads to the proliferation of invasive and salt-tolerant vegetation, which further hampers the recovery of indigenous, slow-growing vegetation.

Unsustainable practices, such as grenades, fine meshes on fishing nets, and fishing with scuba diving equipment, are replacing traditional fishing techniques. These, together with overfishing, both harm the ecosystem's biodiversity and ultimately also fishing livelihoods by reducing available habitats for the very fish

10 Both acronyms are from the project names in French.

11 Islands of Sao Tome and Principe of the coast of Equatorial Guinea. WWF website. Accessed September 2016.

they need to catch. Professional artisanal fishers are ageing, while a new generation of inexperienced fishers is emerging. These fishers do not hold official licences, and they engage in fishing to complement incomes from small-scale agriculture or other sources of revenue.

Farmers' own perceptions that the climate is becoming hot and dry with more unpredictable rain is borne out by climate change projections of hotter temperatures and more rain falling more irregularly and heavily. This is having a negative impact on the main crops grown on the islands, especially cocoa and coffee. As crops and fish catches diminish, poor people are prompted to enter the forests to make ends meet – and a vicious cycle sets in.

Project responses

The project aims to promote integrated ecosystem management, including increased incomes for poor farmers through biodiversity friendly agricultural production in shade forests, marine areas, and mangroves in the buffer areas of the natural parks.[12]

The first base project (PAPAFPA) aimed to set up farmers' organizations on productive land in the buffer zones and provide communities living there with expertise and financial support for organic coffee, cocoa and pepper farming using appropriate methods. The project also builds on PAPAFPA's participatory approach, which allows stakeholders to have a voice along with government agencies and the private sector involved in value chains. Since 2015, the IFAD-GEF intervention has been integrated into a successor project (PAPAC), which is building on initial successes in boosting incomes through sustainable production and private-sector partnership in order to reduce pressure on precious natural resources and reduce poverty.

The project is shaped around two components focused on institutional support and integrated ecosystem management. "Institutional support for biodiversity mainstreaming" is about trying to mainstream biodiversity into the existing institutional framework by improving coordination between sectors, strengthening the legislative framework and regulations in the area of fisheries and hunting, and building capacities of the government and civil society. There is also a specific emphasis on integrating biodiversity into national sectoral policies.

The second component on "integrated ecosystem management for biodiversity conservation" targets five co-management areas covering approximately 18,000 hectares in and around the buffer zones of these protected areas. Sustainable livelihoods in the buffer zones are a key strategy, and participatory management plans are being developed to drive investments to conserve at least 5,000 hectares of shade forests. A focus on responsible tourism seeks to boost sustainable employment opportunities by creating a "tourism platform" with new services and packages. The platform has been designed with a strong partnership approach between government, civil society and the private sector.

12 The main purpose of a buffer zone is to insulate areas where biodiversity conservation is the primary objective from potentially damaging external influences, and particularly from those caused by inappropriate forms of land use. This, therefore, allows for a range of sustainable human activities. Source: Review of Experience with Ecological Networks, Corridors and Buffer Zones (CBD, 2006).

Sao Tome is one of the world's biodiversity hotspots, and one in ten plants are found nowhere else in the world. ©IFAD/Susan Beccio

Biodiversity and environmental impacts

- Working groups for terrestrial and marine biodiversity are in place. The terrestrial working group meets every month, but the marine biodiversity working group has yet to be fully functional. Learning visits, for example to Cameroon, have allowed government partners to see successful practices elsewhere.
- Five co-management areas, including 44 target communities with 5,000 hectares of forest, were defined through a public consultation process. The co-management plans have been developed and training of community leaders on their implementation is planned. In 2015, 2,000 smallholders from these areas were targeted with training on how to reduce erosion. Maps of these areas containing bookmarks through the use of a global information system are available. The project is currently undertaking the physical marking of boundaries, and about 60 percent of these in Obo Park are in place.
- Two marine protected areas (MPAs), covering 2,000 hectares off the two islands of Sao Tome and Principe, have been identified and mapped together with an Italian NGO. The MPAs have been recognized by fishers and the Directorate of Fisheries. Today, institutional plans setting out their role and functions have been submitted for official approval, and support is being sought for the first action plan. The experience of mapping out the MPAs was in itself a learning process, and has stimulated the directorate to already identify other potential areas (e.g. Santana). The directorate has also taken the initiative to carry out training for ten fishing associations on sustainable fishing and management of fish resources.
- Policy impacts also include the development of a wildlife decree that establishes legislation on hunting rights; it has been approved and

promulgated by the government. An evaluation of fish stocks around Sao Tome and Principe islands was conducted with the support of the Directorate of Fisheries, and efforts are under way to implement its recommendations.

- 240 hectares of mangroves are expected to benefit from improved management. So far, mangrove management committees have been set up for both mangroves targeted by the project, in Praia das Conchas and in Malanza. An NGO has trained managers and mangrove users, as well as tourism associations operating in mangroves.
- The platform for sustainable tourism has been set up, and collaboration agreements are in place with local NGOs, the University of Lisbon, the Directorates of Fisheries, Forests, Natural Resources and Energy, Obo Natural Park, and Tourism. The platform brings together 40 tourism operators and has an action plan for 2016. As well as receiving some support from the GEF, the platform also collects monthly contributions from members. In partnership with an Italian sustainable certification organization,[13] it has developed a "Cocoa Route" that allows visitors to find out about cocoa production and engage with local communities.

