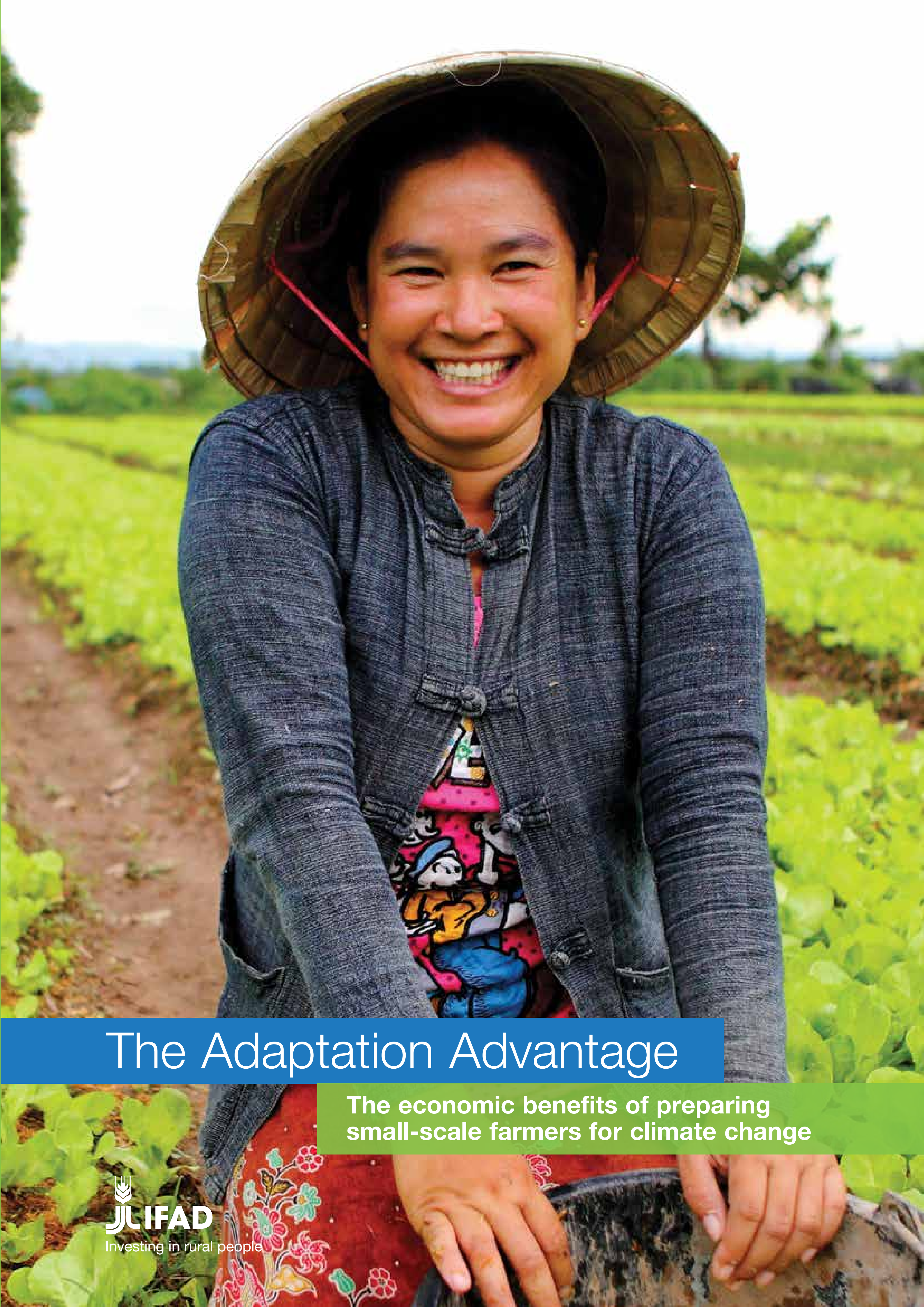

The Adaptation Advantage

The economic benefits of preparing small-scale farmers for climate change

IFAD
Investing in rural people

The adaptation advantage: The economic benefits of preparing small-scale farmers for climate change

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Investing in rural people

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Introduction

It is now beyond a reasonable doubt that the earth's changing climate is a result of human actions. The expanding total volume of carbon dioxide being released into the atmosphere is precipitating higher global surface temperatures and sea level rise. The effects of human-induced climate change threaten the very existence of numerous species across the planet, including our own.

The recently released *Fifth Assessment Report* from the Intergovernmental Panel on Climate Change (IPCC) presents a range of scenarios that forecast between a 1° C and 5° C temperature rise above preindustrial levels by 2100. Climate models also predict that heat waves will become more frequent and extend over longer periods. Rainfall patterns are expected to be more unpredictable and concentrated in intense storms. Coral reefs could start disintegrating in tropical regions and more extreme weather events could lead to the extensive destruction of agricultural lands, property and human life. The danger to the global food supply—especially for the world's most poor and vulnerable people—is real. The effects are already being felt.

Given the scientific consensus on human responsibility for climate change, it is urgent that we arrive at a similar consensus on human responsibility for addressing it. Countries will have to take additional measures to adapt, while ensuring that the most vulnerable individuals are protected. This will be one of the great challenges of the 21st century, as the IPCC is unequivocal in stating that the poorest will be hit the hardest.

The climate debate often overlooks how adaptation can result in economic and financial opportunities for smallholder farmers. Taking into account long-term climatic changes and market forces, farmers can capitalize on opportunities to diversify their production and spread climate risk across different income streams, or sustainably intensify to maintain stable harvests in a more resilient natural environment.

The economic benefits of adaptation are many: sustained or increased agricultural production, higher household incomes, enhanced environmental services, protection of the asset base, and less vulnerability to extreme weather events.

The case studies included in this paper represent the diverse situations in which environmental or climate-related problems pose a challenge to human development. They demonstrate that it is possible to quantify the benefits that arise from adaptation investments in economic and financial terms. This is part of a more comprehensive accounting process aimed at evaluating different adaptation options to get the most impact.

There are a number of methodologies one can use when trying to reach an economic valuation for adaptation measures. Cost-benefit comparisons, which are standard in economic assessments, offer limited utility since adaptation generally results in non-monetary impacts. In some cases, more can be understood by using a cost-effectiveness approach (selecting the options that have the lowest cost to supply an environmental service). In others, a risk-based approach, where practices that are adjusted to reduce a specific climate risk level are chosen, may be more appropriate (UNFCCC, 2009).

The following case studies are centered on expressing benefits at the community or household scale. The methodologies that have been applied look at values such as:

- Avoided damages from investments in climate change adaptation
- Increased production functions as a result of sustainable intensification or diversification
- Net incremental income for smallholder farmers
- Employment gains

At the global level, the International Fund for Agricultural Development (IFAD) is calling for climate finance to prioritize investments in small-scale agriculture. Indeed, small-scale farmers produce up to 80 per cent of the food in sub-Saharan Africa and parts of Asia. In the least-developed countries, agriculture is the backbone of the economy, accounting for a large segment of gross domestic product (GDP) and employing as much as 70 per cent or more of the workforce. Given the development imperative of maintaining healthy and productive food systems, targeted financing instruments are crucial to enabling small-scale farmers to make the necessary investments that will avoid crop losses.

