



RESILIENT, HEALTHY, AND SUSTAINABLE FOOD SYSTEMS FOR
BIODIVERSITY CONSERVATION AND USE 2030 ACTION TARGETS:

A GLOBAL COLLECTION OF GOOD PRACTICE CASES

Citation:

Bioversity International; Global Crop Diversity Trust; United Nations Environment Programme; World Wildlife Fund International (2022) Resilient, healthy, and sustainable food systems for biodiversity conservation and use 2030 Action Targets: A global collection of good practice cases. Rome (Italy): Alliance of Bioversity International and CIAT. 86 p.

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ACKNOWLEDGEMENTS:

We would like to thank the following colleagues for the valuable inputs provided to this report:

CGIAR:

Adam Drucker, Beatrice Ekesa, Carlo Fadda, Carolina Navarrete, Dejene Menjistu, Devra Jarvis, Isabel Lopez Noriega, Jefferson Valencia, Keyu Bai, Louis Reymondin, Muhabbat Turdieva, Nadia Bergamini, Nicole Demers, Paola De Santis, Prem Mathur, Ronnie Vernooy, Rose Nankya, Sebastien Carpentier, Thuy Nguyen, Yosef Gebrehawaryat, Wendy Francesconi (Alliance of Bioversity International and CIAT – CGIAR), Chris Dickens (IWMI), James Stapleton and Stef De Haan (CIP), Alice Muchugi and Kindu Mekonen (ILRI).

Crop Trust:

Luigi Guarino, Sarada Krishnan, Laura Marshall, Hannes Dempewolf, Isbandiyar Valiyev

UNEP:

Angela Prias, Anna Kontorov, Atifa Kassam Manji, Daniel Pouakouyou, Jessica Troni, Marcus Nield, Marieta Sakalian, Marta Moneo Lain, Oscar Ivanova; and UNEP partners: Agnes Fonteneau, Devendra Gauchan, Elisabetta Rossetti, Fatima Ezzahra Harga, Laura Lewis, Lindsey Hook Paolo Colangelo, Rami Khalil (Platform for Agrobiodiversity Research).

WWF:

Abhinand Aryapratheep (WWF Thailand); Alissa Wachter (WWF International); Anna Richert (WWF Sweden); Angus Bruns (WWF South-Africa); Barbara Bendandi (WWF Germany); Cristine Eghenter (WWF International), Eleni Svoronou (WWF Greece), Happiness Genes (WWF Tanzania); Melody Melo-Rijk (WWF Philippines), Ply Pirom (WWF Thailand); Severin Kalonga (WWF Tanzania); Tanja Ploetz (WWF Germany)

We thank the Alliance of Bioversity and CIAT and WWF Germany for their financial contribution.



Wamena coffee is an organic arabica coffee from central range montane forest of New Guinea, cultivated by local communities without insecticide and chemical fertilizers.

INTRODUCTION

This guide is a showcase of good practices from around the world that use food systems as a pathway to meet many interconnected biodiversity-related targets in the Post-2020 Global Biodiversity Framework.

Intended for practitioners and policymakers, it does not set out a ‘one size fits all’ approach but rather good practice examples that have the potential to be adapted and scaled in a variety of food systems around the world.

The post-2020 Global Biodiversity Framework sets out an ambitious plan to implement broad-based action to transform society’s relationship with biodiversity, ensuring that by 2050 the shared vision of ‘living in harmony with nature’ is fulfilled. To live in harmony with nature and deliver food and livelihood security to millions of vulnerable people around the world, we must conserve and sustainably use biodiversity in our food systems, and better integrate and align efforts to conserve both agricultural and wild biodiversity rather than pursuing them separately.

That today’s unsustainable agricultural practices are both driving and suffering from the effects of climate change, biodiversity loss, and ecosystem degradation is not under dispute. Modern food systems also invest in and rely on just a narrow handful of plant and animal species. This high-risk approach neglects the myriad of species, breeds, and strains of crops, animals, and fish at the heart of our food systems that boost resilience and provide diverse diets that are nutritious, sustainable, affordable, acceptable, safe, and accessible to all. At the same time, wild biodiversity that contributes to healthy ecosystems and ecosystem services that are critical to food

production, such as pollination and soil fertility, is also at risk from agriculture, for example, through land conversion.

The good news is that there are many good practices from around the world that use and conserve biodiversity to replenish ecosystem health and restore forest systems; deliver inclusive development for rural communities and Indigenous Peoples; increase productivity and resilience to climate change in production systems; help drive consumer shifts toward healthy eating for a healthy planet. You will also find examples of efforts to conserve traditional varieties of crops and associated knowledge that may hold unique genetic keys to adapt our food systems now and in the future. Many of these examples are supported by strong innovative enabling policies, at regional, national, and local levels, that incentivize the sustainable use and conservation of biodiversity for resilient, healthy, and sustainable food systems.

Each section in the guide is mapped to its potential to deliver across Action 2030 Targets as set out in the first draft of the [Post-2020 Global Biodiversity Framework \(CBD/WG2020/3/3\)](#). It is important to note that using and conserving biodiversity in food systems delivers across many objectives of the CBD Framework simultaneously so this is not intended as a definitive list but rather as a useful overview of ways that sustainable food systems can deliver across many objectives of the framework.

RECOGNIZING THE ROLE OF BIODIVERSITY IN UNDERPINNING THE PRODUCTIVITY AND RESILIENCE OF AGRICULTURAL AND OTHER ECOSYSTEMS IS A CRITICAL FIRST STEP TOWARDS TRANSFORMING THE WAY WE PRODUCE FOOD WHILE GUARANTEEING FOOD SECURITY.

**ELIZABETH MREMA, EXECUTIVE SECRETARY,
CONVENTION ON BIOLOGICAL DIVERSITY**

1. REDUCING THREATS TO BIODIVERSITY

Target 2: Ensure that at least 20% of degraded freshwater, marine and terrestrial ecosystems are under restoration, ensuring connectivity among them and focusing on priority ecosystems.

Target 3: Ensure that at least 30% globally of land areas and of sea areas, especially areas of particular importance for biodiversity and its contributions to people, are conserved effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures and integrated into wider landscapes and seascapes.

Target 4: Ensure active management actions to enable the recovery and conservation of species and genetic diversity of wild and domesticated species, including through ex situ conservation, and effectively manage human-wildlife interactions to avoid or reduce human-wildlife conflict.

2. MEETING PEOPLE’S NEEDS THROUGH SUSTAINABLE USE AND BENEFIT-SHARING

Target 9: Ensure benefits, including nutrition, food security, medicines and livelihoods for people, especially for the most vulnerable through sustainable management of wild, terrestrial, freshwater and marine species and protecting customary sustainable use by indigenous peoples and local communities.

Target 10: Ensure all areas under agriculture, aquaculture and forestry are managed sustainably, in particular through the conservation and sustainable use of biodiversity, increasing the productivity and resilience of these production systems.

Target 13: Implement measures at global level and in all countries to facilitate access to genetic resources and to ensure the fair and equitable sharing of benefits arising from the use of genetic resources, and as relevant, of associated traditional knowledge including through mutually agreed terms and prior and informed consent.

3. TOOLS AND SOLUTIONS FOR IMPLEMENTATION AND MAINSTREAMING

Target 14: Fully integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies, accounts and assessments of environmental impacts at all levels of government and across all sectors of the economy, ensuring that all activities and financial flows are aligned with biodiversity values.

Target 16: Ensure that people are encouraged and enabled to make responsible choices and have access to relevant information and alternatives, taking into account cultural preferences, to reduce by at least half the waste, and where relevant, the overconsumption, of food and other materials.

1. REPLENISHING ECOSYSTEM HEALTH AND RESTORING FORESTS, LANDSCAPES, AND WATER SYSTEMS

Targets 2, 3, 4, 9, 10, 13, 14

Ecosystem services are the benefits that people obtain from nature such as clean water and carbon sequestration. In agriculture, ecosystem services include pollination, natural pest and disease control, nutrient cycling, and more. Yet despite the importance of ecosystem services to farming communities, markets, policies, and research often focus on specialization and economies of scale where biodiversity is seen as an impediment to crop productivity and farm income.

Using agricultural practices based on biodiversity – genetic varieties, species, soil, and landscapes – can increase resilience in our food production systems and contribute to restoration efforts, for example, by reducing soil erosion. At the same time, restoration efforts increase habitats for wild species of benefit to food production systems such as pollinators, pest predators, and crop wild relatives.



Vietnam farmer Bearing seedlings of rice to plant, Asian farmer Bearing rice seedlings on the back before the grown in paddy field.

1.1 E-flows in the Limpopo Basin in Botswana, Mozambique, South Africa, and Zimbabwe



Takeaways

- Better understanding and management of e-flows in river basins can increase freshwater supplies, including for irrigation, and protect freshwater ecosystems and the services they provide.
- Successful forest, water system, and landscape restoration often requires working with transboundary partners to understand needs and overcome challenges. In the Limpopo Basin, this included mapping both physical attributes and cultural needs for shared aquifers.
- Incentives for farmers to support agricultural water management is critical. This project supported adapted tools to optimize groundwater use for irrigation which saved farmers costs and water, and enhanced production.

The project

The Limpopo River basin in southern Africa is shared by Botswana, Mozambique, South Africa, and Zimbabwe. It is the driest it has been for 35 years with groundwater supplies held in porous rock under the ground – aquifers – at risk of running low, especially at times of drought. [This project](#) has been set out to deliver ecosystem health, boost biodiversity and support the livelihoods of rural communities that depend on the river basin for their water security, for example, for irrigation of their crops, through better understanding and management of environmental flows (e-flows). E-flows are the river flows needed to support vegetation, fish, and macroinvertebrates like snails, worms, and crayfish in both the river and its margins, which in turn provide ecosystem services, like nutrient recycling. By studying the volume, timing, and duration of e-flows it is possible to strike a balance between water resource development and the protection of freshwater ecosystems.

Why it matters

Water resources provided by the Limpopo Basin are socially, economically, and ecologically valuable, supporting communities that are highly vulnerable to the effects of climate change. In 2016, reduced rainfall led to the Limpopo Province in South Africa being declared a disaster area with widespread crop failure and economic hardship. Other threats include a growing population which is driving greater demand for the water, and pollution caused by excessive upstream use – major cities including Johannesburg, Pretoria, and Gaborone lie upstream. The water resources are also over-utilized, primarily for irrigation, and the goods and services provided by the biodiversity and ecosystems of the rivers in the basin are affected.

Good practices

- The project carried out a risk assessment to predict how changes in the river’s flow affect the various ecosystem services that people depend on, as well as local biodiversity. The assessment included field surveys and looked at historical data in 27 risk areas to inform a plan to sustainably protect and use the water resources.
- Findings showed that the risk of altered flows into the ecosystem and potential negative impacts are high where the sub-basin areas are in a high-risk, unsustainable, and impaired state – almost 68% of the basin falls under this category, with high risk to ecosystem services identified in 27% in the upper and middle parts of the basin.
- Implementing e-flows can reduce risks, potentially returning more than 80% of the area to a sustainable state, for example, through better management of groundwater. The project worked with transboundary partners to understand better the needs and challenges of sustainable water management in shared aquifers, for example, the Ramotswa Aquifer, which lies between South Africa and Botswana. Activities included mapping both physical attributes and cultural needs.

- To support agricultural water management, the researchers adapted a set of tools that local farmers could use to optimize their groundwater use for irrigation. Using soil moisture probes and nutrient measurements, farmers were able to save up to 40% of water, 30% of energy (for pumping groundwater), and 80% of fertilizers on their crops and enhanced crop production creating savings and additional incomes for the farmers.
- Currently, the countries in the Limpopo Basin have different policy requirements relating to the provision of e-flows, but all are committed to protecting the aquatic ecosystems to ensure a sustainable future and to meet water-resource-sharing treaties. While there is only detail about environmental flows in the South African legislation, the basic framework exists in all riparian countries.
- Next steps include testing high-tech modern digital methods to contribute to aspects of assessing and implementing e-flows as well as other parts of water resource management.



E-flows in the Limpopo Basin have four riparian countries: Botswana, Mozambique, South Africa and Zimbabwe.

This project was carried out by the International Water Management Institute (IWMI) in partnership with Rivers for Life and the University of Mpumalanga in South Africa and supported by USAID with help from national departments responsible for water and sanitation including the Limpopo Watercourse Commission.



1.2 Community Engagement for Large-scale Forest Restoration Efforts in Tanzania

Takeaways

- Civil Society Organizations can be an effective entry point for community engagement, needs mapping and capacity building in forest landscape restoration projects.
- Community volunteers, including women, who receive training on improved farm practices, can be supported and incentivized to set up their own forest-friendly farms to demonstrate agroecological production practices and serve as a means of empowerment and livelihoods.
- Value addition activities, for example, seed oil production, can also serve as incentives for communities to transition to sustainable agricultural practices in the long-term.

The project

Through its [Trillion Trees project](#), WWF in partnership with BirdLife International and the Wildlife Conservation Society is leading large-scale efforts to maintain multiple forest functions, prevent the loss of globally important biodiversity, and improve the livelihoods of forest-dependent communities through climate-smart, sustainable agriculture. The project is working in the Usambara mountains which cover an area of 3,500 km² and include the Eastern Arc Mountain forests, nature reserves, and major rivers which supply water essential for agriculture, hydropower, human use, livestock, and wildlife. WWF is also supporting forest restoration efforts in the Kilwa and Kisarawe districts in southeast Tanzania.

Why it matters

Forest areas in Tanzania are being adversely impacted by deforestation and degradation, in particular, for charcoal production which is a source of fuel and income for many households, and for agriculture, which is the mainstay of the Tanzanian economy and the country's largest employer. The degradation of the landscape is harming the communities who depend on it for their livelihoods, well-being, and food security, for example, in the Kilwa districts, the loss of nutrients in the soil means that crop farming is not viable beyond a season or two, so plots are abandoned, and new forest areas cleared to serve as new ones.

Good practices

- Civil Society Organization (CSO) engagement through a stakeholder mapping exercise with five CSOs to ensure enhanced community representation and inclusion in the restoration project. CSOs were also invited by WWF to attend an engagement planning workshop with government agencies, NGOs, research institutions, and community groups. Two were selected to receive financial support through grants while the others continued to be included in the planning, implementation, and monitoring of their forest landscape restoration, building capacity in conservation work, and financial management.
- Capacity building to train farmers on how to combine cropping practices to help reduce soil erosion and water runoff, increase soil fertility, and increase yields to reduce the practice of shifting to new plots.
- Community members from six project sites, in particular, vulnerable women, were encouraged to establish demonstration farms of sunflower, sesame, sorghum, or cassava on previously abandoned farmlands to boost incomes and as a means of empowerment beyond the project, for example, through small-scale oil production.
- Engagement with six schools as an entry point reached young people and households with information and other benefits on restoration, for example, through tree planting and management activities. The project expects to raise 30,000 tree seedlings that will be planted around and within the East Usambara mountains.



A restored Ngitili system in the Shinyanga Region, Tanzania.

© Lalisa A. Duguma/WWF

This WWF-led project is carried out in partnership with Tanzania Forest Services and is part of the large Forest Landscape Restoration (FLR) program in the East Usambara funded by the Finnish Ministry of Foreign Affairs (MFA). Find out more about the [Trillion Trees](#) project.

Checklist:



Community
engagement



Capacity
Strengthening

1.3 Diverse Cropping Systems as an Entry Point for Forest Restoration in Thailand

Organization:



Takeaways

- Food production of diversified local varieties and perennial crops can help restore degraded lands and forests, protect biodiversity and pollinators, and restore carbon back into the soil. Family farmers that adopt biodiversity-based approaches can be powerful agents of change with the right support.
- To encourage farmers to permanently make the shift from intensive agrochemical monoculture practices to using agroecological approaches requires educational outreach, capacity strengthening and incentives including financial support, land, seedlings, value chain development and carbon credits.
- FLR349 SE (Social Enterprise), a bankable business model, was recently established to develop a self-sufficient value chain to remove reliance on public funding, through the 'Food for Forests' umbrella. Products include 'Vegetables for Forests,' 'Chicken Eggs for Forests,' and 'Coffee and Cacao for Forests.'

The project

[Three Forests, Four Benefits](#) is a WWF conservation project that works in partnership with farmers, the private sector, the public sector, and civil society organizations, to implement agricultural practices for environmental restoration. It is part of an initiative of His Majesty King Bhumibol Adulyadej which includes a Forest and Landscape Restoration Fund and approach (FLR349) to restore degraded land through the development of sustainable value chains which empower rural communities. Activities include planting mixed systems of fruit trees, vegetables, and herbs which help replenish the soil, contribute to ecosystem health, and increase resilience in food systems. This regenerative agricultural system also offers increased yields and resilience to climate instability and improves the health and vitality of farming communities. The project is focused on the Chiangmai and Nan provinces in northern Thailand which is an area dominated by watershed forests and rich in biodiversity, but which is being encroached upon for cash crop plantations.

Why it matters

Approximately 800,000ha of forest in Thailand has been destroyed so far for cash crop cultivation which is primarily maize for animal feed to support the country's meat export industry. This has reduced the ability of smallholder producers in the forest to be able to sustain their livelihoods putting food security at risk. As well as forest clearance, land preparation includes open burning of agricultural residues which leads to heavy haze pollution. Over the past decades, maize has become a major driver of deforestation in northern Thailand, as well as in neighboring Myanmar and Lao PDR.



In the Nan Province, known as a monoculture farming area, a conservation group called 'Jorb Plien Nan' is working to turn 'bald mountains' into rich watershed forests again.

