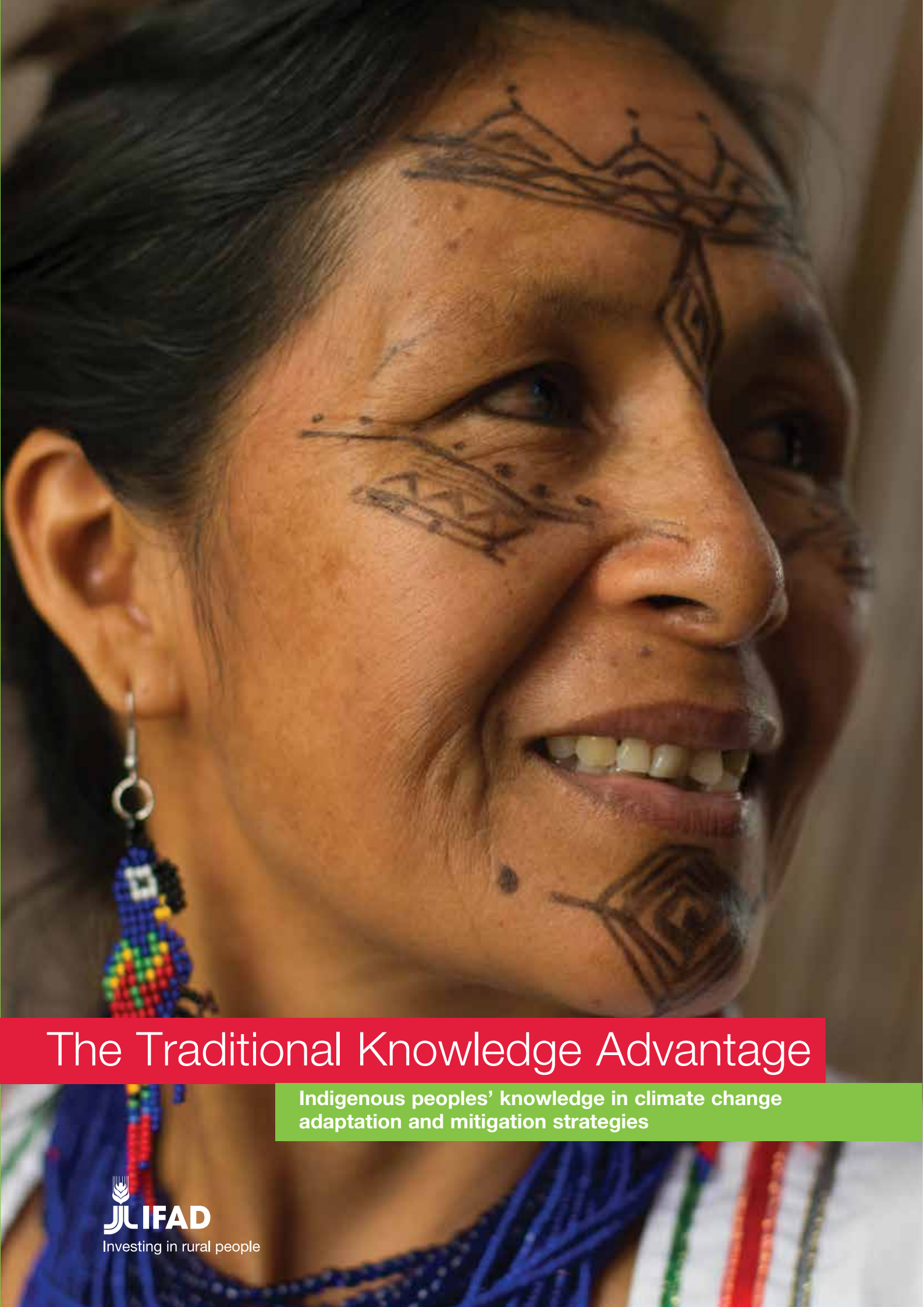

The Traditional Knowledge Advantage

Indigenous peoples' knowledge in climate change adaptation and mitigation strategies

IFAD
Investing in rural people

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Acronyms

ACCESOS	Economic Inclusion Programme for Families and Rural Communities in the Territory of the Plurinational State of Bolivia
ASAP	Adaptation for Smallholder Agriculture Programme
CCA	community-conserved area
CHARMP	Second Cordillera Highland Agricultural Resource Management Project
IPAF	Indigenous Peoples Assistance Facility
NERCORMP	North Eastern Region Community Resource Management Project for Upland Areas in India
NRMG	natural resources management group
NUS	neglected and underutilized species
PROHYPA	Pastoral Water and Resource Management Project in Sahelian Areas
SHG	self-help group

Introduction

Indigenous peoples' knowledge in climate change adaptation and mitigation strategies

Higher temperatures, wildlife extinction, rising sea levels, droughts, floods, heat-related diseases and economic losses are among the consequences of climate change. Climate change disproportionally affects the poorest and most marginalized communities living in vulnerable regions, among them indigenous peoples, whose livelihoods depend on natural resources.

Nevertheless, indigenous peoples are also the world's "advance guard" of climate change (Galloway McLean 2010). While they are generally depicted as victims of poverty and vulnerability to climate change, it would also be appropriate to emphasize their sensitivity to the environment, adaptive capacity and resilience, as manifested by their ability to modify their behaviour in response to changing climatic conditions (Nakashima et al. 2012). Indigenous peoples' knowledge can provide important insights into the processes of observation, adaptation and mitigation of climate change consequences.

Indigenous peoples' knowledge

There are approximately 370 million indigenous peoples in the world; they represent the greater part of the world's cultural diversity (UNPFII nd) and speak more than 4,000 of the world's almost 7,000 languages (Harrison 2007). They own, occupy or use up to 22 per cent of the global land area, which is home to 80 per cent of the world's biological diversity (UNDP 2011).

Indigenous peoples' knowledge refers to the knowledge and know-how accumulated across generations, and tested and adopted through millennia, which guide indigenous societies in their interactions with their surrounding environment. The inherent dynamism of indigenous peoples' knowledge systems lies at the heart of their ability to adjust and modify their actions in response to environmental change. The diversity of resilience systems and capacities to adapt to climate change directly corresponds to the diversity of indigenous peoples and the different contexts they inhabit. Most of them have developed strategies to cope with unusual weather events and accompanying impacts. For instance, in the Puno region of Peru, indigenous peoples use their traditional knowledge about the environment and the wildlife (e.g. frequency of rains, flowering of certain plants, appearance of certain animals, mating of animals, incidence of pest infestations, etc.) to determine when to plant and when to harvest. Similarly, the Chipaya people of Bolivia monitor the wind, snow, clouds and stars to determine what species to plant and when and where to plant them.

Distinctive expressions of indigenous peoples' practices are the diversity of their crops and their farming, herding, fishing, hunting and gathering systems. Indigenous peoples around the world diversify their livelihood systems in order to cope with climate and environmental changes. Strategies such as maintaining genetic

and species diversity in fields and herds provide a response to uncertain weather conditions, while the diversified use of the landscape, mobility and access to multiple resources increase the capacity to respond to environmental variability and change. The Comcaac people of Northern Mexico are semi-nomadic hunters, gatherers and fishers, who rely on both the desert and the sea for their subsistence in order to minimize risks and to increase options for adaptation to environmental change. Likewise, the Yabarana people of Venezuela shift from hunting and gathering to fishing, agriculture and animal husbandry according to seasonal and environmental conditions. On the Indian Andaman and Nicobar Islands, farmers cope with the extreme heat and dryness of summer by intercropping coconut and betel nut seedlings with banana plants. In Bhutan, farmers diversify their food sources by cultivating crops, rearing livestock and managing communal forests. In times of crop failure, livestock and wild foods meet most of their households' nutritional requirements.

Traditional indigenous lands and territories have considerable economic potential as sources of water, timber, medicinal plants and organic foods. Indigenous peoples' community-based forest management strategies involve setting aside conservation areas and woodcutting and watershed management zones, which have an important role to play in reversing the process of deforestation. For example, the Miskito people of Nicaragua maintain three land-use types (cultivated fields, pastures and forest areas), while in Indonesian Borneo, the Dayak Jalai utilize a shifting mosaic land-use pattern that includes patches of natural forest and managed forest, as well as rotating swidden/fallow and permanent fields.

Indigenous peoples' water harvesting and irrigation systems play an important role in increasing the water supply in water stress-prone environments. In Tunisia, the Amazigh people use the jessour system, which consists of dams and terraces for collecting run-off water, thus enabling the cultivation of olives, fruit trees, grains and legumes. In the Andes, the Quechua people have revived the waru waru, an ancient cultivation, irrigation and drainage system that increases the productivity of land with high salinity levels and poor drainage in areas with frequent droughts and frost. In South Asia, rainwater harvesting has been practised by indigenous peoples for centuries using a very simple procedure that involves scooping earth and putting up embankments along farm boundaries to trap rainwater.

Indigenous and traditional knowledge and practices are used to rehabilitate the soil, and adapt and react to floods and droughts. In Bangladesh, flood-affected indigenous communities cultivate saline-tolerant varieties of reeds, and saline-tolerant and drought-resistant fruit and timber trees, in order to reduce vulnerability to floods and sea-level rise and ensure longer-term income generation. Also in Bangladesh, villagers create floating vegetable gardens in order to protect their livelihoods from flooding. In Rajasthan, India, the johads are a traditional rainwater harvesting system comprising concave mud barriers, built across small uphill river tributaries to collect water, encourage groundwater recharge and improve forest growth. The indigenous people who inhabit the village of Guarita in Honduras use the traditional Quezungal farming method, which involves planting crops under trees whose roots anchor the soil. They also prune vegetation in order to provide nutrients to the soil and conserve soil water.

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Indigenous peoples have millennia of experience in collecting and applying local environmental information to help their communities plan for and better manage the risks and impacts of the natural variability and extremes of climate. What is new is the threat of human-induced climate change and the need to adapt to its adverse effects. In this context, indigenous peoples' communities are proving to be an important source of climate history and baseline data, and are already playing a valuable role by providing local-scale expertise, monitoring impacts and implementing adaptive responses at the local level. Indigenous peoples' traditional knowledge offers information and insight that complement conventional science and environmental observations, as well as provide a holistic understanding of the environment, natural resources and culture, and the human interrelation with them (Galloway McLean 2010; Tebtebba Foundation 2009; Nakashima et al. 2012; Tauli-Corpuz et al. 2009; United Nations University 2013).

IFAD and indigenous peoples

For IFAD, indigenous peoples represent a significant target group because they face economic, social, political and cultural disadvantages in the societies in which they live, resulting in extreme poverty and vulnerability. IFAD's strategic advantage lies in its targeting and its people-centred approach, which take into account the differentiated and context-specific conditions of poor rural people, as well as in the Fund's particular ability to reach marginalized and vulnerable groups, of which indigenous people represent a large percentage. In the past decade, IFAD has made significant progress in enhancing its development effectiveness with regard to indigenous peoples. It established instruments to support indigenous peoples' self-driven development and their full and effective participation at all levels. A recent report, published by two major indigenous peoples' organizations in Asia, has distinguished IFAD as "a global pioneer" among UN agencies (Tebtebba Foundation and AIPP 2014).

Since its inception, IFAD has financed approximately US$2 billion in loans and some US$40 million in grants for projects benefiting indigenous peoples. Since 2003, around 20 per cent of IFAD's annual lending has supported initiatives for indigenous women and men in rural communities. Today, 30 per cent of the ongoing projects funded by IFAD loans support indigenous peoples' communities in about 38 countries, representing a total investment of about US$800 million. In addition to regular loan and grant-financed activities, IFAD has access to a dedicated financial instrument – the Indigenous Peoples Assistance Facility (IPAF) – which aims to strengthen indigenous peoples' communities and their organizations by financing small projects that foster their self-driven development. IPAF builds direct partnerships with indigenous peoples in order to enable them and their communities to design, approve and implement grass-roots development projects. Since 2007, IPAF has financed 130 projects for a total amount of about US$4 million.