  The platform has also has carried out rehabilitation work and labelling in the botanical garden of Bom Successo, the headquarters of the Obo and Principe National Park and centre for related services. With over 400 species of flora and over a thousand samples of plants, the botanical garden and herbarium was a centre for education and conservation science, used by teams of researchers from all over the world. The structure includes a small visitor centre and basic accommodation facilities for tourists, but it had fallen into some disrepair. GEF support will also enable a new tourist centre at Nova Moca to be built, on the route to Bom Successo.

Socio-economic impacts

- Twenty-six community microprojects have been identified for investments, reaching about 40 communities in five co-management areas; indeed the projects were identified during the formulation of the co-management plans.
- Twelve microprojects are being implemented through four cooperatives established under PAPAFPA. The Cooperative for Quality Cocoa exports, for example, is implementing an innovative project to transform cocoa pulp, a by-product of cocoa processing, into jelly for sale in local minimarkets and for distribution to schoolchildren because of its nutritional value. Some projects are piloting organic robusta coffee plantations in humid areas, which offer few other income-generating opportunities (Colonia Açoreana and Santa Catarina). The Cooperative for Export and Market of Organic Cocoa (French acronym "CECAB"), which was created under PAPAFPA with IFAD, NGOs and private-sector support, has also successfully been renovating cocoa plantations; see Box 5.

13 *Istituto per la Certificazione Etica ed Ambientale.*

Box 5. Sao Tome's cocoa cooperatives provide cash and trees

Sao Tome's Cooperative for Export and Market of Organic Cocoa (CECAB) has successfully been renovating cocoa plantations, providing both shade trees and higher incomes for women and men. In 2015, CECAB supported the following, often coming in over initial targets:

- 48,000 unproductive trees were regenerated in 2015
- 200 hectares were redensified through over 50,000 grafted planted by farmers almost 6,000 shade trees were planted
- Over 1,000 tons of dry cocoa were exported (up from 2014), at an increased average price of 2,705 euros per ton.

All this translates into better livelihoods for CECAB's 34 associations and over 2,000 members, including 693 woman-headed households. This helps to reduce their need to encroach on resources in the national park, and thereby contributes to the conservation of the country's precious biodiversity.

Conclusions and the way forward

The case studies show how IFAD has been tackling the challenges of protecting and enhancing ecosystems while increasing their benefits to smallholders and globally. The case studies are from various contexts, but they have a number of common features. These include:

- Reducing direct pressures on biodiversity through sustainable smallholder agriculture
- A participatory approach that builds the existing capacities of rural people and empowers them
- Promoting biodiversity, including agricultural biodiversity, as a strategy to increase smallholder's resilience to climate change
- Actively seeking out benefits for women and indigenous peoples (see Boxes 6 and 7).

Box 6. Women and agricultural biodiversity

"The role of women in agriculture is essential and complementary to that of men. Women are often the natural custodians of biodiversity, and they are the ones who by vocation or necessity hand down recipes and traditional ingredients. They conserve different species in their home gardens, manage community seedbanks and feed their families."

Ann Tutwiler, Director-General of Bioversity International, speaking at an event on agricultural biodiversity, value chains and women's empowerment at Expo 2015, Milan.

Box 7. Indigenous peoples and biodiversity conservation

There is a strong correlation between the location of indigenous peoples' territories and the areas with the highest biodiversity and natural resources conservation. Scientific evidence indicates that the territories in which indigenous peoples have special claims harbour exceptionally high levels of biodiversity and that human cultural diversity is associated with the remaining concentrations of biodiversity. The world's biodiversity will only be effectively preserved by preserving the diversity of cultures and vice versa.

In their role as stewards of biodiversity and holders of traditional knowledge relevant for conservation and sustainable use, indigenous peoples have a unique contribution to make in mitigation and adaptation initiatives aimed at biodiversity conservation.

Adapted from *The Traditional Knowledge Advantage. Indigenous peoples' knowledge in climate change adaptation and mitigation strategies* (IFAD, 2016c).

Looking ahead, IFAD will seek to further enhance its contribution to biodiversity conservation and the Aichi targets, going beyond "doing no harm" and advocating for active engagement in the projects it supports. It will build on established partnerships in this area, such as with the GEF, Bioversity International, and national governments and research organizations – and seek new ones. Working with its partners, as well as with smallholders themselves, IFAD is working to support both "life above land" and "life below water", corresponding to the Sustainable Development Goals 14 and 15, respectively. IFAD's multidimensional approach to promoting biodiversity also helps countries to achieve other Sustainable Development Goals (SDGs).

Given its mandate to eradicate rural poverty and food insecurity, and by investing to raise smallholder productivity and incomes, IFAD also contributes to other SDGs, such as SDG1 (no poverty), 2 (zero hunger), 10 (reduced inequalities), 5 (gender equality), and 8 (decent work and economic growth).