© Baranee Temboonkiet/WWF

Good practices

- The economic trade-off between the natural capital of a healthy landscape against primary food production is mitigated through the FLR349 Fund. The fund provides each smallholder farmer with 1-1.5 ha of land and a subsidy of \$390 ha per year for five years to support the transition to sustainable farming and increase their self-reliance beyond the project. It costs \$5,859 per ha for 6 years of operation to sustain the restoration program which includes support such as capacity building and seedlings. The funding is sourced through crowdfunding and private-sector donations.
- Seedlings include a diverse mix of food and cash crops such as avocado, cacao coffee, lychee, and mango, that grow within the forest landscape, can support livelihoods, and are appropriate for the land, for example, trees and plants that provide moisture and trap water or that can grow under the shade of large trees.
- Other incentivizing schemes include a carbon credit scheme for sustainable agriculture transformation, which is currently under feasibility study (2022) with a multi-stakeholder partnership. The scheme will use remote sensing technologies in the measurement of carbon sequestration in the project areas.
- FLR349 SE (Social Enterprise), a bankable business model, was recently established to develop a self-sufficient value chain to remove reliance on public funding, through the 'Food for Forests' umbrella. Products include 'Vegetables for Forests,' 'Chicken Eggs for Forests,' and 'Coffee and Cacao for Forests.' Through the value chain, FLR349 SE assists farmers to market and brand products, and distribute them to the right markets, helping to connect producers with consumers.
- A traceability platform will be developed (currently in progress) to link stakeholders along the supply chain and enable them to access information and remote sensing data regarding the food supply chain, make donations to support the operation, and track the progress of reforestation efforts. Clear indicators, such as carbon sequestration and social return on investment will help ensure good socio-economic and environmental benefits from the project.
- WWF Thailand has also supported and worked directly together with smallholder farmers, community-based organizations, and local social enterprises to build capacity and skills in implementing agricultural approaches for ecological restoration.

Highlight: A Healthy Social Return on Investment

The project has provided support to and worked in partnership with smallholder farmers, cooperatives and local administrative organizations at project sites. Between 2018 – 2022, a thousand smallholder farmers have benefited from the project. Workshops have been conducted to validate and share farming practices that better protect the environment. More than 200 ha of maize plantation have been successfully converted from monoculture to agroecology so far serving as model sites for sustainable agriculture and supply chains. Once established, the FLR349 model provides smallholder farmers with multiple times the income compared to what they were earning through monoculture agriculture, increasing their self-reliance.

Impact assessments show how that for every 1 Thai baht (USD 0.026) invested, social benefits of 8.367 Thai baht (USD 0.22) are generated including increased farmer knowledge and income, a decrease in environmental management cost, increased access to affordable organic food and a reduction in government healthcare expenses from reduced agrochemical use. It also shows potential to contribute to national GHG mitigation strategies and forest restoration targets. Agroecology has proven climate mitigation potential. A study commissioned by the project found that while maize plantation releases high amount of carbon, agroecology systems store more carbon than they release, demonstrating the high potential of scaling out implementation of the project for climate mitigation.

Checklist:



Community Inclusion



Capacity Building



Public-Private Partnerships

1.4 Agua de Honduras – Improving Water for Smallholder Farming and Human Consumption

Organization:



Takeaways

- The Agua de Honduras platform provides critical data to help policymakers make smarter water investment decisions and improve water management. Its development included community engagement to inform the creation of water scenarios that reflect real life needs.
- The Government of Honduras has adopted the platform as one of its main water management systems which will expand its potential to help water conservation investments as well as access to water for smallholder farms and human consumption.
- A third phase of the project is strengthening local capacities in using the platform for water resource planning and management.

The project

'Agua de Honduras' is a governmental data platform that provides communities with data on hydrology, vegetative cover, soil properties, water demand, and future climate scenarios. It includes an important component called *AGua para Riego (AGRI)*, which is a decision-making tool to identify irrigation and drinking water. Having this information readily available means technicians and decision-makers from local to national levels can access water-related information, enter local data, obtain statistics, simulate scenarios, and find new water sources. This, in turn, supports municipal, governmental, and international cooperation investments related to water conservation and improving water for smallholder farming and human consumption.

Why it matters

Access to water resources has been one of the greatest challenges for economic and social development in some Central American countries such as Honduras where farmers and governments often lack the information needed to make the smartest water and agricultural investments. In Western Honduras, where the Agua de Honduras Platform was initially implemented, the climate can be brutally dry and unpredictable constraining most farmers to rainfed subsistence agriculture. The data in the platform can be used to help them become more food secure and boost livelihoods, as well as contribute to water conservation.

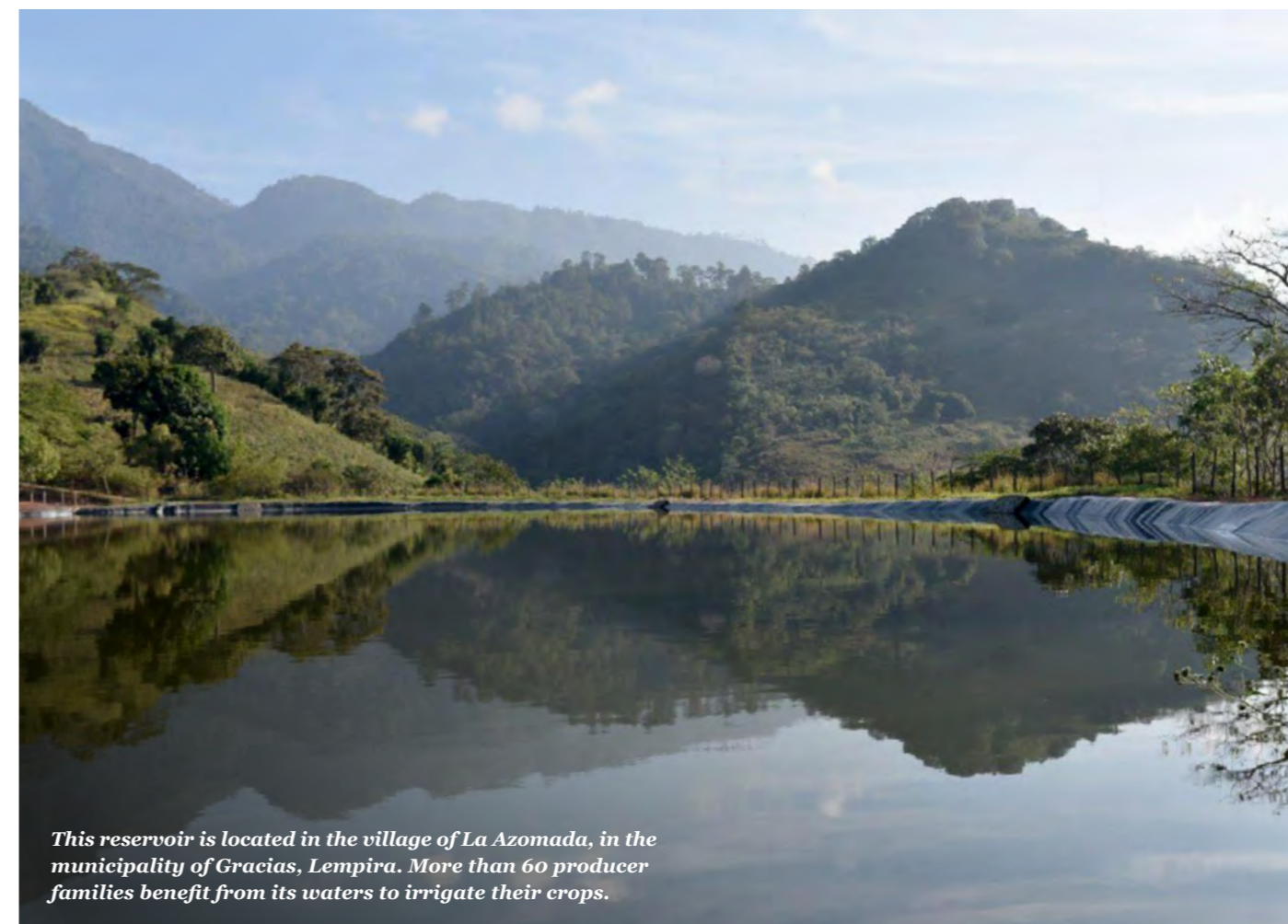
Good practices

- At the local level, the platform was successfully piloted in four micro-watersheds with local organizations and municipal governments. One of these organizations has already used the platform to decide where to purchase land as a strategy to increase water availability for potable water systems.
- The platform has been developed in different modules, for example, data on climate change scenarios or tools for irrigation water planning (AGRI) or to assess the water balance under natural conditions.
- The project has sought to engage with communities and local stakeholders in the water planning process so that local water use, and demand, can be considered when creating balanced water scenarios under different conditions, for example, that may include periods when irrigation is needed and other periods when it is not. A third phase of the project is also strengthening local capacities in using the platform for water resource planning and management.

Highlight: Building on Success and Scaling Up

Following the success of the Agua de Honduras platform in providing critical data to help policymakers make smarter water investment decisions and improve water management, the Government of Honduras has officially adopted it as one of the main water management systems of the Ministry of Environment (MiAmbiente+) where it is expected to help water conservation investments as well as access to water for smallholder farms and human consumption. In the future, it could benefit millions of Hondurans.

It has also attracted the attention of international agencies which have supported the expansion and migration of the AGRI tool to the whole of Central America, East Africa, and the island of Grenada. Now, this novel tool is almost finished for other four islands of the Caribbean and in the north of Argentina with the support of FAO.



This reservoir is located in the village of La Azomada, in the municipality of Gracias, Lempira. More than 60 producer families benefit from its waters to irrigate their crops.

© CIAT/Adriana Varón

This project was supported by USAID and the Swiss Agency for Development and Cooperation (SDC).

Checklist:



Community Inclusion



Capacity Strengthening



Digital Innovation



Policy Change

1.5 Diversity Assessment Tool for Agrobiodiversity and Resilience (DATAR)

Takeaways

- Focusing agricultural research-for-development efforts at the species level can miss the genetic diversity of crop varieties, livestock breeds and fish strains that could provide unique traits needed to adapt food systems to challenges such as climate change adaptation.
- Having data about the genetic diversity that is available and how it can be used is essential for local communities and policymakers to make informed decisions and investments for its sustainable use and conservation to meet current and future needs.
- Participatory community assessments of an unlimited number of varieties of crops, and breeds of livestock, can be carried out in multiple projects and sites. The DATAR tool quickly synthesizes the information at local and national levels for community and national validation. After data assessment and validation, DATAR is then used as a decision-making tool to identify constraints and provide a portfolio of actions to support the use of agrobiodiversity to improve livelihoods and ecosystem health.

The project

The Diversity Assessment Tool for Agrobiodiversity and Resilience (DATAR) is an innovative, open-source IT tool built to assess agrobiodiversity and support decision-making for agricultural development. It has been developed as part of an IFAD-implemented GEF-integrated approach program to foster sustainability and resilience for food security in sub-Saharan Africa. The tool has three components – a website, web portal, and app – that help decision-makers design agricultural projects to maximize biodiversity. It enables users to access information on crops, livestock, and aquatic stock going beyond the species level to consider crop varieties, livestock breeds, and fish strains and the diversity of genetic traits they bring to the development table, for example, for climate resilience. The tool connects users with providers including ones in local communities who supply crop seeds, animal breeds, and (coming soon) aquatic farmed types best suited to their needs. It also identifies management, market, policy, and institutional constraints producers face when using local crop and animal biodiversity.

Why it matters

Food production systems such as farms, livestock, agroforestry, and aquatic systems are home to rich genetic diversity yet agricultural development programs, for example, climate resilience planning, often stop short at the species level when deciding which crop, livestock, or aquatic animal would be best suited to meet its particular goal. Yet there are thousands of crop varieties, livestock breeds, and fish strains that contain a wealth of genetic diversity that can also be deployed to deliver on sustainable development goals.

Good practices

- Building the DATAR App and web portal was an iterative process with multiple tests and improvements, made possible through close collaboration with national partners in Asia, Africa, the Americas, the Middle East, and Europe and local IT practitioners.
- An important component of the DATAR tools is that surveys can be completed in multiple projects and sites for many species and that they include templates and questionnaires to support community engagement, for example, through focus group discussions, household surveys, and key informant interviews on various aspects including management practices, market, policy, and institutions.
- Data is input directly into the app while conducting the surveys so is quick and efficient and the tool is also easy to use to find out if within your community or stakeholder group you have the biodiversity you need to meet your goal.

- Over 1,000 [knowledge products](#) published including training manuals, reference books, videos, drama, website articles, workshops, diversity fairs, exhibitions, cross-site visits, posters, fliers, peer-reviewed publications, case studies, on-farm demonstrations, and national knowledge-sharing events between scientists and farmers.
- [Education materials](#) developed and used in universities, middle schools, and technical schools in 25 countries that integrate the use of agricultural biodiversity into local curriculums.



Over the past 10 years, the DATAR methodology has improved farmer livelihoods by leveraging farm genetic diversity in over 25 countries.



Highlights: Results

- Improved farmer livelihoods from the use of on-farm genetic diversity in over 25 countries.
- Increased land areas under sustainable management with intra-specific diversity on farms and in forest production including fruit and nut wild relatives in 25 countries.
- Development of networks and institutions for community access to local crop and livestock genetic materials including community seedbanks and genebanks in Bolivia, Burkina Faso, China, Ecuador, Ethiopia, Kazakhstan, Kyrgyzstan, Malawi, Mali, Morocco, Nepal, Tajikistan, Turkmenistan, Uganda, and Uzbekistan.
- Policy gaps or constraints identified through using the tool have resulted in policy change including:
 - Protocols for benefit sharing and access to germplasm from the community genebanks and farmers' fields in Bolivia, Burkina Faso, China, Ecuador, Mali, Morocco, Nepal, and Uganda.
 - National governments of Morocco, Nepal, Uganda, and Uzbekistan, supporting agrobiodiversity and local seed systems.
 - Ministries of Agriculture and Education in Morocco and Uzbekistan including agrobiodiversity education, in middle school, and higher education technical schools.
 - Formal recognition of farmer breed varieties by the governments of Mali and Nepal.
 - Government policies for new reforestation targets that include local fruit and nut tree genetic diversity in Uzbekistan.

Beneficiaries include development workers and researchers, together with farmer communities in 18 countries (Burundi, China, Egypt, Ethiopia, Germany, India, Italy, Malawi, Mexico, Morocco, Nepal, Niger, Pakistan, Peru, Tanzania, Uganda, USA, and Uzbekistan). The number of countries is growing. 60,000+ farmers have benefitted so far of which 30-60% were women (% depending on the country).

DATAR was developed by the Platform for Agrobiodiversity Research in collaboration with the Alliance of Bioversity International and CIAT¹, and Sapienza University under the framework of the IFAD implemented GEF Integrated approach program on fostering sustainability and resilience for food security in Sub-Saharan Africa, as part of the Cross Cutting Capacity Building, Knowledge Services and Coordination Project for the Food Security Integrated Approach Pilot Program and more specifically under the Monitoring and Evaluation components executed by UNEP and the Platform for Agrobiodiversity Research.



¹ Bioversity International and the International Center of Tropical Agriculture (CIAT) are two CGIAR centers that forged an Alliance in 2020 becoming the Alliance of Bioversity International and CIAT. While many projects by the two organizations referred to in this document took place or started prior to this, for consistency and ease of readership, they are both referred to as the Alliance of Bioversity International and CIAT throughout regardless of the date of the project.

1.6 Integrating Resilient Rice Systems into Forest Restoration Efforts in Madagascar

Takeaways

- **Integrated Resilient Rice Systems are improving livelihoods, food security and biodiversity in Madagascar, increasing average rice yields up to three times.**
- **Improved rice varieties developed using climate-resilience traits such as drought tolerance were selected in participation with local communities, helping to increase adoption rates and ensure that introduced improved varieties meet local needs.**
- **Reforestation efforts are more likely to succeed if they can generate long-term income for local communities beyond a project, for example, by planting agroforestry species with market demand to supplement income and to create incentives for sustainable management.**

The project

The rice sector in Madagascar generates 41% of households' income making it the most important economic sector in the country. Using an [Adaptation Fund](#) established to reduce the negative effects of climate change on vulnerable communities, this adaptation project executed by the Government of Madagascar with support from UNEP and funding from the Adaptation Fund developed and piloted an Integrated Resilient Rice Model. This model adopts ecological production practices such as using organic compost rather than chemicals, deploys resilient rice varieties that require fewer inputs, and restores ecological services through reforestation and restoration efforts.

Why it matters

In Madagascar, climate change is reducing both winter and spring rainfall in many parts of the country, which poses a serious risk to rice yields and livelihoods in the region. Additionally, there is continued environmental degradation as deforestation for agricultural land is leading to widespread soil erosion due to run-off including loss of topsoil, depletion of soil nutrients, landslides, and heavy siltation of lowlands and waterways. Land clearance and environmental degradation are both putting local biodiversity at risk.



A Madagascan farmer trained on using resilient seed varieties and agroecological approaches to field preparation, fertilization, pest management, land use, and post-harvest storage.

Good practices

- 2,400 farmers trained on using resilient seed varieties and agroecological approaches to field preparation, fertilization, pest management, better livestock and land management, and post-harvest storage have been undertaken.
- The selection of three improved rice varieties that showed promise for climate resilience was carried out in participation with local communities. The project distributed almost 12,000kg of improved seeds and trained seed producer groups to increase access to improved varieties which resulted in the production of 26,000kg of improved seeds.
- Training has been carried out at the regional and district levels on climate risk management and how to disseminate that knowledge to farmers including through better weather forecasting. Communication methods deployed include dynamic agricultural calendars to inform and adjust planting schedules based on seven-day climate forecasts which have been distributed to farmers and extension staff, as well as local radio forecasts twice a day. Two new weather stations have also been installed.
- Water infrastructure for irrigation has been upgraded and 21km of canals have been dredged and cleared. 6km of dikes have been strengthened to prevent flooding. In one project site, water availability has increased between 28-55% near the dam.