IFAD's Policy on Engagement with Indigenous Peoples is a key instrument which sets out the basic principles of this engagement, fully embedded into IFAD's working procedures. IFAD's aim in working with indigenous peoples is to ensure that their communities in rural areas are empowered to improve their well-being, income and food security through self-driven development that builds on their identity and culture.

Among the nine principles of the Policy, two relate directly to indigenous peoples' knowledge: (i) Indigenous peoples' knowledge: Recognizing that indigenous peoples are often bearers of unique knowledge and custodians of biodiversity IFAD will build on these assets by supporting pro-poor research that blends traditional knowledge and practices with modern scientific approaches as well as by blending new ways with traditional ones to improve their livelihoods; (ii) Environmental issues and climate change: IFAD will support indigenous peoples in enhancing the resilience of the ecosystems in which they live and in developing innovative

adaptation measures. IFAD will also not fund mitigation measures that would affect the livelihoods of indigenous peoples.

To implement its Policy on Engagement with Indigenous Peoples and to institutionalize its partnership with indigenous peoples, IFAD established the Indigenous Peoples' Forum in 2011. In 2013, the first global meeting of the Forum was held, commencing a process of dialogue among IFAD staff and indigenous peoples' representatives. The Forum convenes its global meeting in Rome every other year and focuses on indigenous peoples' involvement in the development of IFAD's country strategies, project design, implementation and monitoring processes, policy dialogue and advocacy.

Working with indigenous peoples, IFAD has learned that the relationship between natural resources management, sustainable livelihoods and indigenous concepts of self-driven development are interrelated and interdependent. Indigenous peoples conceive and manage their livelihoods in harmony with nature and in accordance with agroecological conservation, natural resources sustainable management, and climate change adaptation and mitigation practices.

In this paper, a number of cases from IFAD-funded projects analyse the important role of indigenous peoples' knowledge preservation and application in community responses to climate change.

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Climate change adaptation

Reliance on vulnerable ecosystems has made it possible for indigenous peoples to observe the effects of climate change first-hand for several decades. Certain communities report very visible indicators, such as the disappearing sea ice in the Arctic region, or the measurable disappearance of snow and ice surfaces in the Andean region. Others observe the impacts of warming weather, such as the disappearance of food sources or the appearance of new species. Agricultural traditional knowledge has proven to be an invaluable adaptation tool for indigenous peoples. In the Americas, indigenous peoples rely on a diversity of crops, varieties and planting locations to cope with excessive or low rainfall, drought and other environmental changes. This serves as a safety measure which ensures that, in the face of severe environmental change, some crops survive. Various adaptive strategies employed in areas that are subject to water stress build upon traditional indigenous peoples' techniques of soil and water conservation. The bethma practice in Sri Lanka promotes the temporary redistribution of lands during drought periods as a means to share water resources. Traditional indigenous peoples' institutions also contribute to their communities' adaptive capacity and resilience. Many indigenous peoples around the world rely on reciprocity modes of social organization, especially during times of environmental stress, which allow to produce and exchange resources. Inversely, the growing alienation of young people from older generations and the degradation of social networks are all contributing to decreasing resilience and increasing vulnerability of indigenous peoples' communities. (Galloway McLean 2010; Galloway McLean et al. 2009; Nakashima et al. 2012; Tauli-Corpuz et al. 2009)

CASE STUDY: BOLIVIA

Economic Inclusion Programme for Families and Rural Communities in the Territory of the Plurinational State of Bolivia (ACCESOS – ASAP)

Total project cost:
US$55.6 million

Total IFAD financing:
US$28.0 million

IFAD loan:
US$18.0 million

ASAP grant:
US$10.0 million

Implementation period:

ACCESOS 2013-2017
ASAP 2014-2017

Background

The traditional socioecological systems of the Bolivian valleys and highlands are the result of a millennial co-evolution and adaptation of the Andean societies to their highly variable climatic environment. The most vulnerable communities are concentrated in the south-west of the country, characterized by extreme climatic conditions and an increasing aridity due to climate change. Agriculture depends on climatic variability and agroecosystems are rapidly degrading. Bolivia is one of the top eight richest countries in the world in terms of biodiversity and boasts a rich variety of knowledge and practices related to the environment. The agro-environmental/physical, social/human and cultural resilience of ecological systems are interrelated and interdependent. Any important change within one of these systems impacts them all, causing the loss of resilience in other areas and an acceleration of the negative effects of climate change. Therefore, the recovery and strengthening of these diversity systems is the most effective way to increase the resilience of landscapes and communities to climate change challenges.

Project's strategy and activities

Due to high environmental vulnerability, climate change adaptation activities funded by the Adaptation for Smallholder Agriculture Programme (ASAP) have been integrated into the Economic Inclusion Programme for Families and Rural Communities in the Territory of the Plurinational State of Bolivia (ACCESOS). Two independent, though still strictly related components were added to the first ACCESOS

Figure 1
Map of ACCESOS-ASAP project area (Bolivia)

component (natural resources management): the "development of community adaptation capacities" component and the "climate risks management" component. Activities of the ACCESOS-ASAP components are based on a participatory approach, which features:

Gathering of local practices used to cope with climate change

These include recording and validating ancestral knowledge applied by project stakeholders. Through community meetings, exchanges of experiences and trainings, a community identifies those practices which improve productivity, reduce vulnerability to climate risks and can be adopted and replicated.

"Talking maps"

These are one of the instruments through which a community defines its development planning. They include a journey through the past, the present and the future (i.e. the desired development of the community). The maps are geo-referenced and include an assessment of the community's natural resources, a projection of their sustainable use and climatic data.

Transfer of resources in the form of competition prizes (concursos)

Concursos have proven to be a successful mechanism for encouraging communities to engage in natural resources management. ACCESOS-ASAP builds on this mechanism to embed community-driven adaptation priorities in local planning. The competitions are based on "talking maps." ASAP's competition approach focuses on larger territorial levels to complement those at the community/group level funded by ACCESOS. The underlying principle is the recognition of the complexity of people's interactions with landscapes and the fact that investments or management practices in different parts of a landscape unit can either produce benefits or reduce the other parts' climate risks, with effects stretching well beyond the local administrative borders.

Learning routes

Learning routes represent another tool which can be used to systematize and spread good practices on traditional knowledge.

The combination of these activities forms a practical strategy that encourages community-based adaptation to climate change, building on knowledge-sharing, sensitization and joint learning among different stakeholders.

Good practices

While the results of the recently initiated ASAP project are still awaited, this case study presents a good example of how climate change adaptation activities can be systematically introduced in project design. In ACCESOS, the design of the ASAP components in itself represents a good practice, precisely because indigenous peoples have been involved during the design phase of the project and will participate in its supervision. Finally and most importantly, the project mainstreams indigenous concerns and the need to draw on ancestral knowledge, thus responding to a common request expressed by indigenous peoples, who on several occasions have highlighted the need to revitalize and make use of their traditional knowledge.

The project is recovering indigenous peoples' traditional knowledge and technologies associated with the agricultural cycle, and integrating these practices in its activities. Notably and in line with IFAD's policy of engagement with indigenous peoples, the project views traditional knowledge as an in-kind contribution by the indigenous peoples it aims to benefit. Technical teams and project promoters are trained to use indigenous peoples' practices in order to ensure the optimal integration of the latter in project activities.

Among the practices based on indigenous peoples' knowledge that the project uses is an indigenous climatic information system called the Pachagrama. This system (which derives its name from Pachamama, the Mother Earth) is a register that catalogues "bio-indicators" – i.e. the behaviour of plants and animals. Indigenous peoples' communities compile and share the Pachagrama in order to know when to plant, when the rains are expected to begin and how long they will last. This system supports management processes of agro-climatic information. In the case of Bolivia, which relies on a weak meteorological reporting system, the Pachagrama is a cost-effective and reliable system, which has proved to coincide with scientific data and has helped to reduce agricultural losses. It thus constitutes a good practice for producers and decision makers developing adaptation processes to climate change. In addition to adopting indigenous peoples' systems, the project is introducing new techniques compatible with local practices. Such is the case of the quthañas, a water harvesting system used by the Aymara people, which collects water by means of small dams. The project is integrating the latter in a larger scheme that includes the construction of basins, ponds and small and medium dams at family/group level in watersheds, intended as an adaptation measure to overcome the negative effects of climate change on water availability.

ACCESOS-ASAP is also building on local agrobiodiversity promotion and diversification as a means to adapt to climate change. Building on traditional agroecosystems, such as the aynokas (vertical sections of the watershed in which each year a different crop is communally grown) and the sayanas (family lands usually close to the houses used by the families to complement the production of the aynokas), the project is promoting and developing home gardens that include local horticultural and medicinal plant species, and communal seed banks to be used and exchanged between families. The project is also promoting composting using totora reeds and other local plants in order to fertilize the soil, and is employing the ali Chamachiri, an organic fertilizer, to strengthen it. Additionally, ACCESOS-ASAP is reforesting soils affected by a high degree of erosion, building riverbanks to regulate water flow, and designing and constructing water harvesting structures.

Box 1: Adaptation to climate change in Asia

Project title: Building Capacity of Indigenous peoples to cope with, adapt to or mitigate the effects of climate change on their livelihoods and environment (financed through the IFAD Indigenous Peoples Assistance Facility [IPAF])

Organization responsible: Centre for Development Action (CDA)

Project location: Odisha, India

Beneficiaries: Oraons, Mundas Kisans, Kharias and Birhors peoples of Sundargarh district of Orissa

The tribal communities were engaged in a vulnerability study to assess the consequences of climate change on their environment and the development of action plans to adapt to these effects. The Tribal Peoples' Committee on Climate Change Impact was established in order to provide information on drought-resistant crops, rainwater conservation technology, crop insurance, seed and grain banks.

Building on traditional knowledge, demonstrations of ground water recharge methods, water harvesting structures, erosion control, construction of terraces and drainage channels were undertaken. The project helped tribal peoples' communities to develop and disseminate climate change adaptation strategies, share information and build the capacity of local committees to be involved in decision-making processes related to climate change. As a result of the project, 2,800 people (men and women) were involved in natural resources management groups and participated in capacity-building programmes. The project beneficiaries also decided to include mitigation measures that address climate change impact in all future planning undertaken by local communities.

Box 2: Adaptation to climate change in Africa

Project title: Chencha-Guggie Indigenous Tree Species Restoration, Local Climate Change Adaptation and Indigenous Livelihood Enhancement Project (financed through the IFAD Indigenous Peoples Assistance Facility [IPAF])

Organization responsible: Initiative for Living Community Action (ILCA)

Project location: Ethiopia

Beneficiaries: Gamo people

Before the inception of the project, the Gamo people had begun to assess climate change impacts on their livelihoods (such as lower crop yields, low soil fertility and moisture, a decrease in water availability, unpredictable and erratic rainfalls), interpreting these changes as a consequence of forest destruction. This acknowledgement led to the recognition of the importance of local tree species in maintaining soil moisture and increasing the fertility of land, as well as in terms of their medical value. The Gamo people decided to protect and restore endangered species as a means to halt deforestation and cope with climate change consequences affecting their environment.

The project adopted an intergenerational approach, whereby community members taught their children the value of preserving and protecting the indigenous trees, and trained them on how to use these trees in a sustainable manner. Most of the farmers involved their children in the creation of tree nurseries, using this as an opportunity to transfer knowledge.

The Gamo community worked very closely with the local government which provided the technical support required for agroforestry. This relationship also provided ILCA with the building blocks needed for them to engage with the national government on issues of sustainable forest management and REDD+ that are at the centre of climate change meetings and discussions at national, regional and international levels.