The adaptation options available to smallholder farmers depend on contextual climate risks, geographic location, asset base and livelihood strategies. With access to better technical assistance on climate risk analysis, including tools such as satellite-based monitoring, Geographic Information Systems (GIS) and scenario-based modeling, farmers can supplement traditional, tried-and-tested adaptation practices with innovative know-how.

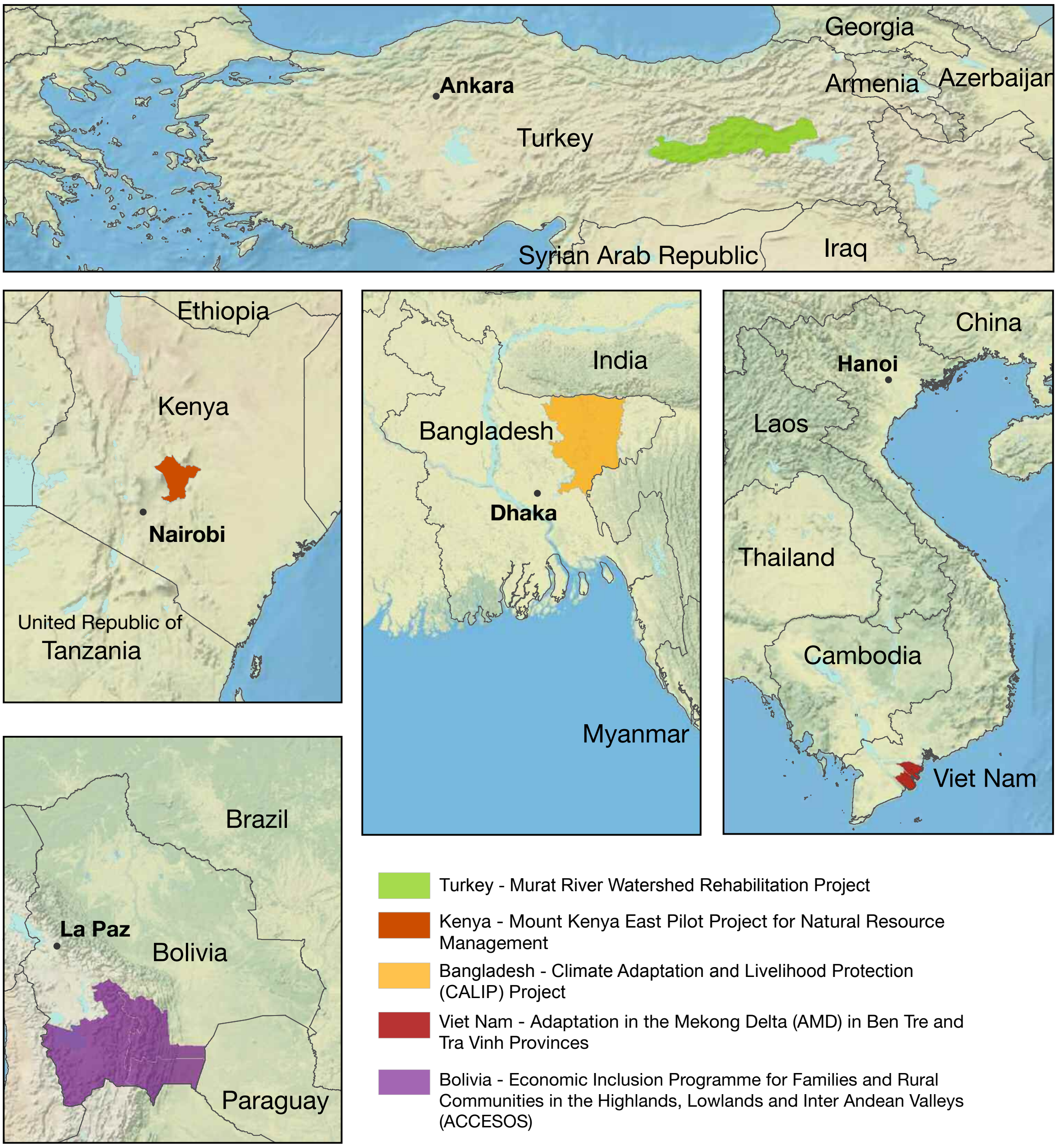
IFAD's Adaptation for Smallholder Agriculture Programme (ASAP), launched in 2012, is a unique instrument that directs resources to small-scale farmers so that they can increase their climate resilience through 'multi-benefit' adaptation approaches. Several of the case studies presented here are ex-ante assessments of the profitability associated with ASAP projects.

In its adaptation work, IFAD focuses on soft investments related to skills, knowledge and access to information, but also on hard investments in physical infrastructure. For instance, improved access to meteorological forecasts and training of extension services complements investments in mixed cropping and the adaptive engineering of rural roads.

IFAD's climate adaptation projects also take due consideration of local social and economic contexts. These factors ultimately help in determining the appropriate technologies and strategies that are congruent with community institutions and the values of affected groups.

The five selected rural development projects examine a range of adaptation activities that are geared to reduce risks from specific climate hazards. From flood protection in the Haor Delta of Bangladesh, to coping with extreme heat and aridity in the Bolivian highlands, climate adaptation is proving its effectiveness in equipping smallholder farmers with the tools and practices they need to carry on their livelihoods in a future with many uncertainties. Climate adaptation for small-scale farmers is not only a valuable part of global climate efforts but an essential one, with benefits that contribute to many human development goals.

Selected IFAD Climate Adaptation and Natural Resource Management Projects



Kenya
Mount Kenya East Pilot Project for Natural Resource Management (MKEPP-NRM)

KEY FACTS

Project title: Mount Kenya East Pilot Project for Natural Resource Management (MKEPP-NRM)

Beneficiaries: 558,145 individuals (286,546 women and 271,599 men)

Duration: 2004-2012

Project area: Ena, Kapingazi, Kathita, Mutonga and Tungu river basins within the Tana River catchment area

Financing:

IFAD loan: US$16,740,000

Global Environment Facility (GEF) grant: US$4,700,000

Background

The Mount Kenya East Pilot Project for Natural Resource Management (MKEPP-NRM) is one of the most illustrative examples of successful natural resource management and climate adaptation in IFAD's loan portfolio. Mount Kenya is a major water tower that provides close to 49 per cent of the Tana River's water. The river supports half of the country's hydropower, irrigated agriculture, fisheries, livestock production and the rich biodiversity in the lower Tana basin. This makes it an ecosystem that is strategically important to Kenya's economic development.