Highlight: Integrating system-based approaches into food production and restoration efforts

Incorporating biodiversity-based approaches into agriculture is a win-win as it can benefit ecosystem services which in turn benefit agricultural production, particularly when supported by enabling policies.

So far:

- 1,137 hectares have been reforested to rehabilitate watersheds
- 31 acres have been planted with agroforestry plants and farmers trained in agroforestry practices – reforestation efforts that generate livelihood options for farmers are more likely to be sustained.
- Farmers have been trained on the use of rice straw as an energy source, increasing the use of rice byproducts and on using integrated pest management approaches.
- Almost 2,500 farmers have been trained on producing and using organic compost although a spate of cattle theft in the area increased the rarity of cow dung, making compost production more expensive.

Looking ahead:

- A replication and upscaling strategy has been developed and implemented in two other regions
- The Integrated Resilient Rice Model has been integrated into the National Strategy for Rice Development and local development plans.

The project ‘Promoting Climate Resilience in the Rice Sector through Pilot Investments in Alaotra-Mangoro Region’ known as ‘AF Rice’ was executed by the Ministry of Environment and Sustainable Development, Government of Madagascar with support from UNEP and funding from the Adaptation Fund.

Checklist:



Community Inclusion



Capacity Building



Policy Change



Rice fields close to Vondrozo, Madagascar

2. INCLUSIVE DEVELOPMENT FOR RURAL COMMUNITIES AND INDIGENOUS PEOPLES

2, 4, 9, 10, 13, 14, 16

Supporting the sustainable use of biodiversity in our food production systems can boost the livelihoods and resilience of farmers, Indigenous Peoples, and rural communities including empowering young people and women to become entrepreneurs with the right support and partnerships.

Biodiversity can also be an entry point to enhance and protect diverse food cultures through value chain activities that celebrate traditional foods, for example, through eco-tourism and market development for diverse, local species. Income from the use of biodiversity is essential as an incentive for its long-term protection and to encourage the sustainable management of natural resources.



Agriculture demonstration plot supported by Total Land Care civil society organisation in Mudandwe village on Liuwa plain in Zambia.

© Jasper Doest / WWF

2.1 Tree Lucerne – the Win-Win Fodder Crop Supporting Livestock Livelihoods in Ethiopia

Takeaways

- Using tree lucerne as a pathway to improve rural livelihoods through its use as livestock fodder is helping to combat environmental degradation and boost local biodiversity.
- Tree lucerne was selected from over 1,000 species held in the Forage Collection managed by ILRI as the most suitable for this project, showing the importance of conserving and studying plant genetic diversity as a source of options for sustainable development initiatives.
- The project was successful because it addressed a key issue that was important to the farmers who became engaged and were willing to adopt tree lucerne as a fodder species.

The project

'[Improving rural livelihoods through the introduction of a multipurpose tree fodder](#)' is a CGIAR project led by ILRI to introduce tree lucerne, a leguminous fodder tree, as a fodder species to boost livestock productivity in Ethiopia. Providing an affordable alternative to supplements through its nutritious leaves, tree lucerne was selected as it grows in high altitude areas and provides several ecological benefits for crops and other forage plants which grow in its vicinity, for example, contributing to soil fertility as a nitrogen-fixer and acting as a windbreaker to prevent soil erosion. Its scented flowers attract bees which supports honey-producing enterprises. It also supports wild biodiversity conservation by providing habitats for species such as birds and supports climate mitigation through carbon sequestration.

Why it matters

In the Ethiopian highlands, grazing lands are shrinking and in some cases have disappeared as more land is used for crop production to feed a rapidly increasing human population. What remains is often degraded meaning that for livestock productivity to reach its potential, extra food and nutrition supplements are needed. For many smallholders, commercial concentrates are just too expensive so they use poor-quality crop residues, and even for those who can afford them, delivery issues limit availability. These constraints adversely affect the farmers' livelihoods.

Good practices

- Selecting tree lucerne as the most suitable fodder species was done in consultation with the International Livestock Research Center (ILRI) which manages the International Forage Genebank. Over 1,000 species of forage grasses, legumes, and food tree species are held in its collection.
- Organization of farmers into eight groups in four sites in the Ethiopian highlands enabled training to targeted groups of both men and women, and of different social groups, on planning and managing tree lucerne on farms, and how to mix it with other local feed sources to feed dairy cows and sheep. Training was also given to farmers on how to use Tree lucerne to establish beekeeping for additional income.
- The project was enabled through the supportive policies of the government of Ethiopia around sustainable land and natural resource management which consider fodder trees and forages as part of watershed management initiatives.



Livestock fed with tree lucerne plants.

© ILRI/ Kindu Mekonen

This project was made possible through the support of USAID.

Checklist:



Community engagement



Capacity Strengthening

2.2 Biodiversity – A Pathway to Economic Empowerment at the Women’s Market in Indonesia

Organization:



Takeaways

- Empowering women through the sale of local agrobiodiversity builds resilience in communities and helps break the poverty cycle, for example, enabling them to pay for their children to pursue higher education.
- Using agrobiodiversity as an entry point to boost women’s livelihoods enhances their role and status as custodians of agrobiodiversity conservation, for example, of ancient crop varieties passed through generations and wild plants.
- Enabling government policies that stimulate both women’s enterprises and conservation can drive change towards more sustainable and equitable production and consumption of diverse traditional foods.

The project

‘Traditional markets for sustainable consumption, conservation, and women economic empowerment in Indonesia’ is an initiative led by WWF which started in 2016 in collaboration with the Women Association and through local government support for women’s enterprise and conservation. The project supported the economic empowerment of indigenous smallholder women producers who had started businesses selling traditional nutritious varieties of vegetables and fruits grown from seeds inherited through generations as well as wild medicinal herbs and the occasional hunting catch. From selling door-to-door, the women had negotiated with a local landowner to start an informal market. This project helped the women to become better organized, develop and enforce quality standards and traceability tools, establish a permanent location for the market, and empower them economically and as agents of biodiversity conservation.

Why it matters

Informal rural markets are a significant sector in developing countries and provide women with an opportunity to generate income and exit the poverty cycle, yet the lack of regulation limits their potential to meet the growing local demand for local vegetables, including the ones that their ancestors used to grow and harvest from the forest. The produce is fresh, grown from local seeds without the use of chemicals, with almost no carbon footprint, and the vegetables and fruit varieties on sale are unique to the area and not found anywhere else, yet the women lacked traceability tools to show its provenance and cultural links.

Good practices

- The support of the local government has helped shape the initiative into a sustainable collective enterprise for green, local, and healthy living. The district has been declared a conservation district and as such, the local government is applying policies and supporting initiatives that generate good economic value and create conservation incentives to protect the forest and traditional agricultural practices including the women’s market which now has a permanent home.
- The women have formed a committee to oversee activities at the market, establish rules, and agree on fair prices. They are applying a self-monitored Internal Control System to guarantee hygiene, reduce the use of plastic, and enhance the cultural aspects of the market. The initiative relies on close interactions between sellers and buyers and relations of knowledge and trust.
- The women have also developed a traceability tool to collect lifecycle information on their produce to show information such as origin and organic credentials.

Highlight: Women Empowering Women through Biodiversity

The Women Association started with around 25 women from two villages and has evolved into a group of more than 100 traders who are working together to improve quality control and raise quality standards. This includes reducing the use of plastic bags and containers, safely disposing of garbage, increasing the cultivation and sale of local produce, and conserving local varieties. Moreover, the women traders in Malinau have been trained as trainers in quality control and implementing the principles of healthy, local, sustainable and fair markets and local supply chains.

The women have shared their initiative and motivation with women in other villages in the province of North Kalimantan and the province of West Kalimantan which has significantly contributed to boosting average incomes.



Woman trader in Malinau, Indonesia, trained in quality control and implementing the principles of healthy, local, sustainable, fair markets and supply chains.

© WWF Indonesia

Checklist:

Community
InclusionCapacity
BuildingPolicy
Change

2.3 Building a Natural-Resource-Based Economy in the Gambia River Basin

Organization:



Takeaways

- To maintain restoration efforts, local communities need to be able to generate income from the conservation, management and sustainable use of local natural resources long after the project is completed. The 176 nature-based enterprises resulting from the project could increase cash incomes by USD 330 a year.
- Restoration efforts that include farmland as well as wild areas to integrate food systems into sustainable resource management strategies mean increased resilience and biodiversity in both systems, as well as increasing food security.
- Capacity building in using approaches and techniques such as natural regeneration for planting has seen the survival rate of planted materials increase from 10-48% to almost 95% after three months of planting.

The project

This [adaptation project](#) executed by the Government of Gambia with support from UNEP and funding from the Green Climate Fund aims to build climate resilience over large areas, promote climate-resilient sustainable development, and create a sustainable natural resource-based economy that could directly benefit up to 8,376 Gambian households and indirectly benefit 30,800 households in four regions along the Gambia river. At the heart of this economic development is an ambitious restoration target of almost 16,000 hectares of degraded forests, mangroves, savannahs, wildlife areas, and farmland to improve ecosystem health, make food production more resilient, and protect bio-diversity. The nature-based economy will be developed through 176 commercial enterprises such as beekeeping, ecotourism, and food processing that will be managed by local communities. The project is also working to strengthen the implementation of existing policies for the participatory management and benefit-sharing of climate-resilient natural resources and integrating ecosystem-based management into national and local policies.

Why it matters

Climate change in the Gambia is resulting in increased temperatures, wind storms, coastal erosion, salt intrusion, erratic rainfall, droughts, and floods which in turn is leading to reduced agricultural and livestock production and unsustainable extraction of resources from forest ecosystems by rural households. The agricultural sector, which employs 44% of the country's workforce, is threatened because it is heavily rain dependent. Sea-level rise and salt intrusion into freshwater wetlands have all but eliminated rice production in the western half of the country, causing 'hunger seasons' between July and September.

Good practices

- As part of efforts to rehabilitate 12,788 ha of degraded forest, savanna, and mangroves, and 3,000 ha of farmland, 10 million mangrove saplings have been planted, which protect coastal villages from storm surges while providing habitat for many fish species.
- 60 beekeeping businesses, managed by local communities, have been established, supported by training in both beekeeping and business management. These new enterprises have created 398 jobs so far – 121 of which are filled by women – and are helping to generate long-term sustainable income for the population.
- Capacity building in approaches and techniques such as natural regeneration for planting has seen the survival rate of planted materials increase from 10-48% to almost 95% after three months of planting.

Highlight: Natural-Resource-Based Economies – From Concept to Practice

- To maintain restoration efforts, it is critical that local communities can generate incomes by adopting sustainable ecosystem-based approaches that maintain biodiversity and the natural resources upon which they depend. Following investment of almost USD 3 million in infrastructure development, the River Company has been established which is expected to employ more than 500 people through 176 new commercial enterprises over the next 20 years. This is estimated to increase the cash incomes of 8,376 households by at least USD 330 per year which is a lifeline in a country where 60% of the population live below the poverty line.
- The River Company is predicted to have a cumulative gross cash return of USD 4,515,270 generated through the adoption of diversified, climate-resilient livelihood options including fisheries, agriculture, natural resource-based businesses, as well as the restored landscapes which are sources of raw materials that will be processed and traded by the natural-resource-based enterprises. It will provide around USD 677,270 in annual contributions to the National Forest Fund (NFF) through taxes and licensing fees.



The 'Building a Natural-Resource-Based Economy in the Gambia River Basin' adaptation project is executed by the Government of Gambia with support from UNEP and funding from the Green Climate Fund.

Checklist:



Community engagement



Capacity Building

2.4 Terra-i – Using Satellite Imagery to Make Coffee Forest-Friendly in Vietnam

Organization:



Takeaways

- Coffee production which provides livelihoods for smallholder producers is increasingly exposed to climate risks including longer droughts and less rain which can prevent crop flowering. At the same time unsustainable forest conversion to coffee plantations increases climate risks.
- Integrating early-warning tools like Terra-i into forest monitoring systems can scale potential and encourage private sector investment in deforestation-free areas.
- Multi-stakeholder workshops helped identify local actors' needs and constraints and identify a baseline and indicators of success. Other activities included identifying gaps that the data provided by Terra-I could fill and the data format needed by different stakeholders for it to be useful and encourage adoption.

The project

Terra-i is an early-warning forest monitoring system that deploys satellite imagery to detect changes in vegetation cover resulting from human activities. Vietnam has an organized forest inventory and a regular process for quantifying change in forests, but it needed a system that could provide data in almost real-time, to alert rangers to respond more quickly to incidences of illegal logging or encroachment. These incidences are increasingly happening due to the massive expansion in Vietnam's coffee production. From an almost non-existent industry 30 years ago, it is now the world's second-largest producer with an export industry valued at \$US3 billion. This project is part of efforts to make the country's coffee production more sustainable and reduce risks through emission reductions, forest conservation, land conversion, financial solutions, and various decision-support tools that contribute to Vietnam's commitments to the global development framework. It is part of the UN-REDD Vietnam Program Phase II.

Why it matters

Vietnam has historically relied on ground patrols to detect illegal logging and encroachment. This costly method takes enormous numbers of staff to cover the country's large and difficult-to-access forest areas and is time-consuming, delaying the detection of illegal activities. Forest loss in the country also mostly happens in small-size sites before expanding into larger areas, so information needs to be in almost real-time and of high spatial resolution. Deploying *Terra-i* as an early-warning system linked to fast response times is a way to address both risks to the forest and the livelihoods of smallholder producers.



Through research and partnerships, the Alliance supports work to make coffee production in Vietnam a sustainable source of prosperity for smallholder farmers.

© CIAT / Trong Chinh

Good practices

- Workshops held with policymakers, private sector representatives, forest rangers, civil society organizations, and ethnic minority groups helped identify local actors' needs and constraints, set a baseline and indicators of success, and identify gaps that the data provided by Terra-I could fill. Useful information gathered included the data format needed by different stakeholders, for example, most stakeholders wanted warning alerts to come through their phones and to be able to send feedback on whether the alerts were true or false on their phones as well.
- Data from the first set of alerts was uploaded to Google and shared as a means of improving the system following comments and feedback, for example, by introducing a ranking system of high, medium, and low-priority alerts. As the project developed, a web-based platform was developed to communicate up-to-date detections to stakeholders.
- As it was the first time the system had been implemented in the region, it was necessary to further calibrate the system with detailed information about the status of the Di Linh forest which required fieldwork to characterize the forests. The analysis included high-resolution optical satellite imagery and field geo-referenced observations.
- Capacity building of local forest rangers through training sessions on how to interpret maps and tables of loss detections was followed by a validation exercise of forest loss detections. The team also worked with technical staff from the forest protection department to explore the integration of Terra-i into their monitoring work.
- The project has been carried out with the full support and engagement of local authorities and communities and work is ongoing to establish a mechanism to integrate Terra-i within the current government forest monitoring system to extend its scope to the national level.

Highlight: Terra-i: A practical application for forest-friendly coffee production in Viet Nam

The pilot project led to an agreement to upscale its use for forest monitoring at provincial and national levels in Vietnam. For example, the Lam Dong Provincial People Committee has adopted Terra-i and expanded its application at a provincial level.

Civil society organizations, including the Centre for Sustainable Rural Development, have also recognized its use to promote participatory forest monitoring to enhance early detection of forest changes and empower communities to help protect the forests.

Continued positive growth in the coffee sector will rely on international collaboration, with several organizations, including the Alliance of Bioversity International and CIAT, working with the government, private sector, and smallholder farmers.

The Alliance of Bioversity International and CIAT supported the pilot application of the Terra-i system to monitor changes in forest land use, especially forest conversion to coffee plantations in Di Linh district, Lam Dong province, where forest encroachment is widespread and difficult to control. This project was carried out in partnership with the Vietnamese government and with partners at the World Meteorological Association and Australia. It was made possible thanks to funding through the International Climate Initiative of the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, and support from the EU.

Checklist:



Community Inclusion



Capacity Strengthening



Digital Innovation

3. INCREASED PRODUCTIVITY AND RESILIENCE TO CLIMATE CHANGE

Targets: 2, 4, 9, 10, 13

Climate change is reducing the yields of key crops, threatening the livelihoods and food security of millions of people. Weather patterns are becoming increasingly erratic, droughts more prolonged, and new crop pests and diseases are emerging – up to 40% of crops are lost to pests every year. At the same time as agriculture is affected by climate change, current agricultural practices contribute to a third of total anthropogenic greenhouse emissions. These good practice case studies show how adopting agricultural practices based on the sustainable use of biodiversity can increase yields and resilience to climate change and help bend the curve on biodiversity loss.



Fish farmers carrying sacks of dry fish on their heads preparing to sail to market, Mousuni Island, Sundarbans, India.

3.1 Microfinancing Ecosystem-based Adaptation to Climate Change

Organization:



Takeaways

- In countries with national plans for climate change adaptation that promote ecosystem-based approaches, microfinance can be an entry point for leveraging investment in products that deliver ecosystem and rural livelihood resilience in rural populations that have been marginalized somewhat by insufficient financial inclusion.
- Microfinancing Ecosystem-Based Adaption has supported the distribution of nearly 18,000 microcredits and benefitted around 4,500 farmers, funding products from solar panels to organic agriculture certification. More than USD 30 million has come from private investors.
- Climate change risks and biodiversity loss are often not considered in agricultural finance packages. This can lead to missed opportunities to invest to enhance resilience to climate change and the ecosystem health of smallholder production systems.

The project

'[Microfinance for Ecosystem-based Adaption to Climate Change \(MEbA\)](#)' is a project in Latin America, the Caribbean, and Africa to help address risks to vulnerable populations from climate change and biodiversity loss. The project uses innovative microfinance services and products as an entry point to promote investment in agricultural systems that are ecosystem-based that can deliver improved climate resilience, protect and enhance biodiversity, and improve the livelihoods of smallholder farmers and other rural producers. The target project beneficiaries were local landholder populations with potential ecosystem-based projects in the areas of influence of the various participating Microfinance Institutions including the Andean region of Colombia and Peru, Benin, Costa Rica, the Dominican Republic, El Salvador, and Senegal.