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Disaster risk reduction

Extreme weather events have highlighted the importance of indigenous peoples' weather prediction knowledge, as a timely warning of impending events is one of the best strategies for mitigating the negative impacts of such events.[1] Indigenous peoples' communities have climate data that range from temperature and rainfall to the frequency of extreme climatic events. Their intimate knowledge of plant and animal cycles gives them the ability to link events in the natural world to a particular climatic cycle, thus permitting the prediction of seasonal events. In Tonga and Tuvalu, traditional forecasting techniques rely upon observations of the sea and the lagoon (the sizes, strengths and sounds of waves, the colour and smell of the water, and the amount of seaweed deposited on the beach), the sky (type and colour of clouds, the appearance of the moon in a particular way) and the winds. Similarly, in both Rapu-Rapu in the Philippines and Aceh in Indonesia, it has been documented that a foul odour emanating from the sea signified the coming of a storm or typhoon. Other key indicators are phenology (e.g. the abundance of particular fruits such as mango and breadfruit is a sign of strong wind or heavy rain, and a rise in the

1 The Sendai Framework for Disaster Risk Reduction 2015-2030, adopted by the Third United Nations World Conference on Disaster Risk Reduction, recognizes the importance of the preventive approach to disaster risk and highlights that disaster risk reduction requires empowerment and inclusive, accessible and non-discriminatory participation, paying special attention to people disproportionately affected by disasters, especially the poorest, among them indigenous peoples. The Sendai Framework promotes the use of indigenous peoples' knowledge and practices to complement scientific knowledge in disaster risk assessment, recognizing that indigenous peoples, through their experience and traditional knowledge, provide an important contribution to the development and implementation of plans and mechanisms, including for early warning.

groundwater table of taro gardens is an indicator of rising seas), and bird and animal behaviour (e.g. low-flying albatross is a sign of poor weather, and animals seeking higher ground is a warning sign of an approaching tsunami). In Raimea and Lau-Hata, Timor-Leste, leaches and caterpillars have been noted to appear before storms. When banana tree leaves and branches of other trees fall to the ground without strong winds, people in Rapu-Rapu, the Philippines, prepare for storms or typhoons. Birds, usually migratory, are seen as important indicators of changing seasons and their duration, as well as of impending heavy rains, storms or droughts in Raimea and Maluru-Beaço in Timor-Leste, and in Sayung and Lipang in Indonesia. In Perez and Rapu-Rapu, the Philippines, the behaviour of various animals helps to predict hazards: rays jumping consecutively in the sea in summer, the fast movement of sea snakes, and hermit crabs going inland or climbing up trees all forewarn of storms or typhoons. Communities have also developed ways to prevent or mitigate such hazards, and adapt to and prepare for them using local materials and methods. In preparation for a storm, for example, local plants are used to strengthen houses, such as Suhay (bamboo rods) in the Philippines and Ai Tatan (used as wooden clamps to hold down the roof) in Timor-Leste (Hiwasaki et al. 2014).

CASE STUDY: SOLOMON ISLANDS

Increasing Community Resilience to Natural Disasters through the Use of Traditional Coping Strategies on the Weather Coast Guadalcanal Communities in the Solomon Islands

Project financed through the IFAD Indigenous Peoples' Assistance Facility (IPAF)

Organization responsible: International Solomon Island Development Trust (SIDT)

Total project cost: US$48,000

Total IFAD financing (IPAF grant): US$40,000

Implementation period: 2012-2014

Background

Because of their low elevation and small size, many small island states are facing partial or virtually total inundation by future rises in sea level due to climate change. Coastal zones are among the hotspots of imminent disasters, threatened by cyclones, storm surges, sea erosion, flooding, sea-level rise and tsunamis. Many of these events are expected to become increasingly severe due to climate change, resulting in the destruction of coral reefs and mangroves which offer protection from impending hazards. Biodiversity and ecosystems also risk disruption and severe damage.

The indigenous peoples of the South Pacific have been developing mechanisms to survive and adapt to such hazards for centuries. Indigenous peoples' knowledge of their ecosystems plays a crucial role in protecting their environment and their communities rely upon it for disaster risk reduction. The revival and application of such knowledge and practices can support ongoing efforts to increase the resilience of coastal communities. The project's main objective was to increase the resilience of Babanakira communities to the impacts of disasters by enabling them to revive, apply and share traditional knowledge and practices. It also aimed to promote the integration and documentation of indigenous peoples' knowledge and practices related to disaster risk reduction.

Project's strategy and activities

Babanakira is the collective name for a series of villages located in the Guadalcanal Province, which are accessible only by sea and locally known as the "unpredictable weather coast area". This is the area where the International Solomon Island Development Trust promoted the recording of traditional knowledge and practices concerning prevention measures and response mechanisms with the purpose of mitigating the effects of natural disasters. Consultations with elders and leaders served to document (i.e. transfer from oral to written) the indigenous peoples' knowledge. The participatory rural appraisal method was applied in 11 communities to assess the situation of the villages, create maps of the communities (including hazard areas and risk maps), draw the seasonal calendar and historical time-lines, and develop community disaster plans. Traditional indigenous peoples' knowledge on response mechanisms was harvested and transmitted to the National Disaster Management Office. The International Solomon Island Development Trust then drafted a manual of response techniques, including both indigenous peoples' and conventional knowledge.

Good practices and lessons learned

The project was successful in recording and reviving indigenous peoples' knowledge on coping mechanisms – "the knowledge you cannot uproot" – proving that such knowledge can enhance conventional techniques of disaster risk reduction and should be preserved and scaled up. From the hazard-ranking exercise it emerged that the most frequent threat in Guadalcanal is flooding, followed by cyclones, droughts, earthquakes, landslides and tsunamis. In response to such hazards, the indigenous peoples of Guadalcanal have based their early warning system – key to their survival – on their ability to predict seasonal events by observing events in the surrounding natural world and establishing the link between the two.

Figure 2
Map of IPAF project area (Solomon Islands)

The communities' traditional disaster preparedness mechanisms consist of re-vegetating coastal foreshores with native species in order to cope with sea-level rise and careful household preparation prior to cyclones or flooding events, such as cutting trees around the houses and reinforcing the houses with reeds and branches. Preservation of the environment is also enforced by cultural rules, including restrictions in form of taboos, bad luck or superstition around some communities' areas and fishing grounds in order to preserve them from landslides caused by excessive cutting of trees and exploitation of fisheries. Furthermore, careful and responsible management of resources enables the indigenous peoples' communities in the Solomon Islands to plan the necessary coping strategies. For example, they diversify their crops and rely on wild species to cope with food shortage. Matured crops or fruits from trees are collected and cooked in an underground oven pit for preservation and consumption in times of scarcity. Each year, before the dry season, farmers plant certain crops such as kumala (sweet potato), different varieties of yam, giant swamp taro and wild cassava, because these plants are known to survive seasons with low rainfall and provide a secure source of food. The project also documented that the indigenous peoples consume wild edible plants (e.g. napalanku, ialken-apen and karwatu) as a substitute for vegetables in times of scarcity and in the aftermath of a hazard, and that they manage marine resources as safety nets, occasionally closing the fishing grounds until a resource recovers.

Intergenerational transfer of knowledge was another important achievement of the project: through the "historical profile" of the communities, old men and women passed their knowledge down to the younger generations. To this end, the project organized trainings for young people on traditional house-building and planting practices. The elderly recalled the use of cone shells and drum-beating to transfer messages, highlighting the importance of family ties and traditional mutual aid arrangements between villages as coping mechanisms. An important consequence of the knowledge transmission was the younger generation's acknowledgement and value of the importance of their indigenous knowledge, which led to its revival and increased self-esteem.

The documentation of indigenous peoples' knowledge and practices on disaster risk management is of crucial importance, since it shows the advantage of relying on such knowledge as a tool for identifying, assessing and monitoring disaster risks and enhancing early warning and responses at the local level. When communication with the outside world is interrupted – as is often the case with small islands such as the Solomon Islands – all that can be relied on is the traditional knowledge of the indigenous communities. Reinforcing traditional disaster risk reduction mechanisms is therefore vital.

Box 3: Mangrove rehabilitation in the Solomon Islands as a means to adapt to climate change

Project title: Mangrove rehabilitation for climate change adaptation and mitigation (financed through the IFAD Indigenous Peoples Assistance Facility [IPAF])

Responsible organization: Aoke Langanga Constituency Apex Association (ALCAA)

Project location: Solomon Islands

Mangroves protect coastlines from erosion and damage by tidal surges, currents, rising sea level, and storm energy in the form of waves, storm surges and wind. Mangroves are also the nursery habitat for many wildlife species and thus contribute to sustaining the local abundance of fish and shellfish populations. Many migratory species depend on mangroves for a part of their seasonal migration. Mangroves also maintain coastal water quality by abiotic and biotic retention, removal and cycling of nutrients, pollutants and particulate matter from land-based sources, filtering these materials from water before they reach seaward coral reef and seagrass habitats. Additionally, mangroves support indigenous peoples' traditional practices, being a source of: (i) clams, crabs, fish and chestnuts, which are collected for consumption; (ii) wood used for construction, handicrafts and fuel; (iii) materials used for fishing equipment; (iv) dye from pigments used to treat textiles, nets and fish traps; and (v) plants used to make traditional medicines. For all these reasons, the loss of mangroves has severe impacts on coastal indigenous peoples' communities (Gilman et al. 2006).

In order to arrest the loss of mangroves and protect coastal communities from the consequences of sea-level rise, the project built stone walls to trap the sand, reclaiming the soil eroded by the waves and replanting mangroves using seeds provided by a mangrove nursery set up by the project. Men, women and children of the community actively participated in this project activity.

"My name is Philip and I have come to build the stone walls to protect our sea shores and the eroding sand beaches to restore and regain the origin of these islands."

"My name is Ben Fidali and I am here to supervise those who are pulling lines to make ready the boundaries for stonewall construction. This work ties up with the climate change. This work is very, very interesting because it involves a lot of people in the villages. I am really looking forward to the goodness of this work and the future of our people will depend very much on this work."

"My name is Bruno Salekai Lindsay and I come from Rade-Aekoa in the Langalanga Lagoon. I have come to work here to build the stone walls to keep sand from waves and the rising sea driving them back into the ocean. Our islands are disappearing because of global warming and sea-level rise which is caused by climate change."

The Premier of Malaita Provincial Government visited the project and expressed the desire to extend it to other parts of the province.

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Biodiversity conservation

There is a strong correlation between the location of indigenous peoples' territories and the areas with the highest biodiversity and natural resources conservation. Scientific evidence indicates that the territories in which indigenous peoples have special claims harbour exceptionally high levels of biodiversity and that human cultural diversity is associated with the remaining concentrations of biodiversity. The world's biodiversity will only be effectively preserved by preserving the diversity of cultures and vice versa. Biodiversity is central to indigenous peoples' environmental management and livelihoods; the management of biodiversity is best carried out using the institutions and governance mechanisms most suited at the ecosystem-level, among which indigenous peoples' institutions and mechanisms have a central role (Tauli-Corpuz et al. 2009). In their role as stewards of biodiversity and holders of traditional knowledge relevant for conservation and sustainable use, indigenous peoples have a unique contribution to make in mitigation and adaptation initiatives aimed at biodiversity conservation (Galloway McLean 2010).