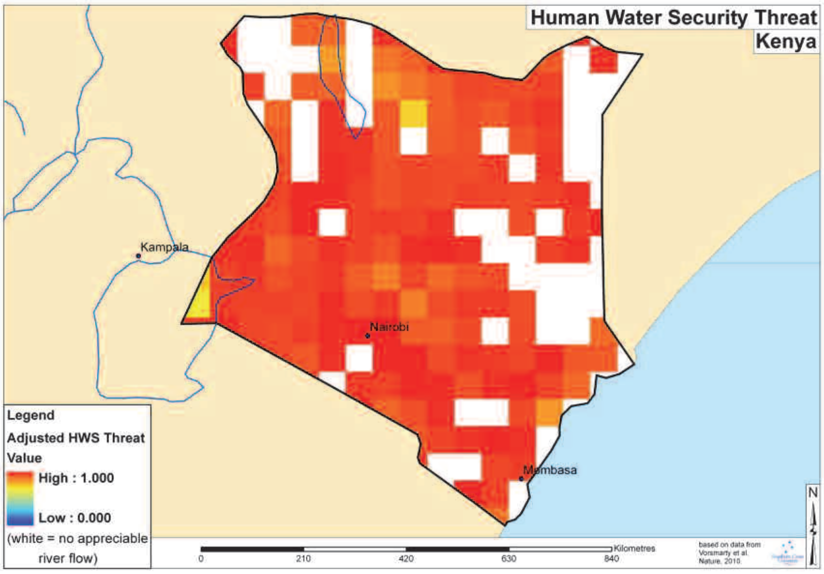
There was growing concern that the life-supporting functions of the river were being systematically lost as a result of degradation in the upper and middle catchment areas of the river. Destruction of forest cover, inappropriate land-use practices and overgrazing had triggered soil erosion, contributing a high sediment load to the Tana, its tributaries and the hydroelectric dams.

The increase in soil erosion had reduced land productivity, leading to more poverty for people who are largely dependent on agriculture for their livelihoods. Additionally, areas that were more ecologically volatile were being used for cultivation. These lands were less able to hold rainwater, causing fluctuations in the river regime during the rainy season and depressing base flows during the dry season, which also impaired water supply. The allocation of water resources had become a sensitive issue with the potential to trigger ethnic tension and conflicts within the project area.

The MKEPP, formulated by the Government of Kenya, was designed to improve the management of the Tana River's water catchment area and enhance the capabilities of smallholder farmers to minimize water stress. IFAD contributed a loan and the Global Environment Facility a grant. The Ministry of Water and Irrigation was the project lead agency and implementation was conducted through various ministries and government agencies such as the Ministry of Agriculture; Ministry of Livestock Development; Ministry of Gender, Children and Social Development; National Environment Management Authority; Kenya Forest Service; and Kenya Wildlife Service.

The MKEPP focused on the sustainable management of natural resources in an effort to engender a more judicious use of the Tana River's water. This approach is expected to yield long-term dividends in the face of climate change, which is forecast to alter hydrological factors in the river basin, affecting the timing, extent and frequency of floods and reducing rainfall during the dry season, all of which would further threaten agroecological systems and food security.

Present adjusted human water security threat (HWS) in Kenya



Source: Met Office Hadley Centre, 2011a.

Adaptation technology/technique

The MKEPP baseline survey report for the base year 2005 indicated that the eastern zone of Mount Kenya was experiencing accelerated soil degradation as a result of uncontrolled tree cutting by tea industry factories, private saw millers and charcoal producers. The roadsides contributed 20 per cent of all the silt that ended up in the rivers. Poverty in the project area, which ranged from 40 to 70 per cent in 2005, was one of the main drivers of deforestation.

The overall goal of the MKEPP was to reduce poverty through improved water and food security and higher income levels for farmers, particularly women farmers. The MKEPP targeted five river basins within the Tana River catchment area, namely the Ena, Kapingazi, Kathita, Mutonga and Tungu.

The project supported a comprehensive set of activities, including: (i) water resource management; (ii) the use of more appropriate agricultural practices (agroforestry and river bank protection); (iii) the introduction of energy-efficient cooking stoves and charcoal kilns; (iv) reforestation; and (v) ecosystem management.

Economic and financial analysis

The assessment of MKEPP outcomes considers how effective the project was in meeting both environmental and human development benchmarks. The outcomes presented below illustrate how the project's four components have benefited the target population in terms of physical assets and food security, among others.

Component 1: Water resource management

The MKEPP established 24 new river gauging systems and rehabilitated 54 additional systems in the river basins to collect, analyse and disseminate hydrological data. Combined with training on the use and maintenance of the technology, smallholder farmers now have access to climatic and water flow information that will enable sound water management.

The project also invested heavily in local infrastructure to improve access to clean water sources for an estimated 149,197 people (80,666 females and 68,531 males). According to the MKEPP impact assessment study in 2012, the project resulted in a 20.6 per cent reduction in the number of people relying on river water, a 56.7 per cent reduction in the time it takes to collect water, a 49.2 per cent reduction in the distance travelled to collect water, a 39 per cent improvement in water quality and a 32 per cent decline in water-related diseases.

Infrastructure in irrigation schemes and the creation of community springs and wells brought about a marked increase in food production and crop intensification. Household income levels showed a general upward trend after project intervention: income from agriculture-related employment increased from 16 to 21.9 per cent, small agribusinesses from 32 to 38.3 per cent and horticulture from 28.5 to 51.4 per cent (Capital Strategies (K) Ltd, 2012). Water-related projects have therefore registered significant benefits to the target population.

Component 2: Environmental conservation

This component focused on initiatives such as riverine conservation, hilltop rehabilitation, school greening programmes, farm forestry, and community and private-sector tree nurseries, all of which either met or surpassed their targets.

For example, the farm forestry initiative was used to promote conservation on individual farms through the establishment of woodlots, agroforestry and boundary tree planting. Farmers planted trees on their farms to ensure self-sufficiency in tree products and commercialization of tree growing for income generation. More than 7 million seedlings were planted, with a survival rate of 75 per cent (which translates into 5.25 million seedlings). The school greening programme, where children adopted trees, was credited with inculcating a culture of tree planting for better environmental governance in the region.

Roadside conservation was also undertaken to prevent soil erosion, particularly gulley erosion, which destroys road infrastructure and silts the river and dams.

Community training in the upkeep of tree nurseries, participatory forest management, environmental governance, and seed collection and handling had a positive impact on the community. For example, tree nurseries were better managed, the quantity and quality of seedlings improved, income from the sale of the tree seedlings and seeds rose, farm-level tree management improved and knowledge of commercial tree farming increased.

More than 700 energy-saving *Jikos* (cook stoves) were constructed using locally available materials after communities were trained by MKEPP. *Jikos* handed over to schools have led to a 50 to 75 per cent reduction in the volume of wood fuel used. These stoves do not release harmful cooking smoke and are thus beneficial to human health.