Why it matters

Climate change risks and biodiversity loss are often not considered in agricultural finance packages. This leads to missed investment opportunities to enhance resilience to climate change and the ecosystem health of smallholder production systems. Methodologies and technologies, as well as awareness and capacities of Financial Services Providers, are needed to carry out agricultural credit assessments that include climate risks and biodiversity considerations.

Good practices

- Investments include solar dehydrators to improve food storage, crop rotation systems, organic agriculture certification, aquaculture, and organic fertilizer production. Products need to show they enhance ecosystems and the services they provide, and the social and economic resilience of human populations vulnerable to climate change.
- Loan access and conditions (interest rates, payment periods, etc.) are tied to a series of indicators, including biodiversity and adaptive capacity, encouraging better stewardship of natural resources while improving production practices and reducing climate vulnerability.
- 13 demonstration farms to show the value and function of ecosystem-based adaptation measures have been implemented.
- Populations included in the project are in places with strong microfinance institutions that were already servicing them with other products.

Highlights

- To date, Microfinance for Ecosystem-based Adaptation to Climate Change (MEBA) has supported the distribution of nearly 18,000 microcredits with more than USD 30 million stemming from private investors.
- The project has directly benefitted and trained close to 4,500 farmers and other rural producers, a third of them being women, in supply chain enhancement and nature-based solutions. Some examples of investments include solar dehydrators to improve food storage, crop rotation systems, organic agriculture certification, aquaculture, and organic fertilizer production.
- The project created the **MEBA biodiversity platform**, an online tool that helps service providers integrate climate and biodiversity risks into credit decisions and use that information as basis to qualify for green credit lines.
- The project also developed 13 demonstrative farms in which ecosystem-based adaptation measures were implemented.
- What is truly transformational about the MEbA approach is the fact that loan access and conditions (interest rates, payment periods, etc.) are tied to a series of indicators, including biodiversity and adaptive capacity, encouraging better stewardship of natural resources while improving production practices and reducing climate vulnerability. This combination of innovative finance mechanisms and ecosystem-based adaptation has been so successful that it is now being implemented in two African countries, Senegal and Benin, and under replication in other countries in Africa and Latin America.



Beneficiary of the UNEP project.

The project 'Microfinancing Ecosystem-based Adaptation to Climate Change' is a UNEP-led adaptation project implemented with funding from the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety (IKI).

Checklist:



Community Inclusion



Capacity Strengthening



Public-Private Partnerships

3.2 Seeds for Climate Change Resilience in Africa

Organization:



Takeaways

- Plant collections held in Africa's national genebanks may hold the genes needed to breed the climate-resilient crops farmers need both now and in the future, but secure funding, staff recruitment and training is needed to safeguard the collections in the long term and make them available to all.
- Identifying and using useful traits held in the collections in breeding programs can increase the livelihoods, nutrition and resilience of farming households and their communities.
- Collaboration between genebanks, farmers, plant breeders and other researchers is essential when evaluating samples held in collections to ensure new crop varieties developed really meet the needs of farmers.

The project

[Seeds for Resilience](#) provides financial, and technical support to secure the genetic diversity held in the national genebanks of Ethiopia, Ghana, Kenya, Nigeria, and Zambia and make it available to all to underpin the development of new varieties and crops, and the increased availability of crop diversity to farmers. Many of the accessions (samples) held are not found in genebanks anywhere else in the world such as many African green leafy vegetables and the African eggplant. The increased international availability of these seeds through enabling policies like the International Treaty on Plant Genetic Resources for Food and Agriculture and the development of climate-resilient crop varieties are expected to benefit farming households and their communities beyond the partner countries and the duration of the project.

Why it matters

Smallholder producers in Africa – around half of whom are women – produce nearly 80% of the continent's food against a backdrop of increasingly unpredictable and extreme weather and changing growing seasons. They urgently need access to a wide range of affordable, quality seeds of productive and nutritious crop species and varieties that are resilient in the face of climate change. While crop improvement programs have released new varieties over the last decades, these have focused on just a small number of species, leaving the unique genetic diversity of many other resilient and nutritious crops untapped. This genetic diversity is being lost at unprecedented rates, particularly for vegetables and fruits. While some accessions are conserved in national genebanks, chronic underfunding and staff shortages place collections at risk.

Good practices

- Evaluate accessions held in collections through a collaboration between genebanks, farmers, plant breeders, and other researchers to find the diversity that can help farmers and food production systems be more resilient to climate change.
- Support national genebanks to reach international standards to ensure the collections are safe and widely available in the long-term including through safety back-ups of collections, the upgrade of equipment, improved internal processes such as documentation of data, and increased staff technical capacity.
- Build and strengthen linkages with key user communities to make sure that new crop varieties are developed to meet their needs.

Kenya's National Genebank

The Kenya Agricultural and Livestock Research Organization (KALRO) houses the Genetic Resources Institute in Kenya which has been conserving seeds since 1988. It currently holds over 50,000 samples representing over 2,000 plant species acquired through donations and field collections carried out across Kenya. Like many other genebanks, it has been facing inconsistent funding and insufficient staff putting its collections at risk. Some of the seeds have been in storage for over 30 years and there are concerns that they could be losing viability.

The Crop Trust, through the Seeds for Resilience project, is providing financial and technical support to help the Genetic Resources Institute meet international standards for seed conservation and data management. Alongside technical training and equipment upgrades, the project is also supporting the genebank to implement a new quality management system. An outreach component will also help the genebank work more closely with farmers and plant breeders.



Beans from national genebanks in Ethiopia, Ghana, Kenya, Nigeria and Zambia.

© CropTrust

This project is being implemented by the Global Crop Diversity Trust in collaboration with partners including national genebanks and research institutes in the project countries. It was made possible through the generous support of the Federal Government of Germany (BMZ), through the German Development Bank (KfW).

Checklist:

Community
InclusionCapacity
Strengthening

3.3 Enhancing Climate Change Resilience of Rural Communities in Cambodia's Protected Areas

Organization:



Takeaways

- It is increasingly recognized that integrating people's needs into sustainable use strategies for protected land management, rather than separating people and protected areas, is the way forward. Most protected areas are already home to people, whether they are permanent residents, seasonal visitors or Indigenous Peoples.
- Engagement between all stakeholders is critical for the long-term sustainability of restoration projects that integrate food systems, including working with local agriculturalists and foresters, and being aware of and respectful to the important cultural aspects of the protected areas.
- Protected areas provide a vital safety net for species diversity, genetic diversity within species, habitats and ecosystems which includes vital plant species for food production systems.

The project

This UNEP-led project is enhancing the [climate change resilience of rural communities living in five community-protected areas of Cambodia](#). It integrates food production into restoration activities to ensure long-term sustainability and diversify food production systems for increased resilience and reduced risks. The main entry point has been through establishing irrigated home gardens planted with diverse crops and supporting small livestock such as chickens, alongside restoration efforts that have included planting native trees that provide food or enhance soil health. The project worked closely with the communities in the protected areas at every step of the project including creating a Project Steering Committee to facilitate engagement between government ministries, civil society, provincial and district officers, and local agriculturalists and foresters.

Why it matters

Climate change is producing erratic rainfall in Cambodia, where dry seasons are getting drier and wet seasons are wetter, causing devastating floods and droughts that can lead to crop failures and soil erosion, which is impacting rural livelihoods and food security. Only 19.5% of cultivated land in Cambodia benefits from irrigation, so the agricultural sector is dependent on rainfall. To counter drops in agricultural yields, communities rely on illegal logging in protected forests to supplement food and income, whether it be collecting fuelwood or timber. These decimated forests once provided both climate and soil water regulation in the agriculturally vital Mekong River Basin with a marked decrease in the number of rain clouds over the now depleted forest.



People living around one of the community-protected areas make roof fronds out of leaves, toothpicks and sticks.

© UNEP

Good practices

- Forest restoration approaches used multi-use native tree species that provide food, erosion control, timber, medicine, and fruit. The project also planted trees alongside 2,200 hectares of rice paddies to reduce erosion and enhance soil productivity.
- The project has trained local households in sustainable income-generating strategies such as raising chickens and crickets, ecotourism, and selling vegetables.
- Climate forecasts were used to inform and adjust planting schedules aiming for a 20% decrease in climate change vulnerability at all project sites, covering a population of 9,271 people.
- 80% of the 1,900 households who participated report an improvement in access to water, to new seed varieties, and to improved rice storage techniques, as a result of additional interventions following the building of rainwater harvesting tankers and pumping wells.
- Drought-tolerant rice varieties were distributed to families to increase yields – the varieties have genetic traits that are particularly adapted to local conditions.
- Training was given to households and schools to create home gardens of diverse crops including vegetables, which diversifies families' agricultural production which increases resilience, and reduces the risk of losing the harvest. Previously, when rice harvests failed due to drought, people had to sell their animals or possessions to buy food.

Highlight: Bringing the Rain Back to Kulen

In Kulen, a sacred and protected area in the Cambodian mountains, illegal logging of trees to fuel the luxury hardwood and charcoal markets has destroyed huge patches of forest, taking the rain clouds that used to gather over the trees with them.

The project has eased people's reliance on rain-fed agriculture through the establishment of home gardens planted with diverse crops including vegetables that have year-round irrigation thanks to a small reservoir dug into springs a few kilometers up the mountain. This means that people no longer need to go into the forest to forage for roots when the rains fail. They also have chickens and have been trained in how to raise them. The vast majority of families in the village now have home gardens and fruit trees have been planted providing mangoes, jackfruit and avocados.

A tree sapling nursery established through the project is helping one community grow 100,000 seedlings with additional saplings donated as part of a plan to plant more than a quarter of a million trees and protect 306 acres from illegal logging.

"I am committed to this work because I want the next generation to have trees and some species have already disappeared," says Thy, one of the village members, paid to tend the tree nursery. "I tell her (my daughter) she needs to care for trees, and they will care for her."

This project 'Enhancing climate change resilience of rural communities living in protected areas of Cambodia' is executed by the Government of Cambodia with support from UNEP and funding from the Adaptation Fund. Checklist: Community Engagement, Capacity Strengthening,

Checklist:  Community engagement  Capacity Strengthening

3.4 Crop Wild Relatives – Adapting Agriculture to Climate Change

Organization:



Takeaways

- Conserving and using the unique genetic diversity held in the wild ancestors of our domesticated crops is critical to future-proof the world's food supplies yet many have been lost and others remain perilously close to extinction, their cause falling somewhere between conservation and agricultural agendas.
- 170 partners have collaborated in a global effort that has collected and conserved 4,500 seed samples of 350 wild relatives of 29 priority food security crops including in some cases the only examples held in any genebank.
- 19 breeding projects in 43 project countries have developed new climate-resilient crop varieties, working closely with farmers to identify the traits they really need.

The project

[Adapting Agriculture to Climate Change: Collecting, Protecting and Preparing Crop Wild Relatives](#) was a global 10-year initiative led by the Crop Trust to collect and conserve crop wild relatives to safeguard their genetic diversity. Crop wild relatives include the wild ancestors of our crops and contain unique traits that could help breeders develop crop varieties to help farmers adapt to climate change. The project focused on 29 food security crops contained in Annex 1 of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and collected materials to be shared through its Multilateral System of Access and Benefit Sharing.

Why it matters

Genetically related to today's cultivated crops, crop wild relatives have been left to evolve in the wild, developing traits such as drought tolerance and pest resistance that farmers need to face today's challenges. Yet we are losing them and many of those that remain are vulnerable to extinction, for example through land use change. While their wild habitats are disappearing through land use changes and degradation, they are poorly represented in genebank collections and undervalued in breeding programs. They also often fall outside conservation and agricultural agendas.

Good practices

- Carry out a global inventory of crop wild relatives already held in genebanks to prioritize collecting missions to fill gaps in collections, which were carried out through a multi-country, multi-partner effort which included 100 scientists from 25 countries. All relevant and applicable national, regional, and international regulations were followed by project partners in the collection of new diversity from within their borders. Collecting missions resulted in the conservation of 4,587 seed samples of more than 355 wild relatives of 29 key crops including, in the case of three wild potato relatives, the only examples held in any genebank.
- Secure the safety and accessibility of the collected material by ensuring it is held in the national collections of the countries of origin, the Millennium Seed Bank, CGIAR international collections, and the Svalbard Global Seed Vault.
- Conduct 19 pre-breeding projects in 43 countries – this means identifying desired genetic traits and introducing them into breeding lines that are crossable with modern varieties. These projects have resulted in new crop varieties with all materials available through the Multilateral System of the Plant Treaty.
- Build information systems to manage and search global crop collections for crop wild relative data ([Genesys](#)) and information from the pre-breeding and evaluation projects via the [Germinate platform](#).
- Conduct capacity building and training on collecting, documenting, and conserving crops with more than 12,000 people from 124 institutions in 71 countries and carry out IT audits in 37 national and regional genebanks, 27 of which resulted in upgrades.

Highlight: Developing Resilience in Drought-Tolerant Grasspea

During the evaluation work to assess the performance of crop wild relatives and their crosses under a range of conditions and climates in different countries, scientists in Morocco and Tunisia identified a wild grasspea species that is resistant to two forms of broomrape, an aggressive parasitic weed led to the abandonment of the crop in some Mediterranean countries. These results may lead to its revival.



Grasspea (Lathyrus sativus) is a hardy crop, able to withstand extreme environmental conditions such as drought, floods and poor soils. It is grown in South Asia, southern Europe and the Horn of Africa.

© CropTrust

This project was managed by the Crop Trust with the Millennium Seed Bank of the Royal Botanic Gardens, Kew UK, and implemented in [partnership](#) with nearly 170 national and international conservation and breeding programs and specialist research institutes in more than 70 countries around the world. It was made possible thanks to the support of the Norwegian government, which is also supporting a second 10-year project launched in 2021 called Biodiversity for Opportunities, Livelihoods and Development (BOLD) in partnership with the ITPGRFA.

Checklist:



Community Inclusion



Capacity Strengthening



Digital Innovation

3.5 Biodiversity – A Buffer Against Environmental Changes in the Nepal Himalayas

Organization:



Takeaways

- Traditional crops that have evolved over hundreds of years in some of the world most extreme landscapes have global importance for climate change adaptation and related challenges yet need protection through conservation and use programs.
- Subsidizing major staple crops in food insecure areas while well-intended can displace resilient traditional crop varieties which are more adapted to local growing conditions.
- Eco-friendly farming practices that use a diverse mix of locally adapted crops can strengthen resilience in production systems, acting as a buffer against environmental changes, and can be supported through community projects, for example, establishing seedbanks to conserve and manage locally adapted crop varieties and make seeds available to local farmers.

The project

The main objective of the UNEP-led project on [Integrating Traditional Crop Genetic Diversity into Technology: Using a Biodiversity Portfolio Approach to Buffer Against Unpredictable Environmental Change in the Nepal Himalayas](#) was to maintain the conservation and use of crop biodiversity found in the mountain agricultural production landscapes of the country. The project's focus was to build resilience to climate change, boost ecosystem services and improve access and benefit-sharing capacity in the mountains' ecosystems. The project focused on eight neglected and underutilized species: buckwheat, cold-tolerant rice, common bean, finger millet, foxtail millet, grain amaranth, naked barley, and proso millet. These species were falling out of common use in local communities who were shifting to subsidized and more accessible staples like rice and wheat which are less adapted to the challenging growing conditions.

Why it matters

Climate-resilient traditional and nutritious crop varieties that have adapted to harsh conditions and high altitudes are the lifelines of the mountain communities that live in the Nepalese Himalayas. Yet many of these crops are at risk just when local communities need them most to build resilience and buffer against increasing unpredictability in weather, temperatures, and the increased frequency and severity of pests and pathogens. Better conservation and use of this crop genetic diversity has global implications for improved food security in other high-altitude areas of high environmental instability and variability.

Good practices

- Promotion of eco-friendly farming practices that include using more traditional locally adapted crop varieties in production systems to strengthen resilience
- Four community seedbanks were established in four project sites to safeguard, better understand, and increase the use of local crop varieties and to conserve local knowledge about their traits and uses.
- Capacity-building through diversity field schools and fairs in project sites to create awareness and mobilize local communities and stakeholders to use and conserve traditional crop biodiversity. In addition, the project developed and disseminated farmer-friendly training materials, community-based biodiversity management tools, and a field guide to diseases of the project crops.
- The project played a significant role in creating awareness of the value of traditional crop diversity including as a buffer against environmental change with over 70 publications in English and local languages.

Highlight: Results

- About 300 varieties of the eight target crops were evaluated in farm conditions out of which 60 have been used and promoted by farmers.
- Seven superior farmer varieties of five crops (amaranth, finger millet, foxtail millet, proso millet and common bean) have been officially registered and promoted widely for enhancing access and benefit-sharing of smallholder farmers.
- 500 local crop genetic resources are now safely stored in the national genebank for future use including breeding.
- 20,000 households received benefits in the project sites and beyond through good quality seeds, germplasm, information on conservation, and the promotion of traditional crops.
- Farmers including women who benefited from capacity-building activities have since been rewarded and recognized as biodiversity custodians in their communities.
- Farmers accessed a low interest collateral free loan from a community biodiversity management trust fund created through the community seedbanks, to boost local livelihoods and self-finance the conservation of rare genetic resources.
- The project developed processing equipment (mainly electric threshers for proso millet) and promoted a finger millet thresher to over 500 households to improve processing efficiency.



Amaranth is consumed as a nutritious grain in the high mountain communities and as an iron rich leafy vegetable in the rest of the country.

© UNEP-GEF

The project was led by UNEP as the GEF Implementing Agency and executed by the Alliance of Bioversity International and CIAT in collaboration with Nepal Agriculture Research Council, the Department of Agriculture, and Local Initiatives for Biodiversity Research and Development.