Total project cost:
US$73.4 million

Total IFAD financing:
US$42.9 million

IFAD loan:
US$22.9 million

IFAD additional financing:
US$20 million

Implementation period:
First phase: 1997-2008
Second phase: 2010-2016

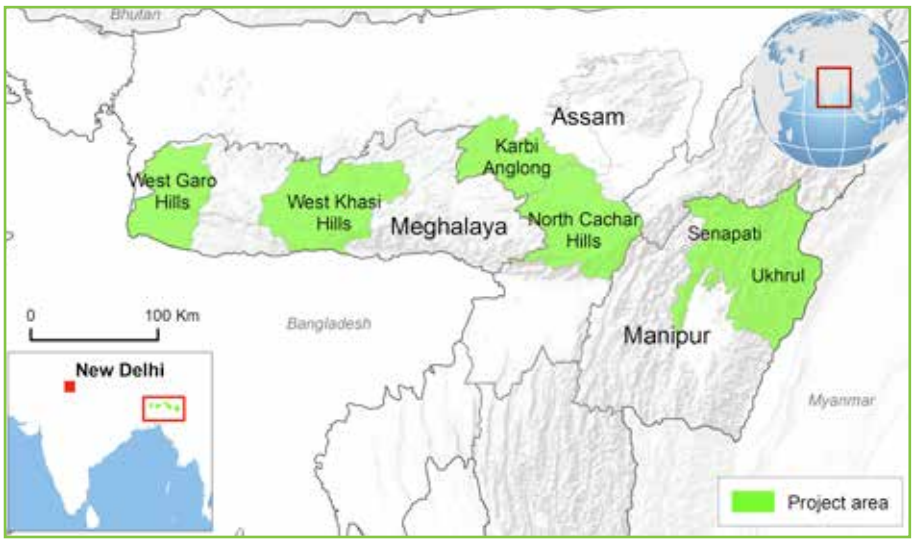
CASE STUDY: INDIA

North Eastern Region Community Resource Management project for Upland Areas in India (NERCORMP)

Background

Most of the north-eastern states of India have more than 60 per cent of their area under forest cover. A total of 51 forest types are found in the region, broadly classified into six major types (tropical moist deciduous forests, tropical semi-evergreen forests, tropical wet evergreen forests, subtropical forests, temperate forests and alpine forests). These forests harbour 8,000 out of 15,000 species of flowering plants. Out of the nine important vegetation types of India, six are found in the north-eastern region. North-east India is globally acknowledged for its rich eco-cultural practices, which include varied tribal peoples' knowledge on biodiversity conservation and sustainable natural resources management. In the north-east, tribal communities manage and preserve the biological diversity and the ecosystems variability through various formal and informal institutions based on their traditional knowledge. In the recent past, the interference of culturally insensitive technologies and market-based economics, coupled with a growing population pressure, has led to unsustainable extraction of natural resources. Therefore, despite being the source of livelihoods for the region inhabitants, these resources are becoming increasingly degraded. The IFAD-supported NERCORMP aimed at improving the livelihood of vulnerable groups through the sustainable management of their resources, in a way that contributed to the preservation of local biodiversity.

Figure 3
Map of NERCORMP project area (India)



Project's strategy and activities

The design of the project responded to previously identified problems in north-east India, including the failure of previous top-down, "culturally inept" development initiatives. NERCORMP was designed with a focus on the environment and aims at slowing the alarming environmental deterioration taking place in the project area. The project seeks to increase access to agricultural technologies and natural resources through the strengthening of the community and traditional tribal organizations' capacity to use ecosystems sustainably, while protecting biodiversity and facilitating secure land tenure – one of IFAD's strategic objectives in India.

Each of the six tribal peoples residing in the programme area has their own traditional system of community forest/biodiversity management; therefore, the project builds on the existent systems in order to ensure ownership of the project by the traditional village institutions, the customary custodians of the community resources in most tribal communities. It promotes an inclusive development approach through the formation and establishment of community-based groups, including self-help groups (SHGs) and natural resources management groups (NRMGs).

Under the Community-based Biodiversity Conservation (CBBC) component, the communities set up and manage their own community-conserved areas (CCAs) and formulate rules and regulations for an improved management of their natural resources. The project has facilitated the creation of 16,351 hectares of CCAs in 460 villages. The communities have also created biodiversity reserves, which include:

- Elephant corridors
- Bamboo reserves
- Water catchment reserves
- Broom grass reserves
- Thatch grass reserves
- Social forestry
- Fresh water fish sanctuaries
- Herbal gardens
- Sacred groves and orchid sanctuaries.

The project has focused on aided regeneration of these CCAs at different stages of degradation and/or regeneration, besides undertaking the development of pasture and mixed species plantations, as well as protection/regeneration of perennial medicinal herbs and shrubs.

Good practices and lessons learned

The project has seen a sharp increase in forestry and agroforestry practiced by the beneficiary households, which rose from 2 per cent from the beginning of the project in 1997 to 45 per cent, as recorded by the last Supervision Mission of 2014. A wide range of non-timber forest products are collected from various natural resource reserves, which are used for domestic consumption, sale and domestication. The natural resource reserves also have other implications, such as riverine protection, water catchment and wildlife preservation.

Box 4: Stories from the field (India)

Fish sanctuaries

In Rohbah Village, many of the older residents have tried for a long time to preserve the fauna species of the Rilang River, which runs downstream through eight villages towards Mawthapdah Village. After some years and consultations, they decided to motivate other villagers to set up an association and to identify an area for establishing a fish sanctuary. The association, which included 13 villages and was named the Mawthapdah Area Rilang Fishing Association, set up a fish sanctuary on Rilang River near Rohbah Village. The occasion to launch it came when Rohbah was included in NERCORMP-II, where the knowledge of the people on biodiversity conservation was considered to be pivotal for the sustainability of the ecosystem. The Superintendent of Fishery, Nongstoin, and NERCORMP inaugurated the fish sanctuary on 7 June 2012. This fish sanctuary has since then become a popular spot, often visited by local people as well as tourists. It received an award from the state, winning the Clean Village Campaign and a biodiversity preservation prize. The association is now planning to establish a fish-breeding hub within the allocated area of the fish sanctuary in order to prevent the extinction of the autochthonous species living in the river.

Community forests for biodiversity conservation and management

Links with cultural traditions have brought about attitudinal and behavioural change regarding the protection of the environment. Thanks to the project, communities have adopted strict regulations to protect the communal forest reserves and their biodiversity, amounting in total to 1,860 square kilometres of lush green reserves spread across all six of the project districts. Local wildlife is returning to these newly reforested and protected areas, and for the first time in many years, villagers are enjoying fish from local rivers, wild edible plants and small wild animals.

The Garo community in Meghalaya has a vast tribal conservation knowledge, which is reflected in their ancient rituals and ceremonies; the people in the project villages have kept a selected area in the village as a CCA. The villagers had decided to protect their forest well before NERCORMP started, but were able to put into effect their desire for forest conservation only when NERCORMP began to facilitate the CCA process from 2007 onward, with new villages taken up in 2010. Organized in an NRMG, villagers have undertaken the planting of native plants such as Gmelina arborea (bamboo, known locally as “gambari”), Tectona grandis (teak, known as “segun”), Shorea robusta (known as “sal”), Schima walichii (known as “boldak”), and protection of local animal species, among which are the hoolock gibbon, slow loris, monkey, deer, rabbit, Himalayan cat, monitor lizard, porcupine and wild boar. To protect the conservation area, the villagers have prohibited its access to those who are not engaged in the NRMG. In case

of violation (e.g. cutting down of trees or hunting in the CCA), the villagers have decided to impose a penalty of INR 5000 (approximately US$75), in addition to 100 kilograms of rice and a cow. The forest is therefore constantly protected like a "Kosi" (a sacred grove), in the words of one of the NRMG members, William D. Sangma:

"We took a decision to conserve the area for our own benefit. We have unanimously decided that the conserved area will not be touched for the next eight years. It is our wealth, we have the right to protect and conserve it."

Punge is a small village in the Ukhrul district of Maniour and home to 25 households. In Punge, villagers decided to create a "green belt" for forest protection and conservation, and have laid out rules and regulations that prohibit any form of hunting or tree-felling. The village authority, enforced by the NRMG and the Punge Mayar-Ngala Long (the Punge Youth Club), set rules and regulations, actively involving and developing a sense of belonging and pride in relation to forest protection. Thanks to the creation of the community conservation area, the communities are witnessing an increase in the number of birds and wildlife in general.

Malong Kisir is a village of the Karbi tribe, situated in the South West Khasi Hills district of Meghalaya in north-eastern India and inhabited by 35 households. The traditional beliefs of Karbi encourage them to protect the forest, which they consider sacred. The Mawranglang community forest (named "Diri Law Adong" by villagers), occupies an area of 6.93 hectares and is home to flora species like Schima wallichii, Callicarpa arborea, Castanopsis hystrix, Cedrela toona, Elaeocarpus florobundus and Alnus nepalensis, and fauna species such as jackals, monkeys, rabbits and birds. NERCORMP–II selected Mawranglang in order to preserve its biodiversity, involving the villagers in activities aimed at biological diversity protection, ensuring breeding grounds for wildlife and recovering the forests' medicinal plants.

Traditional herbal medicine

In Rohbah Village, a traditional healer's family enterprise requested a loan from the local SHG in order to guarantee the preservation, transfer and sustainable use of its traditional knowledge related to the use of forest plants. The loan was given to the traditional healer's wife – a member of the SHG – and served to strengthen his family enterprise which seeks to cure with traditional plants collected from the forest. The renowned healer employs fellow villagers in forest plant collection, while passing his knowledge down to the next generation. The project is not only economically sustainable for the family and the employed villagers; it is also helping in the very valuable process of knowledge transfer and traditional medicine appreciation.

A total of 1,589 SHGs and 494 NRMGs were formed. The latter are the primary community organizations involved in the implementation of project activities; they include all adults, are well integrated with the traditional village authority and have at least one woman among office bearers. Groups are fairly cohesive and display a shared sense of purpose and vision of collective well-being. Many natural resources management groups are successfully managing community assets, such as mini rice mills, CCAs and water supply sub-projects.

The knowledge management strategy of the project, which aims to strengthen knowledge-sharing and learning processes within operating units and among beneficiary communities, has yielded encouraging results. An important innovation was the NEAT Fest, an annual SHG trade fair, at which products made by project beneficiaries are displayed. The NEAT Fest is also an event for community learning and strengthening the sense of agency of women. The Fest enables communities to share their experiences and showcase best practices and knowledge that can be promoted and shared across the project and with other stakeholders.

The project has brought to light the fact that tribal communities' involvement in natural resources management strengthens their traditional agroecosystem and can be pivotal in addressing the key concern of meeting the demands of a growing human population while sustaining ecological balance. It has also proven that when tribal peoples are able to adopt and maintain rules and regulations for biodiversity conservation that are built on traditional norms, values and beliefs, their communities are more cohesive and their ecosystems are better protected.

Box 5: Biodiversity conservation in Latin America

Project title: Recovery of traditional knowledge on dietary and medicinal biodiversity (financed through the IFAD Indigenous Peoples Assistance Facility [IPAF])

Responsible organization: Chirapaq in collaboration with Federación de Club de Madres (FECMA) and Central de Comunidades Nativas de la Selva Central (CECONSEC)

Project location: five communities in the province of Vilcashuamán (Ayacucho) and five communities in the province of Junín, Peru

Beneficiaries: Quechua and Ashaninca peoples

The aim of the project was to protect traditional indigenous knowledge related to biological resources. Through training workshops on the law No. 27811), which protects such knowledge, and interviews with the knowledge holders, the project revived the community's interest in traditional knowledge on medicinal plants. It also initiated a dynamic process that made community members aware of their intellectual property rights over their traditional knowledge of medicinal plants, keen to use the latter to improve their health and that of their families, and willing to spread this knowledge to adjoining communities in the region. The project was extremely appropriate, given that most of the traditional knowledge about medicinal and food plants is gradually disappearing.