Efficient charcoal production kilns, which were also introduced, recorded a wood recovery rate of up to 70 per cent as different vegetation could be used as alternative firewood and the energy-saving clay lining contained heat for a longer time.

Component 3: Rural livelihoods

Farmer field schools (FFSs) made a positive contribution in facilitating technology transfer and behavioural change to increase food security. There was a 90 per cent reduction in the incidence of hunger, especially in the lower regions such as Tharaka and Mbeere districts. Farmers who adopted FFS technologies reported an increase in incomes from the sale of crops (up 71 per cent) and from the sale of livestock products such as milk (up 55 per cent).

Soil and water conservation, water harvesting and seed bulking all had a positive impact on agricultural productivity in the project area. Farmers who adopted soil and water conservation reported a 65 per cent increase in food production.

The rehabilitation of rural access roads supported by the project improved the marketing of farm produce and availability of farm inputs. The cost of transporting produce to markets was reduced by up to 20 per cent and distances were shortened by up to 10 kilometres. This has had a positive impact on small market centres. For example, Kibunga market recorded increased trading volumes and Kaare market has been expanded by local authorities.

Component 4: Community empowerment

Empowerment of communities through training and sensitization resulted in a change of attitude and improved management skills, which transformed the way in which communities viewed development and how they managed projects.

Specifically, the issue of women's empowerment was taken up by communities. Forty-eight per cent of all project management committees trained were women, and 9 out of the project's 47 focal development areas had women chairpersons, who were responsible for overseeing planning, implementation and monitoring of Community Action Plans.

Turkey
Murat River Watershed Rehabilitation Project (MRWRP)

KEY FACTS

Project title: Murat River Watershed Rehabilitation Project (MRWRP)

Beneficiaries: 80,000 individuals (12,500 households)

Duration: 2013-2020

Project area: Elaziğ, Bingöl and Muş provinces

Financing:

IFAD loan: US$32,305,500

IFAD grant: US$485,900

Background

Turkey is a middle-income country, with an average gross national income (GNI) per capita of US$8,720 (2009). In spite of economic growth, regional income disparities are pervasive, and in the mountainous eastern region entrenched pockets of rural poverty exist. Economic development has been accompanied by considerable migration, both from rural to urban areas and from eastern to western regions of the country, as people have sought to benefit from new employment opportunities. The number of people living in rural villages has declined over time, from 75 per cent of the population in the 1950s to 35 per cent in 2000.

The Murat River Watershed Rehabilitation Project (MRWRP) is primarily targeting poor women and men who live in upland villages within the Murat River watershed, and it covers the provinces of Elaziğ, Bingöl and Muş. Village households engage in mixed farming, producing wheat, barley, alfalfa, tomatoes, walnuts and apples. There is some livestock raising in the form of beef and milk cattle and lamb. However, production is seldom sufficient, even for household consumption.

The watershed is one of the most degraded ecosystems in the country. The indiscriminate harvesting of fuel wood and overgrazing by animals has accelerated natural erosion processes, caused the sedimentation of riverbeds, and decreased water quality.

Climate change is also compounding the threat of natural disasters in the Murat watershed, as flooding and landslides caused by changes in rainfall patterns endanger lives and wash away vital infrastructure throughout the mountainous landscape. At the same time, climate models show a coherent warming trend in Turkey that is expected to bring about declining suitability for crop production. Projected temperature increases range from 3.5° C to 4.0° C by 2100 in the east of the country (Met Office Hadley Centre, 2011b).

Adaptation technology/technique

The MRWRP is being implemented over a seven-year period (2013-2020) and consists of three main components: (i) natural resources and environmental management; (ii) investments in natural resources and environmental assets; and (iii) investment in livelihood improvement.

Component 1: Natural resources and environmental management

This component aims to create an environmentally aware community that is capable of planning and managing natural resources. The centrepiece of this project component is the negotiation, preparation and implementation of around 25 micro-catchment plans. The project is promoting participatory co-management, under which the village livelihood strategies are aligned with the sustainable use and improvement of public/shared natural resources.

Component 2: Investment in natural resources and environmental assets

The project, through this component, will reduce erosion, improve vegetative cover and facilitate a steady flow of water. To meet the objectives of the component, project activities are attempting to: (i) conserve soil (slope stabilization, erosion control, gully rehabilitation); (ii) improve terracing (shallow/manual); (iii) create tree plantations (forest and fruit-bearing species); (iv) rehabilitate degraded pastures (via periodic closure of grazing areas); (v) restore degraded forests (via coppicing of oak trees); (vi) improve the quantity/quality of the water supply (including village sanitation and drinking water for livestock); and (vii) improve rangeland infrastructure (livestock watering points and stables).

Component 3: Investment in livelihood improvement

This component will help to improve living conditions through the support of small-scale agriculture, with a focus on increasing productivity, small-scale livestock operations, horticulture, forage and field crops, as well as non-wood forest products. Specifically, the project works to: (i) empower upland communities to benefit from improvements to natural resources; (ii) construct small-scale irrigation systems; (iii) teach smallholder farmers how to adjust cropping patterns to the productive and physical limitations of the land; (iv) improve seedbed preparation and timing of planting; (v) introduce quality seeds, encourage more vegetable production and promote regular crop rotation; (vi) establish tree nurseries in the private sector; and (vii) encourage the use of plastic tunnels and drip irrigation.

Economic and financial analysis

The MRWRP is generating financial benefits by investing in (i) natural resource rehabilitation and (ii) income-generating and/or expense-reducing activities.

Natural resource rehabilitation

The project's erosion-control activities aim at decreasing the probability of landslides and ameliorating the damage (in dollars and deaths) caused by floods. Repairs to infrastructure after a flood in one district near the project area in Bingöl province in 2006 cost US$19.6 million. The project assumes that its ongoing erosion-control activities in the Murat River watershed will lead to a reduction in post-flood repair costs that are approximately in the same range. As the project area is prone to floods and landslides, this was thought to be a good proxy measure of the losses avoided. The financial benefit is assumed to begin in project year six after all erosion control measures have been constructed.

Income-generating and/or expense-reducing activities

The project uses an enterprise data model to test financial returns from three agricultural activities: (i) growing tomatoes under plastic tunnels (proxy measure for benefits derived from vegetables); (ii) cultivating walnuts (proxy measure for

Financial benefits of agricultural opportunities based on representative enterprise models

Model	Unit	Household investment (United States dollars)	Labour days required	Payback (years)	Annual net benefit (United States dollars)
Tomatoes (hectare)	0.05	1 975	100	2.50	1 096
Walnuts (hectare)	0.5	1 992	102	6.50	2 508
Sheep	15	295	15	1.00	597

Source: IFAD, 2011a.

benefits derived from tree crops); and (iii) making improvements to sheep rearing (proxy measure for benefits derived from livestock improvement).