Checklist:

Community
InclusionCapacity
Strengthening

3.6 Seeds for Needs – Traditional Varieties Make a Comeback to Fight Climate Change

Organization:



Takeaways

- For farmers to adopt and use crop varieties that can build resilience into their production systems, it is critical to include them at all stages of the development, evaluation and selection process to boost adoption rates and ensure the varieties deliver what the farmers and their communities need.
- Using the genetic diversity safeguarded in genebank collections and farmers' fields creates new opportunities for breeding that traditionally relies on a narrow tried and tested selection of genetic materials.
- Partnering with the private sector to establish future value chains is important to promote the future cultivation of traditional varieties, ensuring their conservation through use.

The project

The [Seeds for Needs](#) approach started in Ethiopia in 2012 working on durum wheat – the wheat used to make pasta – and has since expanded to become a global project, implemented in 15 countries in a range of contexts and with a diverse range of crops. Led by the Alliance of Bioversity International and CIAT, this innovative approach brings a diverse portfolio of seeds including traditional farmer varieties to rural communities to give the farmers and their households a say in which varieties best meet their needs. As Ethiopia is experiencing frequent droughts that are damaging crops and livestock, threatening the livelihoods and food security of millions of people, identifying the varieties that are best suited to the harsh climates and that farmers will adopt is becoming increasingly urgent. The varieties bred through the project, including two farmer varieties of durum wheat, have been officially registered and released following national protocol procedures.

Why it matters

Past efforts to introduce new varieties to farmers have not always been successful with a major reason being that farmers had not been included in the variety development, evaluation, and selection process. Gathering important information about farmer-preferred traits, for example, taste or texture in traditional recipes is critical to developing the right varieties, and also opens new possibilities in terms of using a wide selection of genetic diversity available in genebanks and farmers' fields that is not normally considered in breeding programs.



Farmers evaluating traditional durum wheat varieties in Ethiopia.

© BioversityInternational

Good practices

- Over 850 Ethiopian durum wheat landraces and several Ethiopian improved lines underwent extensive molecular and phenotypic characterization through the project resulting in a shortlist of 373 varieties from genebanks and 27 improved varieties from farmers' fields. These were tested and ranked by both farmers and researchers. More than 20% of traditional Ethiopian wheat varieties performed better than commercially released varieties showing the importance of using as much diversity as possible in breeding programs.
- Ranking of traits by farmers included a variety of measures beyond standard ones like yield and drought tolerance, for example, taste and texture. These rankings were combined with researchers' evaluations, resulting in a final shortlist of 20 varieties from 50 that were crossbred with an elite variety of durum wheat called Asassa. These were grown and ranked by farmers in real conditions. This ranking was important for the future adoption of any varieties bred through the project.
- The varieties became part of the portfolio of newly established community seedbanks, created in the target regions as an important source of high-quality seeds for the communities.
- The varieties were also tested for how they perform in pasta production working with Italian companies and institutions. This activity was to generate the basis for future value chains that will further promote their future conservation and use.
- An impact study showed that the Seeds for Needs initiative led to a significant improvement in improving on-farm production diversity, and enhanced food security among smallholder farmers in the study regions
- Collaborations with universities, including in Italy, have built capacity and expertise at various levels with ten PhD levels and 15 MSc levels reached, as well as thousands of farmers trained through the project.

Rigeat and Wehabit: Rediscovering and Registering Forgotten Farmers' Varieties for Climate Change Adaptation

Two durum wheat varieties whose local names mean 'Stable' and 'We Have It Back!' have been officially registered and released through the project, targeting farmers operating in marginal production areas. The varieties are drought-tolerant, give high yields and have good nutritional traits. Wehabit had been lost from the community until it was rediscovered in the genebank and reintroduced through the project.

These are just two examples of the many varieties in the pipeline for future breeding programs that have come from this project. So far, more than 50,000 farmers have received seeds through the project's crowdsourcing approach.

The varieties were released using the standard procedures for variety release in Ethiopia. In other words, they had to be compared to the best improved varieties available for the target areas with evaluation done by the breeders. A variety can only be released if it outperforms them otherwise it is rejected. The significance of the process is that it shows how traditional varieties can outperform improved varieties in certain environments. However, the process is not ideal, as it is costly and cumbersome to follow this procedure and only allows the release of a very limited number of varieties, while the aim is to constantly inject new varieties that can keep pace with climate change. Specific protocols for traditional varieties release remain a priority not only in Ethiopia, but in Africa in general.

This project was carried out through ITPGRFA and with the support of GIZ and the World Bank.

Checklist:



Community Inclusion



Public-Private Partnerships




Public-Private Sector Partnerships

4 HEALTHY EATING FOR A HEALTHY PLANET

Targets: 2, 4, 9, 10, 14, 16,

Millions of people face hunger and micronutrient deficiencies, which means they lack the essential vitamins and minerals they need for healthy development, such as Vitamin A deficiency. Yet 75% of the world's food is generated from just 12 plants and five animal species meaning many options are off the menu that could help deliver not just diverse, safe, affordable diets all year round and help deliver planetary health and resilience in our food production systems. Consumer education is also critical to influence production, whether through awareness campaigns, product labeling, or public procurement mechanisms, for example, linked to school feeding programs.



Buckets of carrots, potatoes and beans for sale on the roadside, Upper Catchment, Lake Naivasha, Kenya.

© Simon Rawles / WWF

4.1 The Sustainable Diner – Reducing Food Waste to Reduce CO₂ Emissions in the Philippines

Takeaways

- Private sector partnerships can help scale awareness-raising and incentivize carrying out sustainable consumption and production principles in business operations, as well as strengthen the business case for reducing food waste and implementing sustainable practices.
- Support of the national and local governments has led to the project influencing and advising on policy decisions including the National Sustainable Consumption and Production Framework and the National Food Waste Guidelines.
- Targeting consumers through educational and awareness campaigns about the impact of their dietary choices, such as choosing diverse local foods, will also contribute to the long-term sustainability of the project.

The project

[The Sustainable Diner](#) is an innovative private-public sector partnership led by WWF to reduce CO₂ emissions by tackling food waste and other SCP principles. The project targets tourism and dining out which are two of the Philippines' fastest-growing sectors. Tourism alone supports the livelihoods of over 12 million people. It is part of a set of policy changes to support sustainable local development across a range of sectors supported through the International Climate Initiative. By using food waste as an entry point, the project is assisting the food service sector to transition to low-carbon, sustainable food consumption and production practices across all its activities.

Why it matters

Due to economic growth domestically, many Filipinos are now able and willing to spend on higher-value goods and services, including better-quality meals, ready-to-eat food delivery services, and new restaurant trends. As a result, meat consumption has increased which has a higher carbon and environmental footprint than traditional dietary options, while its vegetable intake is the lowest in Asia. Yet this is also a country where almost 25% of the population lives below the poverty line and where, despite widespread hunger and food insecurity, large amounts of food are being wasted. In Metro Manila alone, 800,000 tons of food waste end up in trash bins every year.

Good practices

- The project, working through the Hotel and Restaurant Association ([HRAP](#)), is supporting restaurants and hotels to offer more sustainable dining options through local food sourcing and procuring products with a reduced carbon footprint, for example, water and energy efficiency and avoidance of single-use plastics. Tools developed such as the [WWF Hotel Kitchen Toolkit](#) provide advice on ways to reduce food waste, for example, through more efficient menu planning and accurate guest counts.
- The initiative is also targeting young consumers through an educational campaign about the impact of their dietary choices, such as choosing diverse local foods, and plant-based options instead of meat, through information materials for primary, secondary, and tertiary teachers and efforts to integrate sustainability issues into school curricula.
- In partnership with the private sector, the National Eco-Labeling Program – Green Choice Philippines – was revisited to include new criteria to strengthen sustainability practices across food and health safety, nutrition, environmental management, and resource efficiency. Partnerships were also forged with 24 restaurants in three cities and with industry platforms that could act as multipliers, raising awareness of the project.

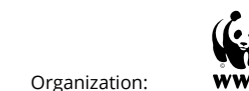
- To incentivize companies, a cost-benefit analysis was conducted to provide the business case for reducing food waste and implementing sustainable practices.
- Policy advocacy achievements included influencing or contributing towards several bills, policies, and guidelines such as the Food Surplus Reduction Bill, the National Sustainable Consumption and Production Framework, the National Food Waste Guidelines, and an MoU with the Department of Tourism to mandate sustainability training for the food service industry.



This project was carried out with the support of the International Climate Initiative.

Checklist:  Capacity Strengthening  Policy Change  Public-Private Partnerships

4.2 The Picnic Basket – Making Sustainable Snacks Cool at School in Romania and Greece



Takeaways

- Education programs on the importance of eating sustainable diets and reducing food waste that target early years have the best chance of behavior change.
- Promoting sustainable diets and reducing food waste helps delivers biodiversity conservation goals.
- Adaptable project planning can reap rewards – going digital in response to COVID restrictions led to better measurements of outcomes in two of the project countries and expanded access to the educational materials.

The project

The [Picnic Basket](#) is a tool to teach children aged 5-11 about sustainable food systems, sustainable diets, and food waste. It adopts a mix of experimental learning, play, and cooking as ways to switch snacking habits towards more sustainable choices and deepen the engagement of students, teachers, and parents on these issues. The program includes teaching materials for the classroom in the form of a real picnic basket filled with games and learning resources to teach sustainable eating habits, promote homemade food and eliminate food waste.

Why it matters

Unsustainable food production is a primary contributor to biodiversity loss and a major driver of climate change yet one-third of food produced goes to waste. Further, poor dietary habits are on the rise. The best moment to shape an individual's taste for sustainable and healthy food and introduce behaviors to prevent food waste is in early childhood.



A sample of the Picnic Basket by WWF.

© WWF Romania

Good practices

- The program is adaptable which means its impacts have reached beyond the classroom as it moved online in response to the COVID-19 pandemic. These adaptations ultimately helped set the scene for scale-up as the digital version of The Picnic Basket could travel to more schools across the three countries and hopefully, outside of these countries as well.
- An added benefit of changing parts of the program to an online version for WWF-Greece and WWF-Romania was that it aided the work of measuring impact including some impressive results:
 - 92% improvement in dietary habits, including a 23% increase in the consumption of fruit and vegetable snacks and 18% in the consumption of homemade snacks (Romania)
 - 20% increase in fruit and vegetable snack consumption and a 15% reduction in food waste (Greece)
- Up to 100% of teachers were happy to recommend the tool to fellow teachers and planned to implement it in the following school year (both).
- The COVID pandemic provided an opportunity to learn about the importance of testing assumptions e.g., it was never considered that schools could be closed. Design thinking helps work through these assumptions and incorporate helpful steps to improve the design.
- Based on the success of the innovation project there are plans to scale up the work with more schools, more students, and more families within each country, and hopefully in more countries across the WWF Network.
- There are plans to further invest in the digital version of The Picnic Basket as a simple and fast way to expand the work within schools with tools that are already available.




Eating outdoors isn't just ideal for safe, pandemic-era, socially distant fun, it's also a perfect opportunity to practice eco-friendly habits.

© NICK CABRERA / WWF

Checklist: Capacity Strengthening Public-Private Partnerships Digital innovation

4.3 Naturbeteskött – The Meat Label Helping to Restore Sweden’s Semi-Natural Grasslands

Organization:  WWF

Takeaways

- Restoring and managing semi-natural grasslands including their use for grazing is an environmentally friendly way to produce dairy and meat that also increases wild biodiversity.
- Certification schemes that show the green credentials of food products including meat and dairy help guide consumers who are increasingly guided by environmental concerns when making purchasing decisions.
- Farmer incentives such as grants, capacity building and access to markets including through public-private partnerships are critical to support transition in food production systems as are enabling policies like the Common Agriculture Policy and the Strategic Plan which support management of semi-wild grasslands and investments in animal housing.

The project

In 1989 WWF Sweden started setting up semi-natural pasture projects in several locations to safeguard resting places for migratory birds and to protect local biodiversity. Grazed natural pastures in Sweden have a high biodiversity of plants, insects, and birds – on average 40 species per square meter. This work led to the realization that reintroducing traditional pastoral systems could present an opportunity to restore the grasslands and produce high-quality meat products with green credentials resulting in *Naturbeteskött* (natural pasture meat), a national label to help consumers who make eco-purchasing decisions when it comes to their food.

Why it matters

In Sweden, as in many other places around the world, semi-natural grasslands have declined by more than 95%. One of the main drivers is a shift from traditional pastoral systems for milk and cattle production to intensive feeding and indoor rearing. This means the grasslands are no longer grazed resulting in the encroachment of bushes and trees and a loss of biodiversity. As semi-natural grasslands are one of the most environmentally friendly ways to produce meat, the idea of producing beef and lamb on extensive high conservation value grasslands is supported by both politicians and environmental agencies.



© WWF Sweden



© WWF

Good practices

- WWF worked with beef and dairy producers to form farmer groups in different parts of Sweden and supported the transition to using grazing in their production systems, for example, through grants for fencing, financial support to restore grazing lands, and working with landowners to release land for grazing.
- The project developed a third-party quality assurance certification – *Naturbeteskött*² – for grass-fed meat. The scheme was launched in 2008 and got a significant number of farmers interested in joining the scheme, as well as helping them to find markets for their certified meat and milk including through a national partnership with Coop Sweden.
- Early producers of *Naturbeteskött*, together with WWF, spent considerable time working with chefs and food journalists to build recognition of the brand as a premium product.

Checklist:



² The environmental certification for *Naturbeteskött* was designed through an open consultation process involving Svenskt Sigill (WWF Sweden, SLU Swedish University of Agricultural Sciences, Swedish Veterinary Association, Animal Welfare Sweden, The Swedish Plant Protection Centre, cattle farmers and the organization Pasture Beef Sweden

4.4 'Buy What's Good' - Consumers Help Drive Palm Oil Production Changes in Indonesia

Organization:



Takeaways

- **Engaging all stakeholders from governments to indigenous people is essential to minimize tradeoffs between economic growth and the destruction of uniquely biodiverse natural ecosystems and the services they provide to people, like clean water, carbon sequestration and CO2 emission reduction.**
- **Targeting consumers as well as producers with campaigns about the importance of purchasing sustainably produced products such as palm oil is critical to create change through consumer demand, particularly when it comes to targeting domestic consumers who can closely relate to local impacts.**
- **While palm oil production does generate jobs, these are frequently precarious and tainted by exploitation, which keeps prices low. Sustainability standards need to include labor and human rights provisions as well as environmental ones which requires engagement with many stakeholders from local communities including Indigenous Peoples to the private sector.**

The project

Indonesia has seen exponential economic growth in the last decade which has cut the poverty rate in half, to just under 10%. Government policies to develop infrastructure, improve logistical efficiency and promote exports have led to an unprecedented expansion of the agriculture and food sector, in particular, the cultivation of high-yielding palm which is produced for its oil. Indonesia has become the world's largest exporter of palm oil, a product used in a vast array of products from chocolate to detergent to diesel fuel. [This project worked to minimize tradeoffs between economic growth and the loss of uniquely biodiverse ecosystems](#) and the services they provide by taking a three-pronged approach to integrating sustainable consumption and production principles into business practices, government policies, and consumer choices.

Why it matters

Indonesia has the third largest tropical rainforest on the planet (94.1 million hectares), as well as the largest tropical peatlands (14.9 million hectares) and vast tracts of mangrove forests (3.31 million hectares). These natural resources store enormous amounts of carbon. The boom in palm oil has come at an incredible cost to nature, through the conversion of immense extensions of tropical forest and peatland in one of the world's most unique biodiversity hotspots, with land clearing and burning frequently accounting for most of the country's greenhouse gas (GHG) emissions – almost 80% in 2015. In addition, while the economic benefits from palm oil have contributed to rural poverty alleviation, jobs generated have been characterized by precariousness and exploitation and land conflicts with regular reports of local communities and indigenous peoples.

Good practices

- **Business Sector:** Working closely with the Indonesia Business Council for Sustainable Development, the project worked with the private sector to develop sustainable procurement guidelines and encouraged companies to incorporate sustainability principles into their strategic plans and operations.
- **Consumers:** The project was built upon WWF Indonesia's consumer campaign [Beli Yang Baik](#) (Buy what's Good) to convey the concept of sustainable palm oil consumption to the Indonesian public. Domestic consumers account for 30% of the oil produced, mostly for cooking (60%). Cooperation with civil society organizations including the Earth Hour community and the Indonesian Organic community increased the campaign's reach while media trips helped to raise awareness of the negative consequences of conventional palm oil production.
- **Policymakers:** To advance progress toward Indonesia's climate targets, the project provided support to policymakers by developing strategies to reduce GHG emissions in the palm oil sector including mitigation measures for the agricultural sector developed with the participation of the government, the private sector, scientific institutions, and civil society organizations

Highlight: Multi-stakeholder Engagement for Uptake

For successful integration of sustainable consumption and production principles into business practices, policies and consumer choices, the project showed the vital role that bringing together and communicating with different stakeholders can bring including:

- **Engaging businesses** in high-level meetings facilitated collaboration between retailers and brand owners that led to commitments between SuperIndo – one of the largest supermarket chains in Indonesia – and the Roundtable of Sustainable Palm Oil Producers (RSPO) resulting in the introduction of sustainable palm oil products. Sustainable Sourcing Guidelines were also published through the project and adopted by a range of sectors from food retailers to the hospitality industry.
- **Targeting consumers** through a range of channels including through radio shows, cooking demonstrations, eco-markets and movie screenings. Consumer power is an important driver of change and can help overcome resistance to align development policies to SDGs and climate targets.
- **Working with community partners** to assess their capacity, commitment, and readiness to implement project-related activities including through a Memorandum of Understanding signed in 2019 between WWF-Indonesia and the Government of West Java Province to increase public awareness on sustainable palm oil by collaborating with community organizations.