References and documents consulted

Appelquist and Balstrøm. 2014. *Application of the Coastal Hazard Wheel Methodology for Coastal Multi-hazard Assessment and Management in the State of Djibouti.*

Bioversity International. 2015. *Agricultural Biodiversity, Value Chains and Women's Empowerment.* Agenda for event at Milan Expo 2015.

Camacho Villa et al., 2005. Defining and identifying crop landraces. *Plant Genetic Resources: Characterization and Utilization.*

CBD. Undated. *Biodiversity 2011-2020 and the Aichi Targets. Living in Harmony with Nature.*

CBD. 2006. *Review of Experience with Ecological Networks, Corridors and Buffer Zones.*

CBD. 1992. *The Convention on Biological Diversity.*

Ceccarelli. 2009. Evolution, Plant Breeding and Biodiversity. *Journal of Agriculture and Environment for International Development 2009,* 103 (1/2): 131-145.

CONAFOR. 2010. *El Ambiente en números.*

FAO. 2013. *Global Forest Resources Assessment 2010.*

Global Forest Coalition. 2008. *Forests and the Biodiversity Convention Independent Monitoring of the Implementation of the Expanded Programme of Work in Mexico.*

Göring. T.F. et al. 2011. "Evolutionary Plant Breeding in Cereals – Into a New Era" in *Sustainability.*

IFAD. 2010. Climate Change Strategy.

IFAD. 2011. Environment and Natural Resource Management Policy: Resilient Livelihoods Through the Sustainable Use of Natural Assets.

IFAD. 2015. The Mitigation Advantage: Maximizing the Co-benefits of Investing in Smallholder Adaptation Initiatives.

IFAD. 2016a. IFAD Strategic Framework 2016-2025. Enabling Inclusive and Sustainable Rural Transformation.

IFAD. 2016b. (Independent Office of Evaluation). Environment and Natural Resource Management Evaluation Synthesis.

IFAD. 2016c. The Traditional Knowledge Advantage. Indigenous Peoples' Knowledge in Climate Change Adaptation and Mitigation Strategies.

Millennium Ecosystem Assessment. 2005. Ecosystems and Human Well-being. Biodiversity Synthesis.

USAID. 2013. Mexico Tropical Forest and Biodiversity Assessment.

Websites accessed July-November 2016

IFAD. 2016. Five "super" crops that can change the world.

UN. Convention for Biological Diversity.

WWF. Islands of Sao Tome and Principe of the Coast of Equatorial Guinea.

Annex: Alignment of IFAD case studies and Aichi targets

The table below presents only the relevant targets, and therefore not all are included.

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably. ***All case studies.***

Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems. ***All case studies, especially at the local level.***

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced. ***All case studies.***

Target 6: By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems, and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits. ***Djibouti and Sao Tome.***

Target 7: By 2020, areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity. ***All case studies.***

Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity. ***All case studies, through sustainable land management measures.***

Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning. ***Djibouti and Sao Tome.***

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed,

ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes. ***Djibouti, Ethiopia, Mexico, Sao Tome.***

Target 13: By 2020, the genetic diversity of cultivated plants, and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity. ***Ethiopia and Iran.***

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable. ***All case studies.***

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification. ***Most case studies contribute, and IFAD has committed to assessing these co-benefits,[14] but Mexico has a specific focus on reducing emissions.***

Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation. ***Iran.***

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity-building

Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities at all relevant levels. ***All case studies.***

14 See *The Mitigation Advantage: Maximizing the Co-benefits of Investing in Smallholder Adaptation Initiatives* (IFAD, 2015).

ASAP Donors and Partners

IFAD's Adaptation for Smallholder Agriculture Programme (ASAP) is a multi-donor programme that helps smallholder farmers cope with the impacts of climate change so they can increase their resilience.

As of 1 October 2015, the total commitments from nine donor countries (Belgium, Canada, Finland, Netherlands, Norway, Republic of Korea, Sweden, Switzerland and United Kingdom) amount to US$366,498,858.

Canadian International Development Agency | Agence canadienne de développement international

FORMIN.FINLAND.FI

MINISTRY FOR FOREIGN AFFAIRS OF FINLAND

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

THE BELGIAN DEVELOPMENT COOPERATION .be

Flanders
State of the Art

KOICA
Korea International Cooperation Agency

NORWEGIAN MINISTRY OF FOREIGN AFFAIRS

Ministry of Foreign Affairs of the Netherlands

REGERINGSKANSLIET
Ministry for Foreign Affairs
Sweden

UKaid
from the British people

International Fund for Agricultural Development
Via Paolo di Dono, 44 - 00142 Rome, Italy
Tel: +39 06 54591 - Fax: +39 06 5043463
E-mail: ifad@ifad.org
www.ifad.org
www.ruralpovertyportal.org
ifad-un.blogspot.com
www.facebook.com/ifad
instagram.com/ifadnews
www.twitter.com/ifadnews
www.youtube.com/user/ifadTV