The main investments are in irrigation equipment, plastic sheeting, planting materials, shelter and fencing. The models assume that 40 per cent of the targeted households (roughly 5,000) will benefit from livestock improvements; 14 per cent will cultivate walnuts or other tree crops; 4 per cent will take up agriculture using plastic tunnels; and the number of greenhouses will be determined by agricultural conditions and land availability. The table above shows the estimated financial benefits from the agricultural activities.

Viet Nam
Adaptation in the Mekong Delta (AMD) in Ben Tre and Tra Vinh Provinces

Background

Viet Nam has experienced modern growth and productivity since the introduction of a comprehensive set of reforms known as Đổi Mới (renovation) in 1986. In the last decade, the GDP growth rate averaged 6.3 per cent and the number of people living below the national poverty line decreased by more than half, from 28.9 per cent in 2002 to 10.7 per cent in 2010. Viet Nam is a lower middle-income country (OECD, 2012) and has reached five out of eight Millennium Development Goal targets.

Notwithstanding structural shifts in the economy, with industry contributing a greater proportion to GDP, the country faces an emerging set of challenges, such as income inequality, environmental degradation and chronic malnutrition. The average income per capita in rural areas (equivalent to US$47) is 50 per cent less than in urban areas, and the rural poverty rate is nearly three times the urban rate.

KEY FACTS

Project title: Adaptation in the Mekong Delta (AMD) in Ben Tre and Tra Vinh Provinces

Beneficiaries: 125,000 individuals (29,000 households)

Duration: 2014-2018

Project area: Ben Tre and Tra Vinh provinces

Financing:

IFAD loan: US$12,400,000

Adaptation for Smallholder Agriculture Programme (ASAP) grant: US$12,800,000

Furthermore, agricultural production and associated degradation of forest and wetland ecosystems, including over-extraction of water (both upstream and downstream), excessive use of chemical inputs, reduced soil fertility and mangrove deforestation are of great concern.

Viet Nam is also facing the hazard of climate change. The Mekong Delta, a major crop-producing area in the south of the country, is one of the most endangered places on earth with regard to rising sea levels, which are leading to more tidal saltwater intrusion further inland. Already this is disrupting the supply of potable water to thousands of households, increasing soil salinity and constraining agricultural production.

According to an Intergovernmental Panel on Climate Change forecast (2007), between 75 and 100 centimetres of sea level rise by the end of this century will affect about 20–50 per cent of the low-lying delta if no adaptation measures are taken. An even greater spatial area is at risk from tropical storms and typhoons, which are expected to increase in frequency. The Adaptation in the Mekong Delta (AMD) project seeks to build the adaptive capacity of communities, institutions and smallholder farmers to help them to cope with the impacts of climate change and expand into sustainable, profit-making enterprises.

Adaptation technology/technique

The AMD project will comprise two interrelated components: (i) enhancing community and institutional adaptive capacity; and (ii) investing in climate change adaptation.

Component 1: Enhancing community and institutional adaptive capacity

The AMD project will finance up to 30 automated salinity monitoring sensors to compute salinity concentrations at given points along the river system for provision of salinity forecasts, enabling farmers to understand how salinity in soils and groundwater evolves over time. Research will be undertaken on saline-tolerant rice varieties and other saline-tolerant crops that have good market value and are suitable for cultivation. The project will also develop a striped catfish variety that is capable of tolerating between 12 and 18 per cent water salinity (currently farmed varieties can withstand only 3–5 per cent salinity) without compromising its growth, fillet quality and disease-resistance traits. These activities will aim to fill gaps in knowledge, expand climate-resilient economic options for smallholder farmers, and provide them with choices that suit their specific contexts and capacities.

Component 2: Investing in climate change adaptation

The project will finance pro-poor adaptation investments that diversify the economic base of poor households. Communities will be supported as they scale up adaptation techniques that have been proven effective via pilot initiatives supported by IFAD and other partner agencies, such as shifting from rice to vegetable crops, coconut or other salt-tolerant crop varieties, and engaging in sustainable shrimp farming and livestock production. The project will also support the design and construction of mostly small-scale, climate-resilient public investments, which will be planned and implemented with consideration to commercial relevance. Investment areas will include rainwater collection and treatment of brackish water, salinity barriers and water management structures, soil works (enabling conversion to other crop systems) and improvement of irrigation canal systems.

Economic and financial analysis

Tables 1 to 4 (pgs. 18-21), summarize the profitability of four types of interventions over a 20-year duration. The anticipated benefits from the implementation of project activities are expressed in terms of incremental net incomes.

(i) Changes in production systems

Switching from rice to other production systems is inevitable in some parts of the Mekong delta. Table 1 reveals that intercropping coconut with sugarcane seems to be the most profitable alternative to rice production, with an incremental net income of US$3,916 per household and an outstanding rise in returns to family labour. Intercropping sugarcane with cacao is equally advisable and has the additional advantage of allowing farmers to diversify risks from the very high exposure to price fluctuations of these two commodities in the international market.

Table 1 also shows that extensive shrimp cultivation combined with paddy production is the most suitable adaptation measure (in areas closer to the coast where salinity levels are higher than 4 g/l during most of the dry season). The model shows an incremental net income of US$8,376. The project will support the change to shrimp cultivation for 4,350 households.

(ii) Changes in rice production technology

Using saline and heat-tolerant rice varieties reduces crop failures and maintains rice productivity. The system of sustainable rice intensification (SRI) increases yields and makes rice production more sustainable by reducing irrigation and farm inputs (fertilizers and pesticides). Table 1 illustrates that the incremental net incomes are positive for both SRI (US$12,439) and the improved saline and high-temperature tolerant variety of rice (US$8,337). This intervention will reach 4,000 households.

(iii) Improved management practices in other systems

Shrimp farming has proven to be very profitable in the Mekong Delta, but it has been prone to disease outbreaks. The benefits of this model arise from the use of certified post-larvae and better management practices that reduce shrimp mortality. As shown in Table 2, the net income for smallholder farmers is US$2,214. An estimated 800 households will receive assistance in changing from monoculture paddy rice to rice alternating with shrimp production.

The project will also support investments in more water-efficient irrigation techniques for peanuts and watermelon crops. Table 2 depicts a real example of an improved irrigation system tested by engineers from the Department of Agriculture and Rural Development, which reduces water consumption and electricity costs, and enables a more efficient use of fertilizers and pesticides.

Table 3 presents four small producer models for alternative crops to rice, showing the prospective benefits and rate of return for two 0.3 hectare and two 0.5 hectare systems. This scale reflects the reality in the Mekong Delta area, where the average size of smallholder farms is generally smaller than one hectare. An estimated 2,650 households will receive support changing from paddy rice to coconut intercropped with sugarcane, cacao and shrimp.

(iv) Farm and off-farm enterprise models

Farm-level commercial investments will include small hatcheries for shrimp post-larvae production and nurseries for crab and clam seed production, which will reduce dependency on external seed supplies, decrease mortality rates and bypass transport costs. Table 4 shows that incremental net income from these activities ranges from US$2,121 to US$15,092, making these types of investments financially attractive.