Box 6: Biodiversity conservation in Africa

Project title: Promotion and preservation of indigenous ethno-veterinary practices among the Mbororos (financed through the IFAD Indigenous Peoples Assistance Facility [IPAF])

Responsible organization: Society for the Protection of Animal Life and the Environment

Project location: Cameroon

Beneficiaries: Mbororo peoples

Mobile pastoralism is a resilient food production system, as it conserves and protects rangelands and ecosystems through mobility. The Mbororo, who are semi-nomadic, move their animals down the valleys during the dry season in search of fresh pasture, crop residues and water, and go back to the plateau during the rainy season, thus adapting and contributing to the well-being of their environment. The Mbororo treat their animals using ethno-veterinary medicine based on traditional medical knowledge and indigenous plants.

The project aimed at reviving the Mbororo's health practices and use of medicinal plants. Through the establishment of home herbal gardens, the project documented, assessed and promoted local health traditions, and the conservation and sustainable use of medicinal plants in light of their social and cultural relevance. The project was successful in reviving the knowledge of medical plants and human/veterinary traditional medicine; it trained community health care workers (paravets), who now use medicinal plants to complement "Western" medicine.

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Food security and agrobiodiversity

Climate change is affecting indigenous peoples' food systems in several ways, ranging from direct effects on crop production to changes in markets, food prices and supply chain infrastructure. Generations of indigenous peoples have developed diverse, complex and locally adapted agricultural systems that are managed via traditional institutions and techniques. Integrated agricultural systems based on indigenous knowledge and traditional practices provide many examples of sustainable and adaptive systems with potential to survive and mitigate major climatic change. Food security lays its foundations on the knowledge and production systems/practices of indigenous farmers around the world and it is connected to the conservation of agrobiodiversity. Agricultural adaptation strategies employed by indigenous peoples include: adjusting crop varieties and planting dates (such as mixed cropping in Burkina Faso or rotational cropping in the Indian Himalayas); relocating crops (e.g. indigenous peoples in Guyana move from their savannah homes to forest areas during droughts and have started planting cassava, their main staple crop, on moist floodplains that are normally too wet for other crops); changing hunting and gathering periods in response to changing animal migration patterns; and improving agricultural techniques. On-farm conservation of crops is a dynamic process, in which varieties managed by indigenous farmers continue to evolve in response to natural and human selection, leading to crops with better adaptive potential. For instance, "kreb" is a mixture of wild and cultivated species (such as Digitaria exilis or "fonio") which is traditionally used in the Sahel by pastoralists. The latter harvest these seeds from the open grasslands and manage the wild species to ensure sustainable seed production for human consumption and fodder.

First phase: 2001-2004
Project title: Enhancing the Contribution of Neglected and Underutilized Species to Food Security and to Incomes of the Rural Poor
Project area: Bolivia, Ecuador, Peru, India, Nepal, Egypt and Yemen
Coordinating organization: Bioversity International
Responsible organizations: PROINPA, INIAP, CIRNMA, MSSRF, NARC, LI-BIRD, DRC, AREA
IFAD grant amount: US$1,410,000
Total project cost: US$7,166,000

Second phase: 2007-2010
Project title: Empowering the rural poor by strengthening their identity, income opportunities and nutritional security through the improved use and marketing of neglected and underutilized species
Project area: Bolivia, Ecuador, Peru, India, Nepal, Egypt and Yemen.
Coordinating organization: Bioversity International
Responsible organizations: PROINPA, INIAP, CIRNMA, MSSRF, NARC, LI-BIRD, DRC, AREA
IFAD grant amount: US$1,400,000
Total project cost: US$3,158,000

Third phase: 2011-2015
Project title: Reinforcing the resilience of poor rural communities in the face of food insecurity, poverty and climate change through on-farm conservation of local agrobiodiversity
Project area: Nepal, India and Bolivia
Coordinating organization: Bioversity International
Responsible organizations: LI-BIRD, MSSRF and PROINPA
Grant amount: US$975,000

CASE STUDY: IFAD NUS

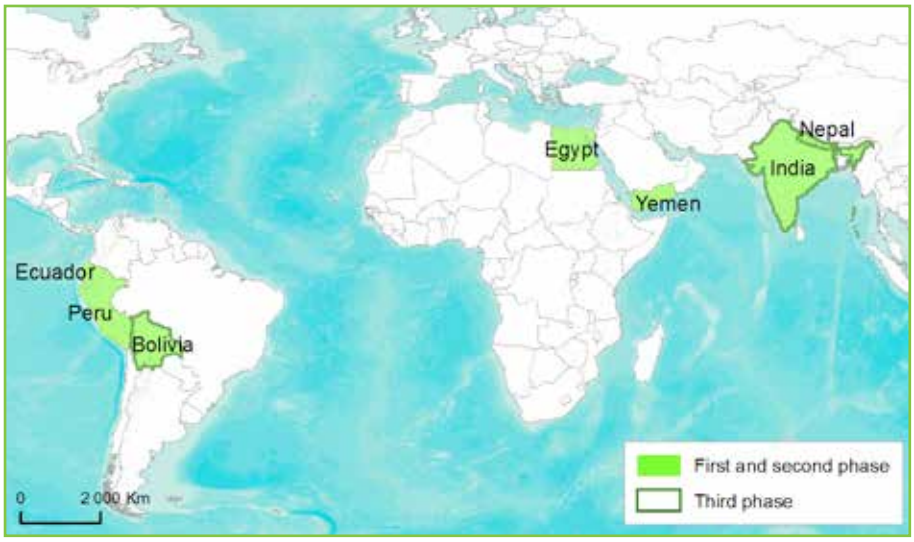
Enhancing the Contribution of Neglected and Underutilized Species to Food Security and to Incomes of the Rural Poor

Background

An extremely important factor in ensuring food security is the acknowledgement of the valuable contribution that neglected and underutilized species (NUS) could make to the latter, as well as to income generation and adaptation to climate change. NUS are a large portfolio of plant genetic resources that include cultivated, semi-domesticated or wild species not treated as commodities. They have been indigenous farmers' safety net whenever staple crops failed during periods of stress or following disasters. This is because NUS occupy important niches and are adapted to the risky and fragile conditions of rural communities that cultivate them according to traditional knowledge and practices using low-cost inputs. Ethnobotanical surveys indicate that hundreds of such species are still to be found in each country, representing an enormous wealth of agrobiodiversity, with potential to contribute to improved incomes and food security.

The first two phases of the IFAD NUS project aimed to enhance the sustainable conservation and use of such species, and raise the incomes and strengthen the food security of small-scale indigenous farmers and communities in Latin America, South Asia and Western Asia through a holistic value chain approach. The third phase aimed to enhance the resilience of rural communities to climate change and enhance food security by strengthening the conservation and use of local agricultural biodiversity. (Courtesy of Bioversity International)

Figure 4
Map of grant area (IFAD NUS)



Project's strategy and activities

The first phase of the project tested novel approaches, while the second phase was used to consolidate evidence on income and nutrition outcomes. The crop species targeted in the first two phases belonged to three priority groups that are recognized to play a strategic role in strengthening nutritional security and income generation of the rural poor, namely Andean grains (such as quinoa, amaranth, cañahua, lupin, etc.), minor millets (such as finger millet, little millet, foxtail millet, proso millet, barnyard millet, etc.), and medicinal and aromatic plants (such as argel, caper, oregano, mint, cumin, coriander, etc.). The third phase of IFAD NUS was based on three sets of interrelated activities:

- Developing and testing new methods and tools to sustainably conserve traditional crops and associated knowledge, and integrating the monitoring of diversity at the farm level;
- Promoting a more balanced complementary conservation agenda in national programmes;
- Guiding research related to climate change and its impact on species and varieties deployed in local production systems.

The project used highly participatory, community-based approaches, methods and tools. Its main action areas for the third phase included:

- Performing farmer surveys to assess farmer perceptions of climate change and the role of traditional crops and management practices for adaptation;
- Strengthening documentation and monitoring of agricultural biodiversity through participatory community-driven methodologies (such as Community Biodiversity Registers and Red Lists for cultivated species, and diversity and threat maps for local species);
- Promoting the use of hardy local crops and continuing activities to promote value chains of minor millets and Andean grains initiated in phases I and II;
- Establishing on-farm networks of custodian farmers who maintain traditional crops and associated knowledge, and who are willing to share these knowledge with the local communities;
- Capacity building to develop supportive policies and greater awareness of the role of underutilized species in climate change adaptation.

Good practices and lessons learned

The project helped document local agrobiodiversity, assessed the threats and competitiveness of a wide variety of crops, and enhanced indigenous farmers' capacities in their sustainable conservation, with a special focus on traditional crops. It also created mechanisms for capturing and sharing indigenous peoples' knowledge at local, national and international levels. At the policy level, IFAD NUS has strengthened pro-poor on-farm conservation by promoting a conservation agenda in national and international programmes. A major achievement of the IFAD NUS project has been its role in supporting India's MP Prof. M.S. Swaminathan to lobby for the amendment of India's Food Security Bill to include highly nutritious and resilient "coarse cereals" in the country's Public Distribution System (PDS); this was realized in 2013, setting an example to other countries.

In Bolivia, the project delivered training on sustainable agrobiodiversity management to both indigenous peoples and practitioners, benefiting more than 240 men and women. One of the most important results was the development and utilization of an organic fertilizer to improve the production of resilient native potato and oca crops. Communities helped identify 43 custodian farmers, who were trained on Community Biodiversity Register compilation and on crop use diversification practices, and who are now guiding other farmers on how to make better use of traditional crops and cope with climate change. Crop diversity gardens and community seed banks were established in each community to safeguard native potato, oca, papalisa, cañahua, quinoa and other Andean crops. More than 15 Biodiversity Fairs were organized, involving hundreds of farmers who exchanged seeds, learned about sustainable management practices and tasted food made from local crops.

In India, training benefited more than 1,800 farmers in target villages across Tamil Nadu, Madhya Pradesh and Uttarakhand States, covering topics such as good agronomic practices and strategies to enhance resilience to climate change. Agrobiodiversity surveys were carried out to gather information on local crops and their use. Information on threatened and lost varieties was also gathered, along with the participatory identification of more than 100 custodian farmers whose work was recognized with awards during seed fairs. Tribal knowledge shared during trainings was then used to produce a book of recipes in which small millets are a core ingredient. Community seed banks were established in project sites, and are now managed by local women and farmers' groups. The project established 17 community-based resource centres, which provided the farmers with 21 improved seed varieties and processing technologies.

In Nepal, training activities focused on the role of community seed banks in seed storage improvement and management. Workshops were organized on community seed bank management, leading to important results such as the identification of NUS and subsequent distribution of seeds to more than 800 farmers. Information on threatened and lost varieties was gathered and linkages with the national gene bank realized. Particularly good results were obtained with regard to documentation of indigenous peoples' systems for on-farm conservation.

Indigenous peoples are fighting against the loss of their traditional food systems and crop heritage. It is necessary and urgent to develop community-based documentation on the conservation knowledge and practices, and on the use of NUS. Local knowledge has to be collected, documented and built into research and development programmes. Community-based varieties to agrobiodiversity monitoring system (the Red List for cultivated species) introduced by IFAD NUS should be further promoted and disseminated to other countries, so as to prevent the loss of resilient and nutritious varieties. In that regard, the existing organizational structures within the communities represent strategic actors in efforts concerned with participatory community-based documentation and monitoring of crop diversity and associated knowledge. Communities should be fully involved in these on-farm conservation efforts and their capacities to carry out such activities should be adequately supported.