WWF Indonesia consumer campaign, [Beli Yang Baik](#) (Buy what's Good) to convey the concept of sustainable palm oil consumption to the Indonesian public.

The project is supported by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV) of Germany.

Checklist:

Community
InclusionCapacity
StrengtheningPublic-Private
Partnerships

4.5 Biodiversity for Food and Nutrition in Brazil, Kenya, Sri Lanka, and Turkey

Takeaways

- Biodiversity for food and nutrition is an often-overlooked link between agriculture and health, with indigenous species ranging from Brazilian vitamin-rich fruits to African leafy vegetables representing a valuable resource to reduce malnutrition and improve livelihoods.
- Public procurement schemes that incentivize production of a diverse range of foods, for example, through school feeding programs, are critical to diversify production systems.
- Biodiversity for Food and Nutrition has helped generate changes in behaviors and attitudes within a range of partner ministries and federal institutions of the project by working in close collaboration with them, for example, inviting representatives of strategic policy programs to be part of national steering and executing committees.

The project

The [Biodiversity for Food and Nutrition project \(BFN\)](#) was a multi-country initiative aimed at strengthening the conservation and sustainable management of agricultural biodiversity in four megadiverse countries – Brazil, Kenya, Sri Lanka, and Turkey. The initiative used a three-pronged approach to i) increase evidence of the nutritional value and cultural importance of local underutilized nutritious foods, ii) better link research to policy to ensure diverse foods are considered in national food and nutrition security strategies and actions, and iii) improve consumer awareness on the benefits of these alternative foods to encourage their incorporation in diets, food systems, and markets.

Why it matters

Agricultural biodiversity is important for food and nutritional security, as safety against hunger, a source of nutrients for improved dietary diversity and quality and strengthening local food systems and environmental sustainability. Brazil, Kenya, Sri Lanka, and Turkey are among the world's most mega-diverse countries thanks to the extraordinary diversity of ecosystems and species existing within their borders. They each contain unique biological diversity and have associated traditional ecological knowledge that supports a large proportion of the world's food supply in a range of ecosystems that are global priorities for conservation. Due to the fact that the biodiversity in these four participating countries is so vast, the use of these indigenous, largely plant, genetic resources is still scarcely explored, appreciated, or conserved.



Farmers displaying their crop diversity at the Busia Food Fair, Kenya.

© Biodiversity International / T. Borelli

Good practices

- **Evidence:** Nutrition and food composition data were collected for 195 species, contributing to national food composition tables and the FAO/In Foods Database. Publications and online databases along with recipes and traditional knowledge are accessible to a wider [audience](#). Collaboration with over 50 national universities and agencies established for data collection across the four countries, leading to the generation of new food composition data and the update of national food composition tables and databases. Four communities in Kenya, 121 villages in Turkey, quilombola communities in the Centre-West region of Brazil, and communities at the three pilot sites in Sri Lanka provided information used to document traditional knowledge associated with the target species.
- **Policy:** BFN led the revision of Brazil's National Biodiversity Strategy and Action Plan (NBSAP), engaging 400 participants from institutions across the business, environment, academia, federal and state government sectors as well as indigenous peoples and traditional communities and included the conservation of biodiversity for food and nutrition as an indicator of biodiversity health in the national revisions to the NBSAP 2020-2021. In addition, BFN supported the formulation of key policies including two Biodiversity Ordinances in Brazil and the first-ever Biodiversity Conservation Policy in Kenya.
- **Awareness:** The project increased the value given to biodiversity by consumers and producers while expanding market capacity. Examples include a farm-to-school direct procurement model, Sri Lankan-women-led traditional food businesses, farmer business school, gastronomy events such as the Wild Herb Festival in Turkey, cooking workshops, nutritionist training, educational and green job training initiatives, recipe books, and an [online course](#), and a [toolkit](#), to help mainstream biodiversity for food and nutrition.

Highlight: Enabling Policies to Mainstream Biodiversity for Food and Nutrition

Brazil

- **Evidence:** Food composition data of 78 underutilized species added to the national database; 12 MSc dissertations and 3 PhD thesis dissertations published in collaboration with federal universities.
- **Awareness:** Gastronomic events featured celebrity chefs using native crops, indigenous species featured on school textbook covers, mainstreaming biodiversity for food and nutrition online course.
- **Policy:** Ordinance 284 prioritizes 101 underutilized species, providing guidance to food procurement, nutrition education and other initiatives. Recommendations made to a number of cross-sectoral programs and action plans such as the National Plan for Agro-ecology and Organic Production, the National Food and Nutrition Security Plan and the School Feeding Program.

Kenya

- **Awareness:** Farmer Business School and training program; school gardens; field days and food fairs. The farm-to-school network has provided healthy school meals to at least 5 500 students and has had positive repercussions on farmers' livelihoods.
- **Policy:** Kenya's first Biodiversity Conservation Policy passed in Busia County recognizing species for conservation, market utilization, and incorporation into school meals.



Sri Lanka

- Evidence: Food composition data of 58 varieties, 28 underutilized species made available in the national database.
- Awareness: Hela Bojun food outlets promote underutilized species and empower women business owners who cook indigenous food while awareness-raising activities were organized in schools.
- Policy: Updated National Biodiversity Strategy and Action Plan mainstreams biodiversity in nutrition and food security policies and programs.

Turkey

- Evidence: Food composition data of 43 wild edible plant species included in the FAO/INFOODS and national database.
- Awareness: Alaçatı Herb Festival organized each year celebrates wild edible plants and traditional culture; 3 wild edible species domesticated with private sector engagement and upgraded market strategies.
- Policy: Biodiversity conservation mainstreamed into agricultural research, school curricula, and programs such as the Turkish Healthy Nutrition and Active Life and Turkish Nutrition-Friendly Schools Initiatives, as well as in the Agricultural Research Master Plan 2016-2020.



The vitamin C content in 100g of the pulp of the native fruits, camu-camu, is at least 3 times the amount contained in 100 g of common varieties of orange (53mg), banana (21,6mg) and papaya (82,9mg).

© Bioversity International

Mainstreaming Biodiversity Conservation and Sustainable Use for Improved Human Health and Well-being (BFN Project) was led by UNEP and FAO as the GEF Implementing Agencies and executed by the Alliance of Bioversity International and CIAT in collaboration with the Governments of Brazil, Kenya, Sri Lanka, Turkey.



4.6 Unpeeling the Potential of Bananas to Tackle Vitamin A deficiency in East Africa

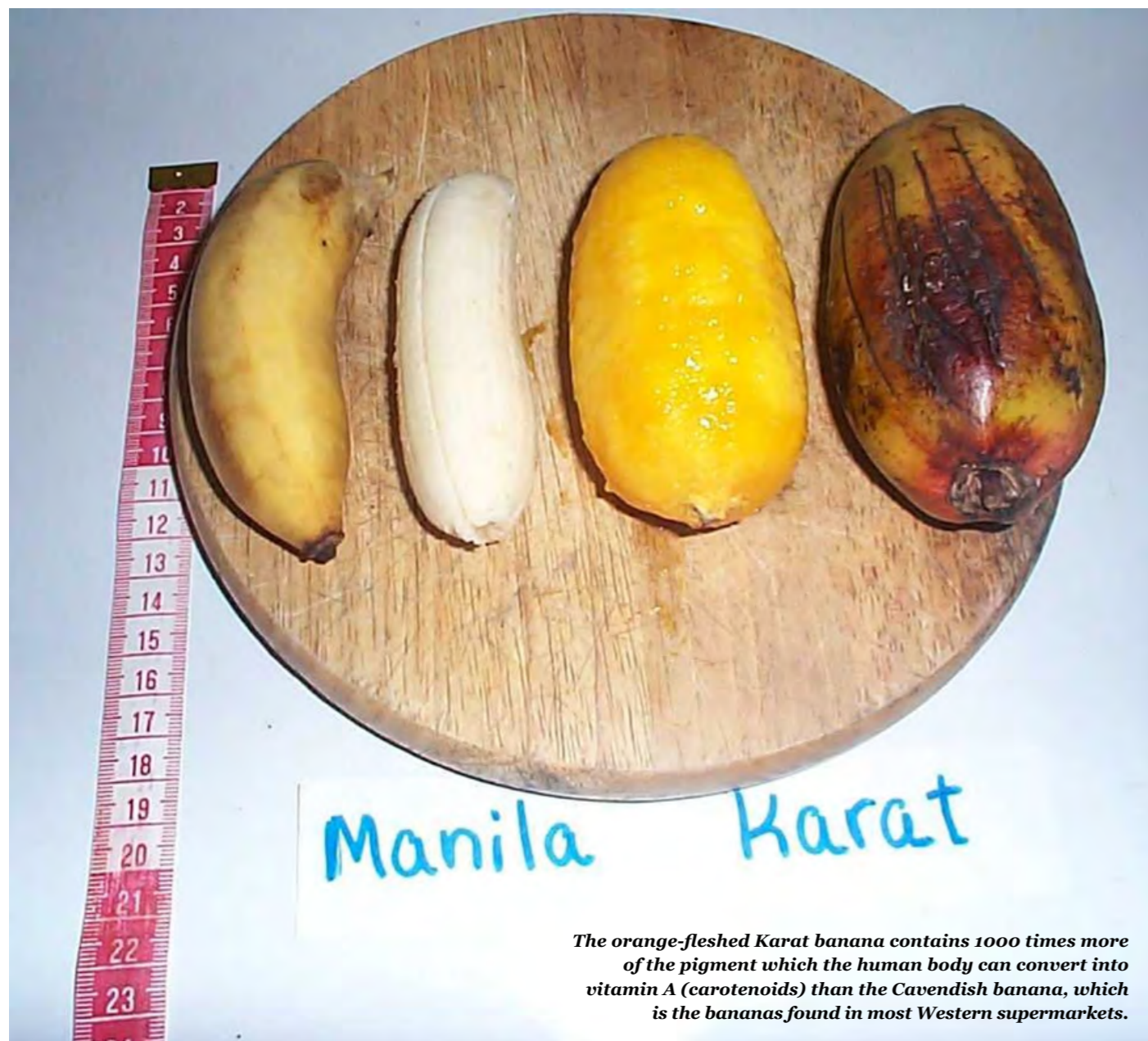


Dessert bananas on display at a fruit and vegetable market in Nairobi, Kenya.

© Bioversity International/A. Vezina

Takeaways

- Banana is a year-round perennial crop that has many diverse varieties, including some that have the potential to help tackle vitamin A deficiencies in populations where it is eaten widely. This includes the East Africa region where the prevalence of vitamin A deficiency is high.
- When introducing a new variety of a traditional crop to a population, it is critical to work closely with members of targeted communities in selection assessments, such as evaluations to assess growing qualities, texture, and taste. They also need access to quality planting material and capacity building support, and nutrition education support to stimulate consumer demand.
- The banana's versatility could be exploited through public-private sector engagement to enhance the production of value-added products that support nutrition and livelihoods.



© Bioversity International/L. Engberger

The project

In Africa, bananas are a major staple and livelihood crop. The daily consumption of cooking bananas in Uganda, Burundi, and Rwanda – plantains and East African Highland bananas – can reach as many as 11 bananas in a day per person, while in the Democratic Republic of Congo (DRC) they are consumed up to four times in a week. As the banana is eaten in such large quantities, introducing varieties that naturally have a higher content of provitamin A carotenoids – plant pigments that the body converts into vitamin A – is a way to tackle the deficiency that is so widespread in the region. For some banana varieties, particularly orange fleshed varieties, eating just two a day can meet 100% of the daily recommended intake for children under five. To this end, the Alliance of Bioversity International and CIAT has been [fast-tracking vitamin-A-rich banana varieties for over a decade and integrating them into rural communities' farming systems and diets.](#)

Why it matters

The Food and Agriculture Organization of the UN (FAO) and the World Health Organization have identified vitamin A deficiency as a major public health problem in many developing countries. It increases the risk of disease and death from severe infections in children, contributes to poor pregnancy outcomes among women, and is the leading cause of preventable blindness in children. The prevalence of vitamin A deficiency in East Africa is around 35% despite efforts towards supplementation and biofortification and around 40% of children are affected.

Good practices

- The first step was to screen more than 400 varieties to identify those with high levels of carotenoids. Bananas are notoriously difficult and expensive to breed, so 'fast-tracking' existing vitamin-A-rich varieties for testing in this way offers savings of both time and money.
- A shortlist of 15 banana varieties from Ghana, Papua New Guinea, and the Philippines, were evaluated in different growing environments in Burundi and Eastern DRC for agroecological performance such as yield, taste, and texture. For communities to adopt the introduced varieties, they must grow under local conditions, work well in a range of traditional recipes, and appeal to children.
- Evaluations were accompanied by awareness creation activities on the importance of vitamin A in diets for healthy development and capacity building, for example, cooking demonstrations. These kinds of activities stimulate consumer demand which increases adoption and market demand which gives added incentives for farmers to cultivate the introduced varieties. Key message booklets and factsheets have been co-developed to ensure they are community friendly, translated into local languages, and disseminated through partners.
- 12,000 farmer households have been reached so far with information on the sustainable use of vitamin-A-rich banana varieties and approximately 20,000 plantlets of five varieties selected from the evaluation trials have been distributed. In addition, farmers are sharing the bananas and planting materials within their communities.
- Next steps include studies to establish the bio-efficacy of provitamin A carotenoids and their contribution to vitamin A body stores following regular consumption of diets based on the bananas selected and used in the project. Results from this study will fill the final piece of the puzzle and enhance efforts toward scaling adoption of the vitamin-A-rich bananas.



© Bioversity International/N.Capozio

This project was made possible through the support of CGIAR and involves farmers and household members, as well as consultations with the National Agricultural Research Institutes and Ministries of Agriculture and Health.

Checklist:  Community engagement  Capacity strengthening

5. CONSERVING PLANT GENETIC DIVERSITY AND TRADITIONAL KNOWLEDGE

Targets: 2, 4, 9, 10, 13, 16,

The IPBES Global Assessment Report³ released in 2019 and presented to the Convention on Biological Diversity generated international headlines on the potential loss of one million species by 2050. These species include the thousands of plant, animal, and fish species as well as the varieties, breeds, and strains found within those species, and those that contribute to ecosystem health, upon which our food systems depend. Conserving agrobiodiversity is critical to give people the options they need to adapt to climate change, fill nutrient gaps, and be resilient to emerging pests and diseases. As well as conserving the genetic diversity that underpins our food systems whether in genebanks, on farms or in the wild, it is critical also to conserve the traditional knowledge about its uses and cultivation methods. Integrating wild and agricultural biodiversity conservation strategies can also be an effective approach although the two agendas often remain separate despite having similar goals.



Colours and shapes show the great diversity of local products. La Cocha, Colombia Northern Andes Ecoregion.

© Diego M. Garces / WWF

³ [Global Assessment Report on Biodiversity and Ecosystem Services | IPBES secretariat](#)

5.1 Conserving Wild Fruit and Nut Species on Farms in Central Asia

Takeaways

- Hundreds of native fruit and nut tree species and their genetic traits developed over millennia are now safely conserved in farmers' orchards in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan and being used to generate livelihood benefits. These nutritious and resilient species are also beneficial to ecosystem health including carbon sequestration and nutrient recycling.
- The regional approach taken working with the countries to tackle shared problems in transboundary ecosystems has proved effective and efficient, improving cooperation and reducing duplication of effort. Moreover, farmers, research institutes, and local communities were equipped with capacity and skills to conserve in situ/on-farm horticultural crops and wild fruit species in Central Asia.
- Tree nurseries, inspired by the project, have distributed hundreds of thousands of saplings across the region, improving livelihoods, increasing food availability and helping to restore degraded environments.

The project

Central Asia is the center of origin and domestication for many temperate fruit and nut species of global significance. Its mountain slopes are home to selected varieties and wild species of, apple, apricot, grape, peach, pear, pistachio, plum, pomegranate, walnuts, and others. These locally developed traditional varieties are adapted to local environments, increasing both resilience in agroecosystems and farmers' livelihoods. The project - [In Situ/On-Farm Conservation and Use of Agricultural Biodiversity \(Horticultural Crops and Wild Species\)](#) in Central Asia - targeted horticultural crops and wild fruit species for sustainable development, food security, and environmental resilience in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan.

Why it matters

These species remain economically and socially significant in the region providing the current population with a consistent supply of valuable foods and income, especially in unirrigated and drier areas, and supporting soil stabilizing through their root systems, among other environmental functions. Each country derives direct benefits from these species and because of the nature of the transboundary ecosystems, they also benefit from coordinated approaches to sustain the diversity of the species and their habitats.

Good practices

- A wide range of stakeholders was brought together from different countries to approach the challenge from a regional perspective that considered the transboundary nature of the ecosystems, habitats, and the globally significant species and their wild relatives in their center of origin and diversity. This included the creation of a regional steering committee to ensure that agreed common purposes, activities, and outcomes were followed and to provide necessary governance of the project at national and regional levels, for example, regular monitoring and reporting to the regional level.
- The project leveraged its regional scope to ensure that farmers from different countries had the opportunity to exchange insights on different aspects of the cultivation and processing of fruits and nuts. For example, in Uzbekistan, farmers were introduced to a new technology for planting pistachio trees with a covered root system that extends the planting season for two months.
- Through consultation with a wide range of stakeholders including scientists, policymakers, farmers, foresters, and users of forest products, a shortlist of 12 endemic perennial priority fruit and nut tree species was created – almond, apple, apricot, cherry plum, currants, fig, mulberries, peach, pear, pistachio, pomegranate, sea buckthorn, and walnut – to allow in-depth work on their conservation and sustainable use. Farmers' associations were promoted to maintain local varieties of horticulture crops and wild fruit species.



Wild apricot sampling process in Chichkan gorge, Kyrgyzstan.