Off-farm enterprises, such as small coconut processing plants, are a major generator of rural employment. The establishment of cacao post-harvest facilities for farmers' interest groups (10 farmers with 0.1 hectare each) will enable farmers to sell dry cocoa at a much higher price than wet cocoa, reduce post-harvest losses and increase the bargaining power of farmers through collective marketing. Table 4 reveals that each farmer who joins the collective will receive an incremental annual net income of US$145. This intervention will reach 4,000 farmers.

Table 1
Changes in production systems and rice production technology
(United States dollars)

Rice production	Gross revenue		Total cost	
	WoP	WP	WoP	WP
Changes in production systems (1 hectare)				
2 crops of rice to coconut intercropped with sugarcane	32 312	27 747	14 638	6 157
2 crops of rice to coconut and cacao	32 312	29 114	14 638	5 873
2 crops of rice to summer rice and improved extensive shrimp systems	32 312	46 471	14 638	20 422
Changes in technology and improved management practices (1 hectare)				
System of rice intensification	37 525	44 968	14 638	14 855
Improved saline and high-temperature-tolerant variety	32 312	40 880	14 638	14 869

Source: IFAD, 2013b.

Abbreviations: FIRR = financial internal rate of return; WoP = without project; WP = with project.

Table 2
Improved management practices in other production systems
(United States dollars)

Other production systems	Gross revenue		Total cost	
	WoP	WP	WoP	WP
Adoption of improved management practices				
Improved extensive black tiger shrimp farming in brackish area (certified post-larvae and better management practices)	5 714	8 000	1 868	1 940
Peanuts and watermelon: improved irrigation system (1 hectare)	1 238	1 238	769	637

Source: IFAD, 2013b.

Abbreviations: FIRR = financial internal rate of return; WoP = without project; WP = with project.

	Net income		Incremental net income	FIRR (%)	Returns to family labour		Cost/ benefit ratio
	WoP	WP			WoP (year 20)	WP (full development)	WP
	17 674	21 590	3 916	54	4	112	5.34
	17 674	23 241	5 566	19	4	30	6.68
	17 674	26 050	8 376	49	4	9	3.57
	17 674	30 113	12 439	N/A	4	11	3.15
	17 674	26 011	8 337	N/A	4	7	2.75

	Net income		Incremental net income	FIRR (%)	Returns to family labour		Cost/ benefit ratio
	WoP	WP			WoP	WP (full development)	WP
	3 846	6 060	2 214	N/A	268 233	282 129	4.12
	469	602	133	15	241 990	890 518	1.94

Table 3
Small producer models for other crops
(United States dollars)

Small producer models	Estimated investment cost			
	PFI loan	ASAP grant	Beneficiary contribution	**Total**
2 crops of rice to coconut intercropped with sugarcane *	87 000	217 000	130 000	435 000
2 crops of rice to coconut and cacao *	56 000	141 000	85 000	282 000
2 crops of rice to summer rice and improved extensive shrimp systems *	190 000	476 000	286 000	952 000
Peanuts and watermelon: improved irrigation systems	95 000	238 000	143 000	476 000

Source: IFAD, 2013b.

Abbreviations: FIRR = financial internal rate of return; NPV = net present value; PFI = participating financial institution.

* Without project (year 20).

Table 4
Farm and off-farm enterprise models
(United States dollars)

Farm and off-farm enterprise models	Estimated investment cost			
	PFI loan	ASAP grant	Beneficiary contribution	**Total**
Establishment of coconut processing plant	5 420	13 551	8 131	27 102
Establishment of cacao post-harvest facilities for CIG (10 farmers with 0.1 hectare each)	177	443	266	886
Establishment of clam nursery	2 857	7 143	7 143	17 143
Establishment of crab nursery	1 981	4 952	2 971	9 905
Establishment of shrimp hatchery	2 724	6 810	4 086	13 619

Source: IFAD, 2013b.

Abbreviations: CIG = community interest group; FIRR = financial internal rate of return; NPV = net present value; PFI = participating financial institution.

Annual net benefit			**Incremental annual net benefit per US$1 of investment**	Returns to family labour per day	FIRR (%)	NPV
Present	Without project	With project: full development				
793	413	669	1.54	112	53	1 179
795	413	941	3.34	30	35	2 431
1 324	691	1 773	1.86	9	49	4 188
-	235	301	0.63	42	15	210

Annual net benefit			Incremental annual net benefit per US$1 of investment	FIRR (%)	NPV
Without project	With project: full development	**Incremental net income**			
0	6 772	6 772	0.25	33	40 158
1 217	1 362	145	1.54	18	552
27 775	42 868	15 092	2.50	62	100 746
0	2 121	2 121	0.21	39	28 112
0	6 669	6 669	0.49	56	45 085

Bangladesh
Climate Adaptation and Livelihood Protection (CALIP) Project

KEY FACTS

Project title: Climate Adaptation and Livelihood Protection (CALIP) Project

Beneficiaries: 240,564 individuals

Duration: 2014-2019

Project area: Haor Basin, north-eastern Bangladesh

Financing:

Adaptation for Smallholder Agriculture Programme (ASAP) grant: US$15,000,000

Background

Bangladesh is one of the most densely populated and impoverished countries in the world. About 80 per cent of the population lives in rural areas where agriculture and related non-farm activities are the main sources of employment. More than two thirds of the rural population are smallholder farmers or landless labourers. Poverty is a chronic problem, mainly due to limited land and other natural resources, and a high population density.

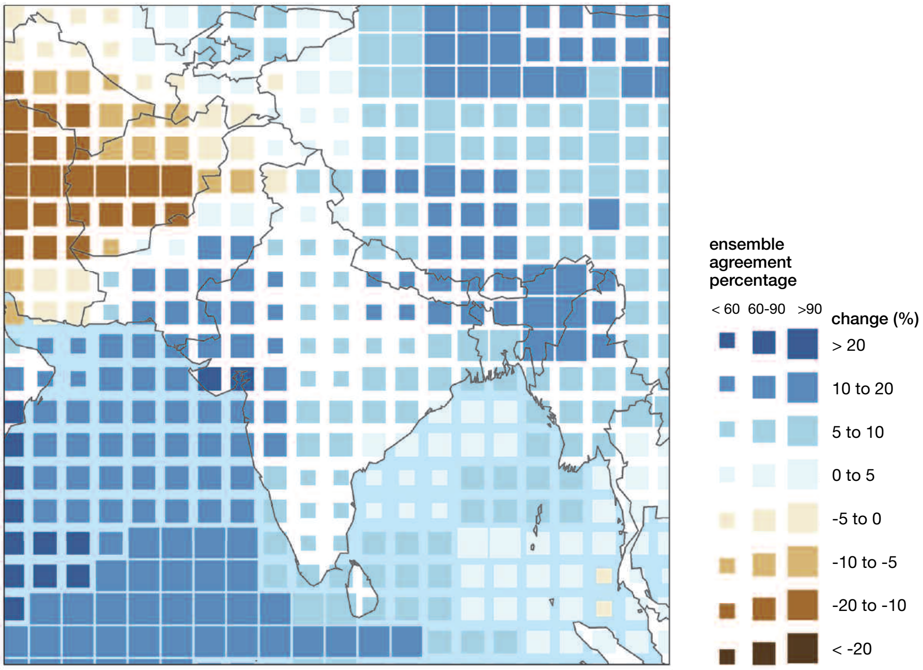
The Climate Adaptation and Livelihood Protection (CALIP) Project, an IFAD initiative, will target poverty alleviation in the Haor Basin, a coastal region with low agricultural productivity that is vulnerable to flash floods and intense waves. The CALIP project will build resilience to climate hazards by strengthening natural, physical, social, human and financial capital at the household level.