Innovation that uses indigenous peoples' knowledge or merges it with new techniques leads to stronger indigenous food production systems and improved food security, better and more sustainable management of fragile ecosystems and enhanced coping mechanisms with regard to climate change. Innovation and introduction of new techniques must leverage on the great richness of local plants, whose livelihood potentials are still largely untapped. However, in order to be functional and accepted, new practices and techniques must be compatible with and improve the traditional systems of indigenous peoples. As the Q'eqchi (mayan) leader in charge of an IPAF project in Belize said:

"Midway village initiated the project according to traditional custom, but they also created a new farmer association to work with the Ministry of Agriculture. Ten Midway farmers demarcated and cleared land manually, as they always have, but they also sent soil samples for laboratory analysis. They learned to apply white lime to balance it and organic fertilizer to prepare it. They selected traditional seeds for planting, as they always have, but treated them with white lime to prevent infestation. They gathered to plant communally, as they always do, but with new techniques that build the soil instead of depleting it. They also learned how to create their own organic fertilizer and pesticides from traditional ingredients they know and trust."

There is a need to support the development of policies at national and international levels, and to strengthen collaboration among institutions working on NUS. New methods and tools should be developed and tested in partnership with indigenous farmers and value chain actors to enhance their capacities to sustainably conserve traditional crops and associated knowledge at the farm level.

NUS hold comparative advantages over commodity crops because of their adaptation to local conditions, their nutritional contributions and their resilience to adverse climatic conditions. These species and the wealth of associated traditional knowledge are a strategic ally in sustainable and productive agroecosystems, contributing towards the latter's resilience in addressing climatic changes and economic distress while promoting traditional and healthy food systems.

Box 7: Stories from the field (Bolivia)

Doña Viviana is a 40-year-old farmer who lives in Cachilaya, a community of about 120 families on the shores of Lake Titicaca, Provincia Los Andes, Bolivia. Doña Vivi is the custodians of 105 varieties of potato, 8 varieties of quinoa, and 2 varieties of tarwi (lupin) and oats (used for fodder). She inherited her first 30 varieties of "papa" from her grandfather, then she bought more in the market and bartered (trueque) them for more varieties with other women in the Provincia Camacho (where most of her seeds come from). Thanks to the project, she attended a course on traditional medicine and is now able to cure herself with herbs when she is sick. She also learned how to prepare bread and biscuits using quinoa, thanks to a cooking workshop organized by the project. She proudly demonstrates her crop varieties during the biodiversity fairs she regularly attends.

"I like to conserve different varieties of quinoa because their colors are so nice, besides being of course so nutritious for us! I sow them all every year in five furrows of my little plot, so that I can get seeds for the following year. I like winning prizes in biodiversity fairs. Last year I got the first prize."

The success of the project was highlighted by Dr Alvaro Otondo Maldonado from the National Institute of Agricultural and Forestry Innovation of Bolivia, who stated that:

"We recognize that custodian farmers are a strategic asset to help Bolivia use and safeguard the country's valuable and rich crop diversity found on farm and in the wild, to achieve sustainable agricultural systems for nutrition and income security in the future. [We express] gratitude to the work of these custodian farmers carried out through the centuries for safeguarding our diversity heritage and the associated knowledge of its value, as today not just Bolivia but also the world looks for crops able to adapt to today's climatic challenges."

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Natural resources management

Lands and territories inhabited by indigenous peoples across the globe are rich in natural resources. Through generations of experimentation and as custodians, indigenous peoples have developed an expansive body of knowledge for sustainable use and management of these resources. The continuity of this knowledge and sustainable use and management practices of these resources are enforced through rules, beliefs and taboos, which form a part of their customary laws and spirituality. Indigenous peoples are knowledgeable about plants, animals and natural phenomena of the ecosystems and their surroundings. This rich knowledge, coupled with their close relationship with their lands, has enabled them to live in harmony with nature. The objective of natural resources management lies in self-sufficiency and sustainability. For instance, the natural resources management system of Naxi people in Yuhu Village in China is intimately related to their social, cultural and spiritual practices, as well as the economic, political, judicial, medical, technological and educational systems. The principles for management of natural resources are established by customary laws and are transmitted from generation to generation through oral traditions, or through daily practice in the family and between the elders and the young people in the community. Natural resources management includes indigenous people's activities related to both the material and the spiritual world, and is an integral part of the daily life activities in the village (He Hong Mu Xiuping and Eliza Kissya with Yanes, AIPP 2010).

Total project cost:
US$66.4 million

Total IFAD financing:
US$27.12 million

IFAD loan: US$26.56 million

IFAD grant: US$0.56 million

Implementation period:
2008- 2016

CASE STUDY: PHILIPPINES

Second Cordillera Highland Agricultural Resource Management Project (CHARMP 2) in the Philippines

Background

Cordillera Administrative Region (CAR) is land-locked, mountainous and isolated because of poor infrastructure. Severe poverty persists in upland and highland CAR, where the population comprises mostly indigenous peoples engaged in agriculture. Persistent poverty combined with population growth has been putting enormous pressure on farmers, pushing them to convert forests to agricultural lands, with the consequence of causing severe deforestation, land erosion and watershed degradation.

The current project scales up the approaches of the first Cordillera Highland Agricultural Resource Management Project (1996-2004). It concentrates on the poorest areas of each province in the region, including Abra, Apayao, Benguet, Ifugao, Kalinga and Mountain provinces. The objectives of the project are to increase the household income of poor farmers through sustainable agricultural development and to enhance the quality of life of targeted communities by improving land tenure security, food security and watershed conservation. The project is in line with the Medium-term Philippines Development Plan, the Community-based Forest Management component of the Master Plan for Forestry Development, and the Cordillera Regional Development Plan, whose goals are economic growth and diversification, sustainable use of natural resources, social and human development and the protection of cultural integrity.

Figure 5
Map of CHARMP 2 project area (Philippines)

Project's strategy and activities

The project's strategy and activities are based on the innovative features of the first Cordillera project, namely: participatory approaches to development planning and natural resources management at the community level; support for ancestral domain/land titling; and identification and documentation of best practices in applying indigenous knowledge systems and practices. In addition, it introduces new forms of innovation through a two-pronged approach that stimulates the adoption of improved indigenous knowledge systems and practices, and commercialization of indigenous peoples' products through appropriate value chain development and market linkages, backed by fresh research on improved indigenous knowledge systems and practices, land and forest management practices, and agribusiness value chain development.

This second phase strengthens the participatory monitoring and evaluation systems of the project, and the capacity of indigenous peoples and their councils of elders to take responsibility for forest management. Natural resources management, agribusiness and investment activities of infrastructure development fall under the ancestral domain sustainable development and protection plan, which community members – collectively or individually – implement and evaluate.

Local government units support the establishment and management of tree nurseries in locations accessible to farmers of the target provinces. The tree nurseries propagate seedlings of appropriate trees, paying special attention to the propagation of indigenous forest species. These are then used to support the reforestation and agroforestry activities of the poor rural communities, aiming to strengthen highland forest and watershed management.

The project is introducing agroforestry, multiple cropping and soil conservation to improve climate adaptation in agriculture, applying indigenous peoples' traditional practices. In the course of assisting projects, local government units have been drawing up their local watershed plans to better integrate adaptation and mitigation strategies, particularly in the agriculture and natural resources sector.

Good practices and lessons learned

The project's outputs included: 6,300 hectares planted with seedling by 150 reforestation peoples' organizations and 163 agroforestry peoples' organizations; 37 community irrigation systems built to cover 650 hectares; and 23 drinking-water systems created to serve 4,000 rural households. Overall, the project has benefited 70,000 households. Reforestation and agroforestry activities, combined with proper fire prevention measures, have created at least 10,500 hectares of new vegetative cover, which will help to address forest fragmentation and assist in carbon sequestration.

The project has introduced a number of new approaches to the Cordillera Administrative Region, including: the ancestral domain sustainable development and protection plan; the covenant approach to reforestation and farmer field schools; the enterprise development plans and their value chain linkage approaches; the participatory monitoring approach; and the responsive, bottom-up approach to locally-driven development. It is documenting indigenous peoples' forest management systems with a view to improving forest management regulations in accordance with indigenous peoples' values and traditions.

Project activities were implemented smoothly in those *barangays* (villages) where indigenous peoples' practices were respected. This showed the advantage of implementing project activities through indigenous peoples' institutions and practices. Such was the case of the *Lapat* system (*lapat* means "to prohibit" or "to regulate"), an indigenous practice of regulating the use of natural resources through customary laws, which was adopted by the project to ensure community participation and ownership of project activities. Similarly, the pango and ab-abbuyog cooperative systems, which are based on an exchange of free labour for community or family projects, were adopted to promote unity and participation in project's activities.

Box 8: Stories from the field (Philippines)

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The project adopted a highly participatory approach, basing its work on indigenous peoples' institutions and practices. For example, in Kalinga Province, the indigenous communities highly value the word of the elders; therefore, when approaching the communities, the project staff were careful to honour the elders and leaders in order to ensure the community's participation in the project's reforestation work. Thanks to the elders' involvement, the reforestation project in Kalinga was able to establish 48 plant nurseries, producing 1.7 million seedlings and planting 1.6 million seedlings in an area of 626 ha.

In Kalinga, the project used the traditional *ab-abbuyog* cooperative system as a means to make the whole community participate in its works. The system is an exchange of free labour within the community. Other examples of free communal work are the *gibbon* and *pango* systems. In Barangay Poblacion, the communities used the *gibbon* system (based on cooperation among community members to speed communal work) to transplant seedlings. Thanks to the traditional practice, the community was able to transplant 10,088 seedlings in one day, thus lessening the time and expenses of the work. In Barangay Bao-yan in the town of Boliney, the project built on the traditional *pango* system, an indigenous cooperative system that provides free labour to support the implementation of community and family-initiated projects.

In the words of Ferdinand G. Solomon, Community Mobilization Officer:

"In the planning of projects, it is well to remember the pango cooperative system and its provision of free labour. Since it is easy to adopt and practical, I think the pango system is applicable in other areas, because it also promotes unity, cooperation and the participation of both men and women."

Box 9: Natural resources management in Africa

Project title: Support the enhancement of territories and traditional lands of indigenous pygmies (financed through the IFAD Indigenous Peoples Assistance Facility [IPAF])

Responsible organization: Programme for the integration and development of the Pygmy population in Kivu

Project location: Democratic Republic of Congo

Beneficiaries: Bambuti, Batwa and Babuluko people

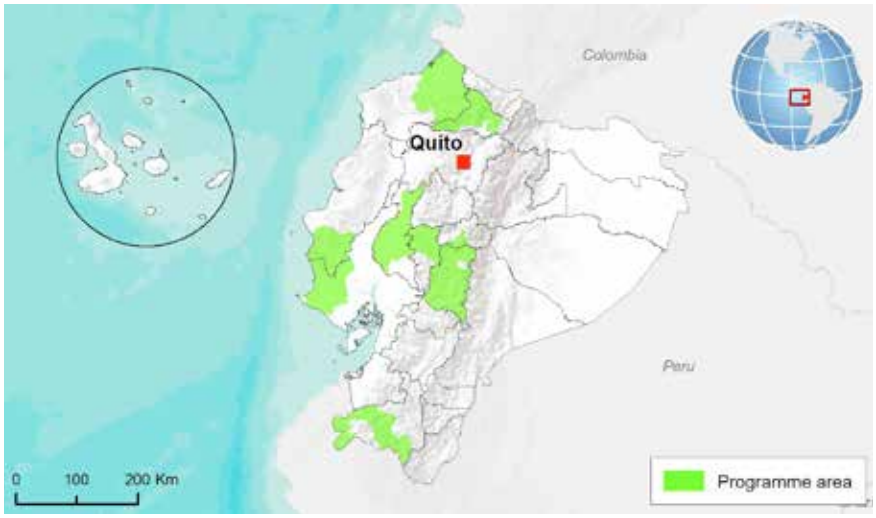
The Bambuti Batwa Babuluko peoples traditionally depend and base their identity, culture and livelihood on the forest. The project helped Bambuti Batwa Babuluko peoples to recover and use their traditional forests. Through participatory planning and management committees, the project produced five maps (one for each forest and a general one including them all) for submission to the Ministry of Land in Goma. After the mapping, communities carried out a "biodiversity analysis" of the forest resources (including the varieties of wildlife, trees, vegetation and fish species in the river) for the purpose of conservation and sustainable use.