© UNEP-GEF/Rashid Azimov

- National project teams prepared and delivered training programs on a wide range of agricultural biodiversity conservation topics for researchers and educators, farmers, managers of protected areas, and policymakers. At each target site, the teams worked closely with local leaders among farmers and forest users to build capacity in using biodiversity for food production and to supply planting material. Farmers also worked in collaboration with researchers on diversity assessments of local varieties of fruit and nut trees. A critical aspect was to connect farmers' conservation strategies with extension services to increase the benefits of managing biodiversity to improve the welfare of rural populations.
- An educational campaign raised awareness among farmers, policymakers, the media, and the general public about the value of indigenous fruit and nut-bearing tree diversity.



Highlight: Results

Conservation

73 demonstration plots/orchards were established in all five partner countries where 436 traditional varieties of fruit and 117 genotypes of wild nut tree crops are maintained *in situ* and on farm. 59 tree nurseries have also been established to improve farmers' access to diversified germplasm and increase understanding about management practices of local varieties among farmers. These nurseries supply 1.5 million saplings of local fruit crop varieties and 100,000 saplings of wild fruit and nut species annually.

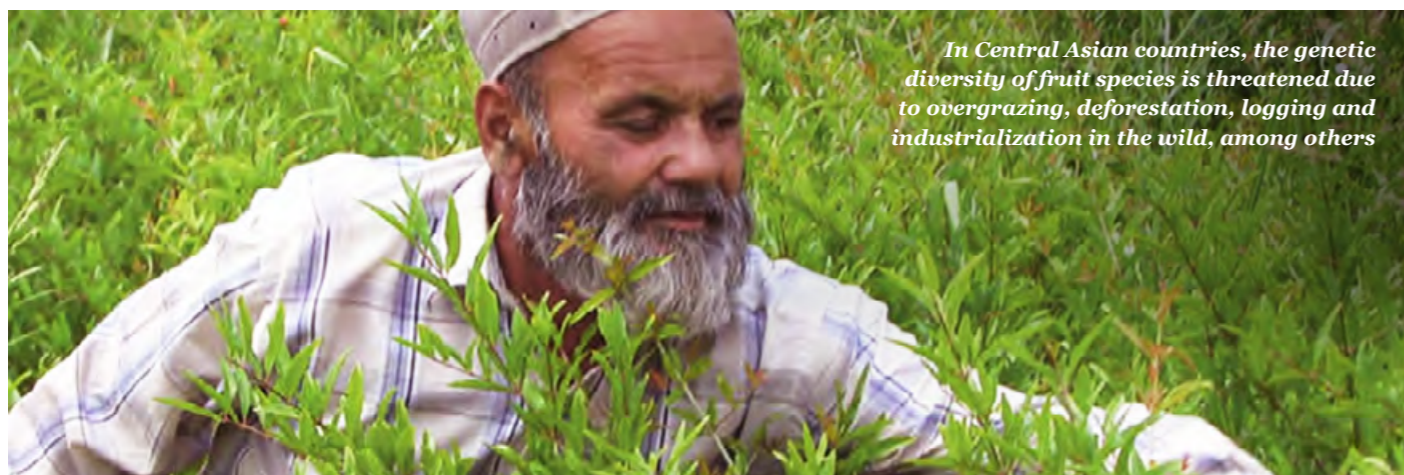
Recognizing Farmers as Custodians of Biodiversity

National rosters of local varieties of fruit, nut-bearing tree crop and grapevine varieties were developed that include information on the genetic diversity and the farmers (diversity custodians) who maintain it on their farms. The national roster in Uzbekistan includes information on 185 custodians who maintain 433 local varieties, in Tajikistan - 118 custodians who maintain 219 varieties, in Turkmenistan, 97 farmers who grow 142 local varieties in their orchards, in Kyrgyzstan - 47 custodians maintain 136 varieties.

Capacity development

Five regional and eight national training centers have been established on the sustainable management of fruit and nut tree diversity. The centers targeted four stakeholder groups: 1) policymakers at state and local levels, 2) instructors and teachers from research institutes and universities, 3) farmers and 4) local communities, and employees of forestry enterprises and forest dwellers.

'Guidelines on Access and Benefit Sharing in Research Projects' have also been produced in Russian and English providing research institutions and decision-makers with different model agreements that can help them in the work related to access and benefit sharing from the use of genetic resources, in light of the Convention on Biological Diversity, Nagoya Protocol on Access and Benefit Sharing and the International Treaty on Plant Genetic Resources for Food and Agriculture.



In Central Asian countries, the genetic diversity of fruit species is threatened due to overgrazing, deforestation, logging and industrialization in the wild, among others

© UNEP

The project 'In Situ/On-Farm Conservation and Use of Agricultural Biodiversity (Horticultural Crops and Wild Species)' in Central Asia was led by UNEP as the GEF Implementing Agency and executed by the Alliance of Bioversity International and CIAT in collaboration with Academy of Agricultural Sciences of the Republic of Kazakhstan, Innovation Centre of Phytotechnologies of National Academy of Sciences in Kyrgyzstan, Tajik Institute of Horticulture, Tajikistan, Academy of Sciences of Turkmenistan, and Research Institute of Genetics and Plant Experimental Biology in Uzbekistan.



5.2 Community Seedbanks: Custodians and Champions of Agrobiodiversity

Takeaways

- The number of community seedbanks is increasing around the world; they are taking on multiple functions, such as conserving, restoring, revitalizing, strengthening, adding value to and improving local seed systems. Women play key roles in community seed banking.
- Community seedbanks conserve large numbers of diverse local crop varieties, including major and minor food crops, and neglected and underutilized crop species. They complement the conservation efforts of the national genebanks, although not always receiving the recognition and support they deserve.
- Community seedbanks can be strong partners in national conservation strategies and systems, but they require more policy, legal, financial, organizational, and technical support. In some countries, community seedbanks have established a formal collaboration agreement with the national genebank to create synergy toward a national conservation system.

The project

For about two decades, the Alliance of Bioversity International and CIAT, and national research and development organizations [have established and supported community seedbanks around the world](#) in Bhutan, China, India, Nepal, Sri Lanka; Burkina Faso, Ethiopia, Ghana, Kenya, Madagascar, Mali, Niger, South Africa, Uganda, Zambia and Zimbabwe; and Bolivia, Guatemala, Honduras, and Peru. Community seedbanks are locally governed and managed institutions whose core function is to maintain seeds for local use. They have been around for about 30 years conserving, restoring, revitalizing, strengthening, and improving local seed systems, especially, but not solely, focused on local crop varieties. Community seedbanks also function as a platform to increase the control of farmers and local communities over seeds and to strengthen or establish dynamic forms of cooperation among farmers and between farmers and others involved in the conservation and sustainable use of agricultural biodiversity. Recently, in Nepal and Uganda, community seedbanks have joined forces and established national platforms to advance their efforts and interests.

Why it matters

Estimates suggest that globally 80% of the seeds on which smallholder farmers in developing countries depend are self-produced and obtained through local channels of distribution and exchange. This high level of farmer seed autonomy masks the fact that almost everywhere local seed systems are under stress. Agricultural intensification, commoditization, privatization of natural resources, and the expansion of corporate power in the life science industries (including the seed industry) are among the forces impacting smallholder agriculture. Large-scale rural-to-urban migration is contributing to a decline in farming in many countries or transforming small-scale family farming into contract farming. These trends are affecting seed conservation, production, selection, storage, distribution, and exchange. Although in many areas farmers continue to maintain a diversity of crops and crop varieties, significant reductions, in terms of numbers as well as area sown or planted, are occurring.



Beans at the CIAT gene bank in Colombia.

© CIAT / NeilPalmer



Gumbu farmers monitor their participatory variety selection experiment

© Bioversity International / R. Vennoy

Good practices

Community seedbanks:

- Have multiple seed system functions including conservation, providing access and availability, sharing seeds and related knowledge, adding value, and establishing linkages with other seed system actors.
- Contribute to the adaptive capacity of farmers and communities (in particular concerning climate change), through several strategies: conserving a portfolio of diverse seeds of crops and crop varieties; conserving seeds from plants that have a high capacity to survive under extreme weather conditions; restoration of 'lost' varieties with particular good adaptation potential; accessing novel diversity not conserved locally, and accessing seeds from areas where plants have adapted to extreme weather conditions.
Bridging traditional knowledge with modern science to strengthen technical and organizational aspects, e.g., through the use of locally available botanical repellents (to keep away infestants), airtight containers (to store seeds), zeolite beads (to dry seeds), and seed registers (to track seed flows in and out of the community seedbank).
- Add value to the conservation function through participatory crop improvement, e.g., evaluating varieties for their adaptive capacity and/or nutritional values; seed production and marketing of good performing varieties and/or varieties with high market demand; and the provision of educational services, e.g., training of other farmers interested to establish a community seedbank.

Highlight: Conserving Crop Diversity in South Africa's Community Seedbanks

Between 2016 and today, community seed banking activities in South Africa has expanded from a pilot in the community seedbank of Gumbu, Limpopo province to conserve multiple varieties of 15 crops. Today, the Plant Genetic Resources Centre under the Department of Agriculture, Land Reform and Rural Development (which houses the national genebank) supports three community seedbanks, facilitating capacity building and knowledge/seed exchanges, and, since 2019, participatory variety selection in collaboration with the plant breeders of the Agricultural Research Council of South Africa. Farmers of the three community seedbanks have evaluated local and improved varieties of high diverse priority crops, including cowpea, pearl millet, oca, and sorghum, selecting best performing varieties according to their criteria.

Some community seedbanks have established or are establishing a formal relationship with the national genebank to create synergies between ex-situ and on-farm conservation and facilitate exchanges of knowledge and seeds. Examples include China, Nepal, Kenya, South Africa, Uganda, and Zimbabwe.

Checklist:



Community Inclusion



Capacity development

5.3 Empowering Conservation Stewards in South Africa's Grasslands

Takeaways

- Empowering communities through incentives to sustainably manage land can result in the effective conservation of the natural resources used by the communities who in turn benefit from ecosystem health and the services it provides.
- Voluntary agreements drawn up between a range of stakeholders protect the interests of the community and landowner stewards.
- Government support and enabling policies including the National Environmental Management Protected Areas Act recognize the role that communities play in managing protected areas and the biodiversity it contains and ensure local communities maintain access to their lands through private protected area management.

The project

'Empowering Conservation Stewards in Grasslands' is a WWF project in South Africa to incentivize and reward communities for sustainably managing the grasslands that cover nearly a third of the country. Grasslands have a critical role in providing water security and supporting the livelihoods and food security of rural communities including through resilience to climate change. They also support the habitats and connectivity of many wild plant, animal, and aquatic species. Since 2015, WWF has worked with rural communities and commercial farmers in the grasslands to ensure the communities benefit from the outcomes of the landscapes that they sustainably manage through the adoption of voluntary agreements.

Why it matters

The rich biodiversity in the grasslands and the continued provision of ecosystem services that they provide to people are under pressure from large-scale agriculture, mining, invasive species, poor fire management, and overgrazing for livestock. Two of the 80 vegetation types found here are classified as critically endangered, 18 as endangered, and 27 as vulnerable, while 83% of its river ecosystems are ranked as threatened or critically endangered. Despite their critical role in supporting biodiversity and rural populations, only 4% of grasslands are protected.



'Empowering Conservation Stewards in Grasslands' is a WWF project in South Africa to incentivize and reward communities for sustainably managing the grasslands that cover nearly a third of the country.

© WWF South Africa

Good practices

- Voluntary agreements have been drawn up that empower the local communities who manage the lands to benefit from doing so, for example through land management plans that ensure sustainable livestock production, economic growth, and biodiversity stewardship. These plans have been developed in collaboration with the communities and other key local stakeholders including the South African National Parks and Provincial Conservation Agencies.
- Capacity-building with local landowners and farmers is ensuring efficient land management which is supported by expanded grassland protection schemes and investments in restoration.
- The project has placed community engagement at the heart of its strategy working in 13 focal community sites, representing 11,500 people, and catalyzing over 200,00 ha of land under stewardship. One of the community stewardship projects, the Mgundeni, is recognized as the only successful land reform and livestock initiative by the district municipality.



Drakensberg grasslands,
South Africa

© WWF

Checklist:



Community
Inclusion



Capacity
Strengthening

5.4 Integrating Wild and Agricultural Biodiversity Conservation Strategies in Cuba

Organization:



Takeaways

- There is potential to better integrate and align efforts and activities to achieve outcomes for both agricultural and wild biodiversity, yet most agricultural and wild conservation strategies continue to be pursued separately. By bringing together different sectors, the project is tapping into the expertise of usually separated fields, to work towards strengthening the resilience and food security of these socio-ecological landscapes.
- Mainstreaming conservation and sustainable use of agrobiodiversity, that builds on traditional knowledge and cultural values, into the protected area management system can provide resilient and innovative resources for society contributing to the sustainability of the protected areas and the livelihoods of the communities.
- Farming that is carried out in and around protected areas is often embedded into agroforestry systems where different wild and cultivated species co-exist and relies on traditional practices that help sustain ecosystem health and biodiversity.

The project

The objective of this initiative was to increase agricultural biodiversity in the buffer and transition zones of the Sierra del Rosario and Cuchillas del Toa in the UNESCO Man and Biosphere (MAB) Reserve of Cuba. The [Man and Biosphere](#) Programme is an intergovernmental scientific program to enhance the relationship between people and their environment including through the creation of diversified and sustainable agricultural production systems that build on traditional knowledge and bio-cultural values, and foster community and stakeholder participation. The project focused on integrating wild and agricultural biodiversity conservation and sustainable use strategies in these areas; improving the management of the Cuban MAB Reserve system through enhanced leadership and decision-making capacity of all relevant stakeholders; and improving the livelihoods of those communities living in and around the project site through benefit-sharing mechanisms that support sustainable use of agricultural biodiversity.

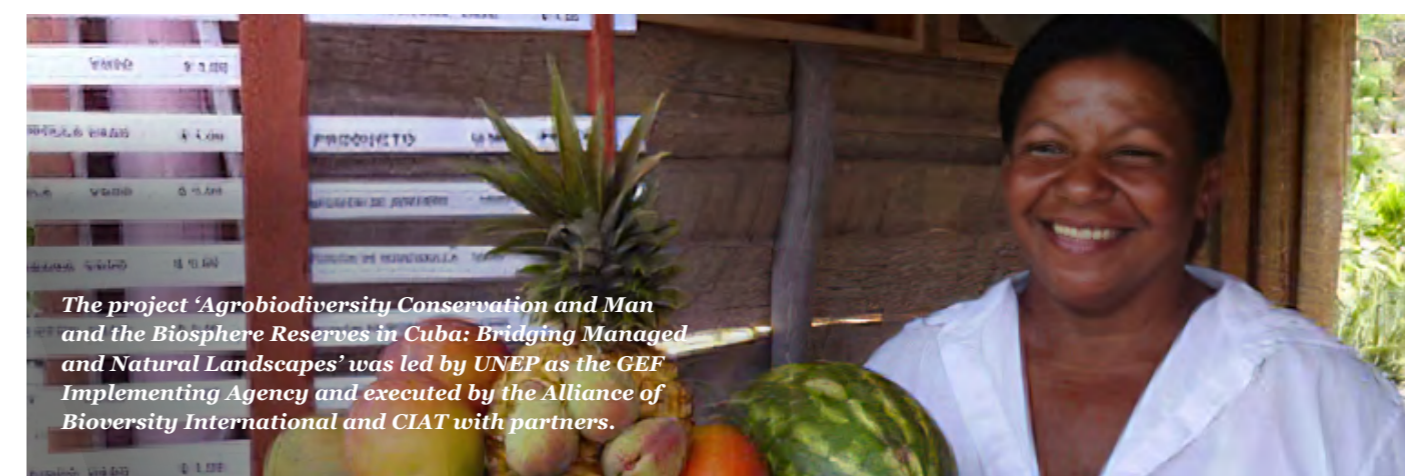
Why it matters

Some of the richest, most beautiful, and most diverse agricultural landscapes can be found in UNESCO Man and Biosphere (MAB) Reserves around the world. Yet, while biodiversity conservation has always been a fundamental tenet in the management of these reserves, the protection of agricultural landscapes has largely been neglected. The result is a continuing tension between conservationists and agricultural communities living in protected areas. An innovative and flexible approach to nature conservation is needed that bridges the objectives of ecosystem and agrobiodiversity conservation, improves the well-being of agricultural communities, and contributes to food sovereignty.

Good practices

- Many of the farming management practices used are biodiversity-friendly, for example, fences made of vegetation, fruit trees to shade vegetable crops, intercropping systems as well as the use of natural compost. The project has promoted recognition of the value of such farming systems within the reserve as a means of food, knowledge, and cultural heritage, and agrobiodiversity conservation is now included in conservation strategies in the reserves.
- Several farmer-based seedbanks have been created in the two reserves with the technical support of the project. Farmers voluntarily accepted to act as custodians of specific crops and varieties (landraces) by conserving seeds or planting material on their farms and exchanging them with other neighboring farmers in case of need or simply because they want to try different crops and varieties.
- A set of indicators developed through the project to measure the socio-ecological resilience of the farms in the face of climate change and enhance resilience using participatory practices has garnered much interest among NGOs, research institutes, and development agencies around the world as a useful tool for participatory landscape resilience assessments. The indicators were developed as part of an earlier project within the framework of the [Satoyama Initiative](#), but Cuba was the first country where they were tested.

- Through the project, farms in the two reserves have been characterized to map and identify crop and livestock diversity, main agroecological conditions, and social issues. Data on biodiversity, including wild species and cultivated varieties, agricultural practices, environmental quality, and socio-economic and socio-cultural aspects were collected using different tools including questionnaires and soil biodiversity indexes.
- Marketing campaigns have helped to build public awareness around the biological and bio-cultural values of Cuban Biosphere Reserves at national and international levels. They have also served to improve markets for Man and Biosphere farmers and create opportunities and conditions for public and private investments in agro-tourism and ecotourism that support the protected areas in Cuba.