Physical conditions in the Haor are the root causes of poverty. The area forms a tectonic depression that constitutes the main drainage outlet for the Meghalaya mountain range in India. During the monsoon period, the Haor receives 3,000-4,000 millimetres of rainfall. Rain, together with monsoon river flow from Meghalaya, completely inundates the Haor with 4-8 metres of water for around half the year. Densely inhabited villages are built on artificially constructed mounds of earth. During the monsoon season, villages turn into islands and boats become the primary mode of transport.

Climate change introduces increased variability into this already perilous situation. According to climate models by the Hadley Centre of the United Kingdom's Met Office, precipitation is forecast to rise by up to 20 per cent in the north-east of the country (see figure on p. 23). The models show a declining trend in post-monsoon rainfall, with an accompanying shift towards greater rainfall in the pre-monsoon season. Flash floods, which are already common in the Haor, are expected to begin overlapping with the pre-harvest period, perhaps considerably worsening the challenge of food production.

The CALIP project will target 28 subdistricts (*upazilas*) that are located within five Haor districts: Brahmanbaria, Habiganj, Kishoreganj, Netrakona and Sunamganj. The *upazilas* were selected on the basis of their exposure to climate risks and the prevalence of rural poverty.

Percentage change in average annual precipitation by 2100 from 1960-1990 baseline climate



Source: Met Office Hadley Centre, 2011c.

Note: Averaged over 21 CMIP3 models. The size of each pixel represents the level of agreement between models on the sign of the change.

Adaptation technology/technique

Building on previous IFAD experiences in the Haor, the project will implement several activities under two components: (i) community infrastructure; and (ii) livelihood protection.

Component 1: Community infrastructure

Village protection against wave action: The CALIP project will focus on developing low-cost, robust village protection walls that can withstand high-intensity wave action. The project will demonstrate the effectiveness of low-cost defences that can be constructed using locally available materials. This is imperative as more than 2,500 villages in the project area are exposed to wave action.

Common village infrastructure: Haor villages are highly congested with little common infrastructure such as walkways, deep tube wells for drinking water and communal toilet facilities. The CALIP project will provide common infrastructure in villages where protective measures are being undertaken and where inhabitants dedicate space for establishing them.

Soil sequestration and slope stabilization: The project will pilot test the use of vegetation (*vetiver* grass and *koroch* trees) to protect 20 earthen platforms, which are instrumental for temporary paddy storage above flood waters.

Slope protection to maintain roads: Unprotected slopes are a major source of erosion that can result in landslides, damage to property and loss of life. The CALIP project will introduce the use of *vetiver* grass as a means of protecting roads that traverse hillsides. This deep-rooted grass variety has been found to be a very effective slope protection option, as tested by the Bangladesh University of Engineering and Technology. Expected outcomes include enhanced village mobility, with associated benefits to public health and access to markets.

Component 2: Livelihood protection

The project will follow a value chain approach to design interventions for each product, identifying opportunities and constraints that will help to leverage returns. Crucial aspects of the approach will be training in the use of new technologies, selection of the right inputs and assistance to facilitate market access.

The project considers women's empowerment as a decisive factor to achieve long-term poverty reduction. Accordingly, efforts will be made to include women in decision-making processes, and vocational training courses will have at least 30 per cent women participants.

Climate-resilient value chains: Based on a value chain analysis, the following products show good market value with opportunities for expansion: (a) village forestry, with an emphasis on bamboo, *murta* (a type of reed), *hijal* (a type of tree), *koroch* trees, *vetiver* grass and medicinal plants; (b) pond fisheries; and (c) wood, cane and clay handicrafts.

Pond fisheries: Pond fisheries will be expanded in all participating subdistricts where action research shows that fishing can be undertaken sustainably and subject to best management practices.

Vocational training: Learning new skills in non-farm areas is practical because it curbs dependency on the natural resource base and can lead to good wages. Vocational training in motorcycle and engine repair, carpentry, shipbuilding, brick making, curing bamboo and establishing seedling nurseries are some of the areas that the project will focus on, as they are profitable trades. This will be part of a diversification strategy to reduce reliance on rice production and fishing as the main livelihood options in the Haor.

Economic and financial analysis

Village protection works will act as cost-saving measures to significantly reduce the labour and financial resources expended on village rehabilitation each year.

The economic valuation of assets that are vulnerable to flash floods in each village is based upon a number of assumptions that enable the calculation of losses avoided as a result of village protection works. Some of the main assumptions are as follows:

- On average, there are 15 houses that are located along the threatened side(s) of a village in the Haor. Each household spends an estimated US$64 per year on bamboo protection materials. Out of the 15 houses along the threatened side(s), it is assumed that two houses per year are damaged as a result of erosion. The present value of damage to households is approximately US$1,288.

Table 1
Financial results of village protection works
(United States dollars)

Cost per village		12 363				
Benefit	1 932	3 670	4 044	4 443	4 881	5 370
Net	-10 431	3 670	4 044	4 443	4 881	5 370
FIRR		**30 per cent**				
NPV = US$48 million						

Source: IFAD, 2013c.
Abbreviations: FIRR = financial internal rate of return; NPV = net present value.
Note: United States dollar amounts are in January 2013 prices, adjusted for inflation.

- Larger infrastructure, such as walkways and wells, is also located along the threatened side(s) of each village. The value of this infrastructure is estimated to be US$6,440; with incurred damages of around 10 per cent each year.

Village protection works will be based on a cost-effective approach that uses simple bamboo protection rather than more costly brick and stone constructions.

- On average, a length of 250 metres is threatened by erosion per village. The cost of a flood protection wall per 100 metres is about US$4,945; the total cost per village would be about US$12,363. Based on an expected life of five years for the village flood protection infrastructure, the financial internal rate of return (FIRR) for this investment would be about 30 per cent.

Village protection works will be built in 224 villages, encircling 11,200 households.