Thanks to the project, the Bambuti Batwa Babuluko peoples recovered their traditional practices related to forest management, had their link with the forests – so central to their identity as a people – legally recognized and were able to enhance their livelihoods through the sustainable use of forest resources.

Box 10: Natural resources management in Latin America

Project title: Buen Vivir in Rural Territories Programme
Responsible institution: Ministry of Agriculture, Livestock and Fishery
Project location: Ecuador
Beneficiaries: Indigenous peoples and Afro-descendants

The programme is a model of development with culture and identity. It is based on the indigenous concept of sumac kawsay (or buen vivir) and is focused on the support, systematization and transmission of indigenous peoples' traditional knowledge and practices related to natural resources management, (ethno)-agroecology, and water management. Indigenous peoples' communities formulate, implement and monitor initiatives to improve their livelihoods based on the sustainable use of their environment and natural resources. Among its activities, the programme is implementing agroecological systems of production, developing small-scale productive infrastructures (irrigation, storage and processing, agro-industry and renewable energy) at both family and community level, as a means to ensure the development of indigenous peoples according to their needs and decisions, and in compliance with their environment and resources.



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Pastoralism

Pastoralism refers to both an economic activity and a cultural identity, whose crucial aspects are the interaction between people, animals and the environment, as well as the development of flexible resource management systems (among them communal land management and non-exclusive entitlements to water resources). Adaptive forms of customary institutions still govern many aspects of pastoral life, often combining aspects of customary and formal organisation (IFAD 2014). Pastoralism is practised in over 100 countries by an estimated 100-200 million peoples on 25 per cent of the world's land area (IUCN ESARO 2011, 2012). Traditional pastoral systems preserve natural ecosystems through extensive ranching and rotational grazing and by using a variety of livestock. Nomads breed their herds over many generations to make them fit in their often harsh and variable environmental conditions. This has produced many different breeds and contributed to the maintenance of biodiversity in domesticated animals. For example, the pastoral Maasai of East Africa keep cattle, goats and sheep, and move their herds throughout the year to optimize the use of rangeland resources for maximum meat and milk production. They distinguish between those plants that are good for increasing milk and those that fatten livestock and improve their condition. This knowledge is particularly important during exceptionally dry years, when decisions have to be made by the Maasai about where to graze, which grasses recover faster than others and, based on the availability of resources, what stock should be culled first. The Qashqai nomadic communities in Iran play an important role in sustaining food production, while at the same time preserving the age-old livestock management practices in drought-prone areas of the country. Some of the pastoralists adapt to

climate change impacts such as droughts and reduced availability of rangelands by adjusting the timing for migration from summer to winter grounds and prolonging migration routes. Pastoral African communities have long experience in developing local adaptation strategies to cope with extreme weather events such as droughts. However, the current changes in climate and the subsequent impacts are severely straining the potential for adaptation of many indigenous and pastoral peoples in the region. Increasing desertification, limitations on migration and mobility, and destruction of biodiversity, are having wide-ranging consequences, from increased conflict over resources to changes in traditions (Galloway McLean 2010).

CASE STUDY: CHAD

Pastoral Water and Resource Management Project in Sahelian areas (PROHYPA) in Chad

Total project cost:
US$39.5 million

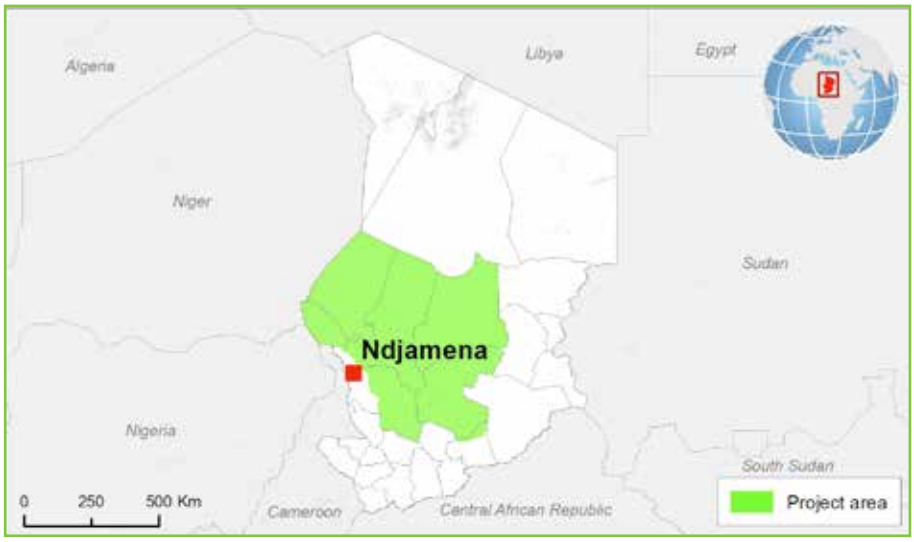
IFAD loan:
US$19.5 million

Implementation period:
2010-2015

Background

In Chad, the potential of pastoral resource remains largely untapped due to an insufficient number of water points and secure passages for livestock between agricultural areas. These shortcomings often force pastoralists to reduce their mobility and use the water resources of the sedentary populations, with the consequence of creating serious conflicts. In the Sahelian belt, the extreme climatic conditions – ranging from drought to floods caused by torrential rains – lead to soil erosion, desertification and competition among different ethnic groups over scarce natural resources. In this context, nomadic and transhumance systems have proved to be highly effective in environmental, economic and social terms because of their good adaptation to low vegetation growth and to fragile ecosystems. Following flexible migration patterns, these systems make the most of seasonally available natural resources and can adapt to changing environmental conditions. The Mbororo Peul

Figure 6
Map of PROHYPA project area (Chad)



pastoralists inhabit the region targeted by the project. Thanks to their extensive ranching and rotational grazing, and the employment of a variety of livestock, they are preserving their natural ecosystems. Mobile pastoralism, which the Mbororo Peul practise, is a resilient livelihood system well adapted to difficult environments. However, due to climate change, access to water resources has become more difficult. The main aim of this project was to improve access to water for mobile pastoralists and their animals in order to reduce their vulnerability and support the communities' way of life.

Project's strategy and activities

The project supported the government's policy of strengthening mobile livestock systems and breaking away from the sedentarization of transhumant communities, making pastoralist communities the key players in the implementation of pastoral policies. It was also consistent with IFAD's strategic objective of improving access to and sustainable management of water resources, aiming to solve water disputes between communities.

In order to reach this goal, the project focused on the planning and management of pastoral water infrastructures through local institutions and conflict management commissions with the involvement of traditional leaders (transhumant tribal chiefs). It secured transhumance systems by establishing water points and marked transhumance corridors in the central and western parts of Chad as a means to adapt to climate change. The PROHYPA put the various committees and their members at the heart of the identification process, site selection, implementation and monitoring of activities.

The intervention method was based on participatory diagnostics, from which it emerged that the pastoralists' main concern/priority was their animals' access to water and health care. Following the participatory diagnostic, the project put the animals at the core of the project strategy and adopted a holistic approach that encompassed the milieu, the animal and the herder, to guide the activities of the project component titled "Basic services for the transhumance communities."

Maps of the project were developed through a participatory approach. The cartographic design was based on a three-step process. The first step involved data collection, which focused on the identification of sites for hydraulic structures using pastoral and hydrogeological participatory diagnosis. The second step involved data processing and validation by the different actors involved, while the third step was the production of maps.

Good practices and lessons learned

The project has greatly contributed to strengthening the resilience of pastoralist communities; pastoral mobility was secured and pastoralism became both more productive and resilient. Indeed, the project produced significant advances in social cohesion, and recovery and improvement of traditional management practices applied to hydraulic structures, allowing transhumant populations to adapt to external shocks related to climate change and rangeland degradation. Consequently, the project reduced conflicts, as well as led to better management of conflicts when such arose.

Transhumance corridors help secure pastoral mobility. They indeed facilitate the passage of herds to grazing areas, avoiding encroachment on cropland. The ancient and pre-existing corridors have been rehabilitated and upgraded, and are managed by a joint committee which is chaired by an administrative authority or by a district chief. Such committees also manage conflicts and monitor the corridors.

The project adopted a holistic, non-sectoral and community-based participatory approach, allowing local stakeholders to occupy a central role in every decision-making process. It enabled the production of four thematic maps, which became important tools in the implementation of policies, plans and programs of the Ministry of Rural and Urban Water, aimed at strengthening pastoral systems in Chad:

- The map of pastoral works plays an important role in the future implementation of water points in the area by the Ministry of Rural and Urban Water. It shows areas with a high concentration of water points and those without water points. The replication of this experience would facilitate the establishment of water points wherever needed and should be scaled up at the national level.
- The land use map enables to visualize the spatial formations of vegetation and their level of degradation, the cultivated areas, the state of the soil and the state of the natural resources. This baseline makes it possible to measure the impact of climate variability or animal pressure around water points. Thus, changes/modifications can be identified for decision-making at a national/governmental level.
- The mobility map provides an overview of natural resources, existing transhumance axes, herd stations used during the dry season and sensitive areas of potential conflict.
- The concentration map provides a headcount for each species (camels, cattle, sheep and goats) in the area served by each water point, thus identifying the areas of large concentration.

Livestock technicians and transhumant pastoralists populations can use the mobility and concentration maps to facilitate the orientation of large herds towards larger ponds in order to avoid excessive concentration and significant risks of conflict around smaller ponds. The national census programme of the Ministry of Livestock Breeding based its approach on the identification of areas of concentration using the maps produced by the project.

The project produced another useful tool: the Methodological Guide for Pastoral Diagnosis. This tool establishes the baseline for pastoralism at project start, providing reliable comparative data for the eventual evaluation of the project and its benefits versus those of previous initiatives. The guide also addresses issues concerning potential users of water points, serviced land, modes of management of water points, rules for access to pastoral resources, the role of women in pastoralism and the identification and management methods for conflict resolution.

PROHYPA documented a number of experiences and activities that contributed to the national debate and public policy dialogue on the development of pastoralism. The latter was fuelled by the ongoing dialogue between stakeholders, collaborative and dynamic partnerships at the local, regional and national level, and renewed respect for and enhancement of local practices.

The beneficiaries were involved in all stages of the process: identification of sites, construction and management of hydraulic structures, and pastoral development. Organized into committees, they were empowered to monitor the daily works. The advantage of this approach lay in the fact that it promoted a sense of ownership and sustainability; given that the design of project activities was based on traditional knowledge, the beneficiaries took personal pride in the project's accomplishments and achievements. The results of the project highlight the fact that transhumants can be well organized when supported by traditional chiefs, administrative authorities and technical services of the state, which assist in the management and maintenance of hydraulic and other infrastructures of pastoralist communities in a manner that respects the experiences and practices of the latter.

An improved understanding of pastoralist systems is necessary for the implementation of sustainable interventions in rangeland management, pastoral risk management and resilience building. The project recognized the importance of building on local production and livelihood systems, acknowledging their economic and ecological value. For instance, pastoral structures (such as wells, ponds and transhumance corridors) can only be effective and sustainable if the management committees responsible for their operation and maintenance rely on strong local structures and traditional institutions.