© UNEP

Highlight

- A new inventory of plants species and their uses found in the two reserves has been created and it amounts to 732. The different farm types found in the two reserves were also characterized and crop distribution is available for 171 farms in the two areas.
- 33 farm-based community seedbanks have been established in the two reserves and 50 different crop species (perennial and annual) have been re-introduced and have benefited multiple families. The creation of new selling points along the road in the two reserves has represented an opportunity for farmers to sell all those products that are not contracted with the state and that usually are wasted on farm because not commercialized or processed
- Local communities received training on different aspects related to conservation and use of agrobiodiversity. Agrobiodiversity was included for the first time in the Strategic Plan of the National System of Protected Areas of Cuba (SNAP) 2015-2020 as part of a program.

The project 'Agrobiodiversity Conservation and Man and the Biosphere Reserves in Cuba: Bridging Managed and Natural Landscapes' was led by UNEP as the GEF Implementing Agency and executed by the Alliance of Biodiversity International and CIAT in collaboration with Instituto de Investigaciones Fundamentales en Agricultura Tropical (INIFAT) and Centro Nacional de Areas Protegidas (CNAP) in Cuba.

Checklist:

Community
InclusionCapacity
StrengtheningPolicy
Change

5.5 Safeguarding and Using Traditional Knowledge on Cultivating Tropical Fruit Diversity in Asia

Takeaways

- Farmers across South and Southeast Asia have a wealth of knowledge and skill developed over millennia for cultivating different species and varieties of fruit trees which needs to be conserved and used, along with the vast array of genetic diversity.
- Integrating traditional knowledge into formal conservation efforts undertaken by national agencies can bring tangible benefits to farmers.
- Community engagement revealed that for fruit tree conservation efforts to succeed and be sustainable it was important that participation not be limited to farmers, but also include private nurseries, local banks, financing agencies and schools.

The project

South and Southeast Asia are the centers of origin and diversity of many globally important tropical fruit tree species from citrus, to mango, papaya, and rambutan, and their wild relatives. India alone is home to over 1,000 varieties of mango. This [project aimed to improve the conservation and use of this rich tropical fruit tree genetic diversity](#) by strengthening the capacity of farmers, local communities, and institutions to implement community-based management of local fruit tree diversity in home gardens and orchards, and to enhance the *in-situ* conservation of their wild relatives in forests. It also worked to establish a platform that integrates farmers' traditional knowledge and skills with scientific knowledge and formal conservation efforts undertaken by national agencies.

Why it matters

The genetic diversity of tropical fruit trees in Asia is increasingly threatened. Threats facing cultivated species are the specialization of production systems in a few varieties, land-use changes, and climate change. Habitat loss is the primary threat facing wild relatives. *Ex situ* conservation of genetic diversity is difficult because tropical fruits generally possess recalcitrant seeds that cannot be stored in conventional genebanks. *In-situ* or on-farm conservation is considered to be a viable low-cost option; however, many national partners do not understand it adequately and experience difficulties with implementation strategies at the community level. The value of the farmer's contribution to *in situ* conservation is not well appreciated as much of the conservation investment in terms of human resources and operational funds are limited to *ex situ* conservation.

Good practices

- The project integrates traditional knowledge and practices into local farming and social systems. Community genetic diversity assessments revealed that farmers maintain rich tropical fruit tree diversity including a significant number of cultivars that have little commercial value but are important for home and local consumption. Traditional knowledge related to the cultivation of diverse tropical fruit tree species and varieties was also documented.
- Participatory methods and on-farm and in situ conservation approaches were introduced as a completely new field of work for all partners. Frontline researchers and community organizers were trained with appropriate traditional knowledge documentation, participatory approaches, CBM methodology, diversity assessments, baseline survey methods, markets for diversity, etc., to equip partners to work with communities in developing action plans that reflect local needs. Capacity building of national and local educational institutes was carried out to train staff, in participatory assessment, conservation, valuation, and enhanced use of tropical fruit tree resources.
- Community-based organizations like farmer organizations, women's groups, or self-help groups were established or strengthened for the implementation of local action plans. Stakeholders were involved through established Multidisciplinary Site Teams who regularly met and were involved in the implementation of activities to share knowledge and skill and promote local innovation built upon traditional knowledge and practices.

- Biodiversity fairs were promoted as a tool for raising public awareness of the value of conserving local fruit landraces. In all the project communities throughout the four countries, fruit diversity fairs were organized at local to national levels. During a fair, farmers from different communities are brought together to exhibit a range of landraces; this continues the traditional system of exchange of seeds and knowledge and local products made from the fruits. This has been a great participatory social learning tool for various objectives by a range of organizations.



Woman farmer practicing *in-situ* on-farm conservation to safeguard genetic diversity of tropical fruit trees in Malaysia.



Highlights

- Training in participatory methodologies and CBM has resulted in a critical mass of frontline staff in 36 communities in four countries.
- Over 43 distinct species of the genera Citrus, Garcinia, Mangifera and Nephelium have been identified in 22 sites including more than 211 distinct named varieties of mango (Mangifera indica) across the four countries, of which 155 are found in the Indian communities.
- The project has reached out to 14,345 households through a wide range of development activities and training workshops across the four countries and worked intensively with 1,900 households across the project communities.
- The project assisted cooperatives and farmer associations and established or strengthened self-help groups, mainly in India through a collaboration with a local NGO (Dhan Foundation) targeting in particular women and poorer households involved in growing or collecting fruits. In total 53 nurseries have been established.
- Farmers have learned grafting techniques and over 77,000 saplings of 87 selected elite materials (best performing trees of a species or variety) were distributed across the project sites. These were documented in 27 fruit catalogues including photos of trees, fruits, and leaves and a description of their uses, characteristics and current availability, including the names and photos of their owners.
- 61 diversity fairs were organized over a period of 5 years, from small but vibrant village fairs to the participation of farmer groups in trade events or fairs in major cities such as the famous 'mango mela' in New Delhi or the Malaysian Agriculture, Horticulture and Agrotourism Show (MAHA) in Kuala Lumpur.
- Custodian farmers and their families have been identified, documented with their fruit tree diversity, and involved in key activities of the project such as developing fruit catalogues, identifying elite materials, participating in diversity fairs and training workshops. They also played a key role in identifying, implementing and mainstreaming of good practices and establishing fruit tree diversity gardens in 30 sites.

The GEF project 'Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihoods, Food Security and Ecosystem Services' was led by UNEP as the GEF Implementing Agency and executed by the Alliance of Bioversity International and CIAT in collaboration with the Indian Council of Agricultural Research (ICAR), the Indonesian Centre for Horticulture Research and Development (ICHORD), the Malaysian Agricultural Research and Development Institute (MARDI), and the Department of Agriculture (DOA), Thailand.



5.6 Incentives for Agrobiodiversity Conservation in Peru (AGUAPAN and PACS)

Why these projects matter

Peru has some of the world's richest biodiversity and is a center of origin for several priority crops that are of global importance on the one hand, and critical for local rural livelihoods on the other. Over 50% of rural inhabitants live in poverty including the indigenous populations who live in arid Andean highlands where much globally important agrobiodiversity is conserved. Like many other low-income countries, Peru faces the challenge of how to safeguard its valuable genetic diversity maintained by farmers in their fields while meeting those same people's development needs and rights, particularly for genetic diversity that has little market demand or cultural appeal. There is also often a gap between the good intentions of policies to 'share benefits' with traditional and indigenous farmers who conserve ancestral varieties and the actual practice of assuring 'benefits' by responding to farmers' demands with clear mechanisms for self-determination.

These two projects set out good practice approaches that recognize and reward the important role of custodian farmers in conserving precious genetic diversity including where there are no market incentives for doing so.

Payments for Agrobiodiversity Conservation Services in Peru (PACS)

Takeaways

- **Agricultural biodiversity is the basis of human survival and well-being – safeguarding it is crucial to providing future food growing options for us all. But its conservation is often carried out by smallholder farmers who receive little recognition or compensation for carrying out what is essentially a service for the public good.**
- **Empowering the communities to identify their own rewards in PACS tenders, an important form of participatory justice, is an essential part of making the incentive scheme work.**
- **Strong support from the Ministry of Environment in Peru, combined with the interest and knowledge of the farmers on quinoa diversity, as well as support through regional governments have all contributed to the success of the project.**

The project

'[Payments for Agrobiodiversity Conservation Services \(PACS\)](#)' recognizes and rewards the role that custodian farmers play in conserving crop varieties of global importance on their farms in particular those that have no economic value. PACS schemes involve landscape-wide competitive tenders where communities are invited to submit proposals to conserve a priority portfolio of crop species and varieties that are at risk of being lost and to name their conditions for doing so – the 'payment' which is usually in the form of in-kind rewards such as community equipment. The scheme has been successfully trialed in Peru on quinoa varieties where the Ministry of the Environment has recognized its complementary role to ensure the conservation of its genetic base against market development activities.



Organization:

Good practices

- The tendering process means that the farming communities can choose the reward they want which provides a strong incentive for completing their side of the agreement. For example, one community group asked for mattresses.
- Out of a portfolio of 700 varieties across 10 crops, 140 were identified as a priority. This priority-setting exercise also included workshops with various stakeholders to set indicators and identify gaps.
- Strong support from the Ministry of Environment in Peru, combined with the interest and knowledge of the farmers on quinoa diversity, as well as support through regional governments have all contributed to the success of the project.

Highlights: Today Peru, Tomorrow the World!

To date, PACS has been used to intervene on 398 threatened crop varieties in Peru across 10 important livelihood crops – amaranth, cañihua, maca, maize, mashua, oca, potato, quinoa, tarwi and ulluco) involving 228 community groups, 2,103 farmers (894 of which were female). The scheme is also operational in Bolivia, Ecuador and Guatemala where a further 31 crop varieties are subject to intervention, involving 67 community groups, and 604 farmers (358 of which were female). Further expansion into Burkina Faso, Ethiopia, Ghana, Madagascar, Malawi, Nepal and Uganda is underway subject to funding approval.



Spades, wheelbarrows, cement, and mattresses - just some of the rewards handed over to six farming communities for cultivating local varieties of quinoa through the PACs scheme in Peru.

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PACS is a mechanism developed for fulfilling commitments under the CBD, ITPGRFA, and various national legislation. It has been made possible through the support of GEF and the CGIAR Research Programs on Roots, Tubers and Bananas and Policies, Institutes, and Markets.



The Native Potato Guardian Association of Central Peru (AGUAPAN)

Takeaways

- To access benefit sharing or payment for environmental services schemes farmers need to be organized. While this is common for export-oriented farmers in Latin America, for example, in the coffee, cacao and fruit sectors, it is less common for food crops like potatoes, beans or lesser-known native crops.
- While the group required support and capacity building, the farmers themselves drove the design of services based on their own ideas and requests. AGUAPAN members have access to tangible monetary and in-kind benefits, including an annual financial bonus, a high value market, health fund, capacity building, etc.
- Supportive private sector collaboration and enabling policies that protect and empower biodiversity guardians to be engaged in the process are essential for access and benefit sharing schemes to be successful. AGUAPAN relies on sustained investment of the private sector through the provision of the funds needed for direct benefit sharing.

The project

[‘The Association of the Guardians of the Native Potato of Central Peru \(AGUAPAN\)’](#) is a project to recognize and provide tangible incentives to indigenous farmers who carry out the conservation of traditional crop varieties.

Custodian farmers from central Peru including farmers from remote highland communities in five regions in Peru’s central highlands (Junín, Pasco, Huanuco, Lima, and Huancavelica) had self-organized into a group – AGUAPAN – to better represent their interests. Each member was conserving a minimum of 50 ancestral landraces as a family inheritance with some conserving over 300. The project helped the group strengthen their organization to secure the continued conservation of valuable ancestral varieties and to help members access (inter)national [benefit-sharing funds](#) and boost livelihoods and wellbeing.



Native potato varieties come in an assortment of colors and shapes. The biodiversity contained in their gene can help safeguard food security for centuries to come.

© CIP/ David Duddenhoefer



Good practices

- Support and mentorship to the group included helping them define its statutes and to elect leaders and regional coordinators while capacity building included national and international regulations and treaties as well as hands-on leadership training.
- The initiative has been supported by the private sector – specifically breeding and seed companies – who wanted to implement global treaties in a very direct manner. Every year the companies directly provide funds for the custodian farmers and their organization without access to genetic resources but instead link their investment to social marketing and corporate social responsibility strategies.
- A key element to success is transparency, communication, and mutual trust. Visit of the companies to AGUAPAN and its members proved to be important for mutual understanding while future sustainability will depend on the intergenerational transfer of ancestral varieties and farmer knowledge from elder to young farmers.
- AGUAPAN's linkage to the International Potato Center (CIP)'s genebank has resulted in an integrated conservation model providing dual back-ups for both in- and ex-situ collections.
- Next steps include designing a youth mentoring function within AGUAPAN to sustain the intergenerational transfer of ancestral varieties and associated knowledge, and expand the model beyond Peru, and for other crops such as cassava, rice, cacao, quinoa among other species with high levels of varietal diversity in the hands of farmers.



Potato varieties at the International Center for Potato's (CIP) genebank.

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Highlights: Driven by Farmers

A series of services for AGUAPAN members were designed based on the farmers' own ideas and requests.

- A direct benefit sharing scheme which works like a payment for ecosystem services scheme was agreed of an annual distribution of a monetary bonus to each AGUAPAN member or custodian household conserving ancestral varieties. Generally, the annual amount corresponds to a monthly minimal salary which households use for purchasing organic inputs for agriculture, covering education or primary healthcare related expenses.
- A collective brand called Miski Papa was developed that provides AGUAPAN members with the opportunity to use the association's own brand to develop high value niche markets for unique family variety collections sold in mixtures.
- A health fund was created to provide members with quick cash in case of a medical emergencies. This fund can be accessed by the custodian farmers in case of an accident or a life-threatening medical situation. In addition, AGUAPAN members also access training opportunities and farmer-to-farmer seed recovery schemes in case of variety loss due to extreme weather events



Native potato varieties come in an assortment of colors and shapes. The biodiversity contained in their gene can help safeguard food security for centuries to come.

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This project was carried out with support from HZPC, AGRICO, the McKnight Foundation, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), and the New Zealand Embassy in Chile.

Checklist:



Community Inclusion



Capacity Strengthening



Public-Private Partnerships

5.7 Measuring Private Sector Biodiversity Conservation Efforts in the Amazon



Takeaways

- The application of monitoring and evaluation frameworks such as TerraBio provide cost-effective and science-rigorous validation of the impacts of economic activities on natural resources.
- Tools are needed that can gather data to show clear evidence of the impact of conservation initiatives by the private sector – businesses need data and information about the efficacy of their corporate social environmental initiatives and co-investors want proof of the biodiversity return on their investments.
- The need for review and monitoring mechanisms was a key lesson from the UNEP-WCMC report on Aichi Target Assessments. The integrated assessment of data provided by TerraBio helps determine if private sector environmental targets are being achieved, and how they affect land use and biodiversity conservation over time.

The project

TerraBio is a geospatial and biodiversity methodological framework developed by the Alliance of Bioversity International and CIAT to support environmental monitoring as part of the Amazon Biodiversity Fund (ABF). It links *in situ* biodiversity data with annual maps of habitat conditions to monitor and evaluate the effectiveness of private-sector food production, forest-based extraction interventions, and restoration activities. These include the adoption of silvo-pastoral systems – an agroecological approach that uses a mix of trees, livestock, and pastures – on biodiversity conservation. The project is being carried out through Catalyzing and Learning through Private Sector Engagement (CAL-PSE), a program for biodiversity conservation in the Brazilian Amazon.

Why it matters

The Amazon is Earth’s single largest tropical forest and biodiversity hotspot providing 20% of the earth’s oxygen and 16% of its freshwater. It also directly supports more than 30 million people contributing to an estimated 70% of South America’s GDP. According to the Living Planet Index, the region is the worst performing in terms of biodiversity loss with an estimated 94% of species decline from 1970 to 2016. In Brazil, land cover change, as well as illegal extractive activities like mining, are putting the forest at risk along with the global and local ecosystem services it provides. Businesses operating in the Amazon have extensive influence on decisions around the use of natural resources, thus through greater accountability and transparency, they could have a pivotal role in transforming food systems and value chains to be more sustainable. Greater accountability is particularly important for those that impact land cover change such as agriculture and extractive industries.

Good practices

- Given that traditional forests and biodiversity monitoring approaches across geographies tend to be expensive, time-consuming, and difficult to standardize, TerraBio is being developed and applied to integrate state-of-the-art land use mapping technologies with innovative biodiversity data collection methodologies. The remote-sensing system can detect forest loss, forest degradation, and the regeneration of vegetation through the implementation of sustainable practices.
- The mapping component is complemented by the collection of on-site soil samples for DNA analysis to inventory the community of species present in different land cover and land use areas.
- The integrated assessment of this data helps determine if private sector environmental targets are being achieved, and how they improve (or not) land use and biodiversity conservation over time.

- A pilot application of TerraBio was conducted in 2021 in an area of 40,000 km² to evaluate the implementation of shaded cocoa plots in pasture-dominated landscapes. The pilot provided many lessons to improve TerraBio’s methodology, and we also learned about the presence of over 50 different insect taxonomic groups in shaded cocoa plots that included important pollinator species such as butterflies and bees.
- In 2022, TerraBio was used in two business deals within the impact investment fund. Analysis is underway to report back to the fund and investors on environmental indicator baselines and monitoring will continue over time as well as incoming ones to assess their actual impact and generate the evidence required to promote sustainable practices and economic development in the Brazilian Amazon.



Business man supported by the Biodiversity Impact Investment Fund.

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This project is supported by USAID-Brazil which is supporting the development and application of TerraBio, with contributions by SERVIR-Amazonia.