Box 11: Pastoralism in Latin America

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Project title: Camelid Producers Development in the Andean High Plateau of Bolivia

Responsible institution: Peasant Alternative Development Program and Foundation for Development Alternatives

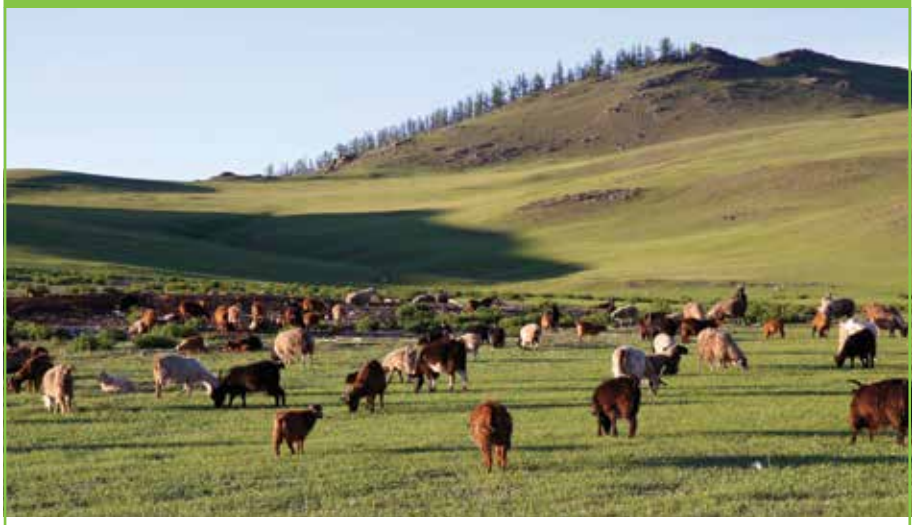
Project location: Bolivia

Beneficiaries: Aymará and Quechua peoples

The project aimed to raise the incomes of llama herders, who are among the poorest inhabitants of Bolivia.

Llama husbandry is practically the only viable productive option in the Andean communities located between 3,000 and 4,000 meters above sea level. The project strengthened the agroecological and productive resource base and provided support to women's production and marketing of handicrafts, enabling llama herders to improve their production as well as maintain and enhance their traditional skills of llama wool handicraft.

Box 12: Pastoralism in Asia



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Project title: Improved livelihood of Tsaatan through biotechnological method (financed through the IFAD Indigenous Peoples Assistance Facility [IPAF])

Responsible institution: Thenkhleg Khugjil

Project location: Mongolia

Beneficiaries: Tsaatan peoples

The Tsaatan people of Mongolia depend entirely on reindeer, which is the source of their livelihood and the basis of their social organization and religious beliefs. Because of intensive inbreeding and the increase in herd diseases, the number of reindeer was dramatically falling, leaving the Tsaatan lacking their means of economic and cultural survival.

The project introduced biotechnological methods, implemented using traditional community councils and traditional leaders, aiming to increase the number of animals and strengthen local skills and participation in communal activities.

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Conclusions

"Traditional and indigenous knowledge is the indispensable information base for many societies seeking to live in harmony with nature and adapt to disruptive weather events, a warming globe and rising seas. […] Local knowledge of the impacts of urbanization, population growth, eco-system decline and greenhouse gas emissions is especially important in an era when more and more disasters are climate- and weather-related."

United Nations Secretary-General Ban Ki-moon[1]

As we have seen, the consequences of climate change, such as severe drought, more devastating hurricanes and typhoons, melting ice, floods, sea-level rise, and increased prevalence and virulence of infectious diseases have gravely affected indigenous peoples' way of life and livelihoods. In the face of these events, indigenous peoples have been forced to adapt using their traditional knowledge and practices. The case studies described in the previous pages highlight IFAD's commitment to value this knowledge and practices as assets that can be used to assess, adapt and mitigate climate change consequences at the local level, seizing every opportunity to scale up and spread them. In its engagement with indigenous peoples – listening to them and working together as equal partners in development – IFAD has learned many lessons, some of which can be drawn from the projects analysed in this report.

There is already a long record of adaptations to climate change practised by indigenous peoples, which enhance their resilience and which can be the foundation

1 Passage taken from United Nations Secretary-General Ban Ki-moon's speech on the occasion of the International Day for Disaster Reduction, 13 October 2015.

upon which to further improve climate change adaptation and mitigation strategies. Examples of such traditional and innovative adaptation practices were described in the introduction and the case studies, and can be summed up as: diversification of resource base as a response to harvest failure risk; change of cultivated varieties and species in response to changes in climate patterns that lead to harvest failure; change in hunting strategies to cope with reduced population of some animal species due to warmer climate; change in the timing of activities to adapt to changes in growing seasons and times of animal migrations; recurrence of traditional exchange systems to cope with food shortages; and use of traditional management techniques to cope with scarce and climate-sensitive resources.

The importance of indigenous peoples' knowledge in relation to climate change has been recognized by the United Nations; as stated during the adoption of the Paris Agreement, the United Nations "(r)ecognizes the need to strengthen knowledge, technologies, practices and efforts of local communities and indigenous peoples related to addressing and responding to climate change, and establishes a platform for the exchange of experiences and sharing of best practices on mitigation and adaptation in a holistic and integrated manner." In the same vein, the Addis Ababa Action Agenda states that: "…we recognize that traditional knowledge, innovations and practices of indigenous peoples and local communities can support social well-being and sustainable livelihoods and we reaffirm that indigenous peoples have the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions."

There is a need to support these bottom-up community adaptation strategies, rooted in indigenous peoples' knowledge, in order to build resilience, preserve livelihoods and traditional ways of life. Indigenous peoples interpret and react to the impacts of climate change in creative ways, drawing on traditional knowledge and other technologies to find solutions which may help society at large to cope with impending changes. Strengthening indigenous peoples' resilience to climate change means to work also on the obstacles they face. There are significant issues which hinder adaptation, including poverty, lack of resources, and financial or technological limits. In the case of indigenous peoples, social and cultural barriers, insecurity of rights and loss of traditional knowledge may also hold back adaptation. Working towards the resolution of these issues, IFAD is exploring culturally appropriate ways to enhance the resilience of indigenous peoples and address the various factors that are hindering adaptation.

Protection and restoration of ecosystems, diversification of agricultural landscapes, and the protection and use of agrobiodiversity define an adaptation framework that can be applied in different environments. However, the choice and design of specific strategies should be based on local experiences of climate change, needs, resources, knowledge and livelihood systems; it is fundamental to keep in mind these specificities when exploring ways of scaling up successful strategies.

IFAD's projects ensure that the introduction of new technologies and the innovation of indigenous peoples' systems build upon the latter's body of knowledge. This answers to the need to establish networks of joint research and action between indigenous peoples and scientists, investigating how to best triangulate scientific and indigenous knowledge in the development of adaptation

and mitigation strategies to climate change, and investigating the synergies and trade-offs between various traditional and non-traditional adaptation measures, and between adaptation and other development priorities. In the face of increasing climate instability, respectful two-way collaboration is the path forward to build better early warning systems and support local efforts towards building resilience (Galloway McLean 2012). Innovations based on traditional knowledge can lead to the development of local adaptation measures that protect ecosystems and empower indigenous peoples.

Given the fact that many indigenous peoples live in areas of elevated risk, their knowledge and adaptation strategies could provide valuable inputs to efforts that aim to identify effective climate change adaptation and mitigation measures, and therefore should be investigated, documented and disseminated (Macchi 2008). IFAD's projects support the documentation and systematization of indigenous peoples' knowledge, aiming to recover, enhance and disseminate it. Such documentation is vital to understanding the impacts of climate change on vulnerable cultures and involves collecting information on past and current practical adaptation actions and measures, as well as progress monitoring of traditional adaptation. These efforts contribute to climate change research, while concurrently addressing indigenous peoples' demands.

Furthermore, IFAD-supported projects targeted to indigenous people are ensuring the protection, promotion, re-introduction or re-vitalization of local traditional crop varieties, food systems, seeds systems, agrobiodiversity and overall agroecological systems. Drawing from the body of traditional community knowledge, particularly that of women farmers, the promotion of traditional crop varieties, food systems and cultivation practices is contributing immensely to our knowledge of climate change adaptation and, therefore, towards building climate-resilient communities. In the words of Seán Kennedy, senior technical specialist on public health and nutrition at IFAD, "here at IFAD we believe it's also important to remember the value of indigenous knowledge related to climate change adaptation. This includes identification of underutilized varieties (often now known only by elderly members of indigenous communities) as well as varieties that have higher micronutrient values and that, with change in climate, have the potential to be grown at higher altitudes."[2]

There is also a need to develop indicators of adaptation, adaptability and resilience that address indigenous peoples' needs and are useful at different levels. These indicators will help to identify what contribution indigenous peoples' knowledge systems can make and where they are likely to be most useful.

However, it is not sufficient to collect and document the knowledge and adaptation strategies of the indigenous peoples. Their lifestyles and worldview must be respected and strengthened, and their rights over land, territories and resources must be recognized (Feldt 2011). The connection to their land and territories is an important source of resilience for indigenous peoples, but this resilience depends on an ability to nurture and manage this relationship (Galloway McLean 2012).

2 IFAD news.

The relationship to ancestral territories and resources is at the core of indigenous peoples' livelihoods and regulated by complex customary systems and practices that are central to their identity. Rights over their land and territories must be recognized in order to protect and enhance indigenous peoples' knowledge and practices and, consequently, their resilience to climate change. Securing land tenure and access rights, as well as access rights to natural resources for indigenous and traditional peoples is thus essential (Macchi 2008).

Indigenous peoples have a holistic perspective: their livelihoods, natural resources management, social organization and worldview are interlinked and interdependent. Thus, projects dealing with indigenous peoples need to encompass a holistic approach in order to support and strengthen their food systems, sustainable livelihood practices, governance systems, and cultural and spiritual values. Working with indigenous peoples implies the adoption of a broad and inclusive perspective and a flexible, systemic and holistic approach, as opposed to a technocratic and sectoral approach. Efforts to enhance and support the adaptive capacity of indigenous peoples will only be successful if this is integrated with other strategies, such as disaster preparation, land-use planning, environmental conservation and national plans for sustainable development.

Indigenous peoples must be seen as development partners rather than mere beneficiaries. It should be kept in mind that some mitigation measures may have undesirable consequences for indigenous communities. For instance, certain agricultural initiatives may reduce greenhouse gas emissions, but may also lead to an increase in monoculture crops and plantations, and an associated decline in biodiversity and food security. The full and effective participation of indigenous peoples is therefore crucial during the elaboration of mitigation measures, so as to ensure that such schemes do not negatively affect their communities. In fact, indigenous peoples must participate in all project stages, from design to evaluation. This should involve free, prior and informed consent, which must be systematically and properly obtained in the context of IFAD-funded projects in order to ensure full understanding, participation and ownership of the project by indigenous peoples.

It is also necessary to raise public awareness around indigenous peoples' values, knowledge, food systems and sustainable livelihoods, including pastoralism. Recognition of indigenous peoples' coping and adaptation strategies, and respect for their systems and perspectives should be the aim of the dialogue with governments and the private sector. The value of indigenous peoples' knowledge and perceptions regarding food, livelihood systems, natural resources management and biodiversity conservation are key elements that must be incorporated into climate change policy at the national and international levels. In order to do so, indigenous peoples should be enabled to actively participate in decision-making processes at regional, national and local levels (Pearce 2009).

IFAD is in an advantageous position to support the inclusion of indigenous peoples' knowledge in activities that promote climate change resilience. Such support will not only enhance the resilience of indigenous peoples to climate change and conserve the world's cultural diversity, but will also reinforce global efforts to mitigate and adapt to climate change.

"The next step is to learn more from each other. I certainly would welcome many more young students being exposed to the way other knowledge systems work and how people look at climate change. We are in this together. We don't have either a monopoly of knowledge or the best knowledge. So I believe the more we increase this multicultural, multi-knowledge perspective on what's happening with us and the planet, the better it will be for us."

Igor Krupnik, Curator of the Arctic and Northern Ethnology
Smithsonian National Museum of Natural History[3]

3 Interview with Erin Loury, available at: http://news.sciencemag.org/2012/02/qa-what-can-indigenous-people-tell-us-about-climate-change

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