The project will generate financial benefits in terms of increased incomes through diversification in various sectors, such as village forestry, pond fisheries and handicraft production. Value chain development activities will concentrate on improving existing crop production as well as introducing high yield varieties. Production and productivity will be increased by providing inputs (seeds, fertilizer, training and technical assistance) for new crops and horticulture to farmers, and through training and technical assistance for existing farmers. It is expected that 121,800 peasants and agricultural labourers, working an average land size of 0.25 hectares, will benefit from value chain development.

Table 2 shows estimated income for selected crops based on two scenarios: (i) without project; and (ii) with project (full development at year four). Combining higher crop output with enhanced market access builds on tried-and-tested approaches to rural development and offers a reliable way to raise household incomes.

Table 2
Crop financial budgets summary
(United States dollars per year)

Item	Boro (local)	Boro (HYV)	*T. Aman* (local)	*T. Aman* (HYV)	Sweet gourd (HYV)	Chili (dried)
Gross output						
WOP	3 688	2 762	951	49.5	4 809	1 082
WP	4 081	3 517	1 141	70.6	6 011	1 397
Incremental	393	755	190	21.1	1 202	315
Input						
WOP	314	364	120	4.7	163.3	163.3
WP	320	755	368	10.7	291.6	291.6
Incremental	6	391	248	5.9	128.3	128.3
Gross margin						
WOP	3 373	2 397	10.7	3 473	4 645	918.4
WP	3 760	2 762	10	4 652	5 719	1 106
Incremental	387	365	-7	1 178	1 074	187.6
Gross margin						
WOP	48	34	0.15	49.6	66.4	13.1
WP	54	39	0.14	66.5	81.7	15.8
Incremental	6	5	-0.01	16.9	15.3	2.7
Returns to labour						
WOP	65.8	47	0.5	83.6	25.8	11.5
WP	73.3	53	0.6	57	22	7.9
With project						
Cost/benefit ratio	12.7	4.7	9.8	6.6	2.4	4.8

Source: IFAD, 2013c.

Abbreviations: HYV = high yield variety; WOP = without project; WP = with project at full production.

Note: For village agroforestry, only the bamboo scenario was used as representative because the other scenarios that involved *murta*, *koroch*, *vetiver* grass and medicinal plants provided the same results. Boro and *T. Aman* are types of rice (T = transplanted) and *Black gram* is a legume.

	Okra (dried/HYV)	*Black gram* (HYV)	Wheat	Mustard	Bamboo	Total
	865	838.6	871.3	961.6	0	**20 669.9**
	1 298	1 055	1 412	1 598.7	386.3	**27 379.4**
	433	216.4	540.7	637.1	386.3	**6 709.6**
						0
	579.8	42.6	320.8	163.6	0	**2 601.1**
	936.4	164.1	488.5	415.7	12.9	**4 873.7**
	356.6	121.5	167.7	252.1	12.9	**2 272.6**
						0
	285.6	796	550.5	798	0.0	**18 068.8**
	361.7	890.6	923.6	1 183.1	373.5	**22 505.7**
	76.1	94.6	373.1	385.1	373.5	**4 436.9**
						0
	4.1	11.4	7.9	11.4	0.0	**258.1**
	5.2	12.7	13.2	16.9	5.3	**321.5**
	1.1	1.3	5.3	5.5	5.3	**63.4**
						0
	1.9	53.1	35.6	534.3	0.0	**371.9**
	2.3	35.6	6.9	896.5	6.4	**325.8**
	1.4	6.4	2.9	3.8	20.7	**76**

Bolivia

Economic Inclusion Programme for Families and Rural Communities in the Highlands, Lowlands and Inter-Andean Valleys (ACCESOS)

KEY FACTS

Project title: Economic Inclusion Programme for Families and Rural Communities in the Highlands, Lowlands and Inter-Andean Valleys (ACCESOS)

Beneficiaries: 122,000 individuals (28,000 households)

Duration: 2014-2017

Programme area: Potosi, Chuquisaca and Tarija Departments (15 municipalities)

Financing:

IFAD loan: US$45,000,000

Adaptation for Smallholder Agriculture Programme (ASAP) grant: US$10,000,000

Background

In the Altiplano and valleys of south-western Bolivia, rural communities are vulnerable to food insecurity due to changing climate patterns, which bring arid conditions and more extreme weather events, such as heavy rains, hail, drought and strong winds.

Smallholder farmers are limited in their ability to cope with these stresses for various reasons: (i) low level of investment in production systems; (ii) inequalities in land tenure; (iii) high dependence on rainfall for crop production; (iv) persistent degradation of agroecosystems; and (v) water pollution from mining and industry.

Based on a report that documents the implementation, analysis and validation of a regional climate model for Bolivia for climate change prediction purposes, temperature is likely to increase by 1.3° C to 1.6° C by 2030 and by 4.8° C to 6° C by 2100 (Seiler, 2009). Increasing temperature extends dry periods and reduces precipitation throughout the year, concentrating rainfall in fewer days. These changes will have major impacts on small-scale agriculture, which is the basis of the rural economy.

The Economic Inclusion Programme for Families and Rural Communities in the Highlands, Lowlands and Inter-Andean Valleys (ACCESOS) will strengthen three types of resilience: (i) agroenvironmental resilience (adaptation measures and investments in conservation, restoration and management of agricultural land and ecosystems); (ii) cultural resilience (recovery of local knowledge of agroclimatic prediction); and (iii) social and human resilience (development of risk management plans). These interrelated factors make up a holistic approach that will ensure communities and their territories are better positioned to absorb and recover from climate vulnerability.

Adaptation technology/technique

The programme will include two components that engage directly with users in 15 municipalities:

Component 1: Capacity-building for community-based adaptation

Capacity-building will mainly take place through participatory planning workshops. During these workshops, community members will be able to consider appropriate adaptation investments in collaboration with technicians who will provide supporting geo-referencing and agroclimatic information to create a diagnostic of climate risks.

The programme will also compile an inventory of adaptation knowledge that has been used by indigenous peoples to manage climate variability and maintain livelihoods.

The grant money will finance the documentation of such practices, and promoters will sensitize community members to the potential of more systematic investment.

One of the main outcomes of the workshops will be the generation of "talking maps", planning tools that help communities to define their own development by identifying how their situation was in the past, how it is currently and how they would like it to become in the future. The main goal will be to generate a full assessment of each communities' natural resources and projections of how they want to use them sustainably. The talking maps will try and establish community-based land use schemes, supported by climate information at the broader territorial level, and potential practices to counter specific climatic problems identified by the communities.

Component 2: Climate risk management

Based on the diagnostic and group talking maps, ACCESOS will facilitate the preparation of project plans through competitions in the 15 municipalities where investment will be concentrated. The prize amount to finance these plans will be up to a maximum of US$35,000 per community and each may decide freely on the use and distribution of resources. The competitions will be organized around the following themes, such as: (i) diversification and promotion of agrobiodiversity and local crop varieties and livestock breeds; (ii) conservation, restoration and management of soil and vegetation; (iii) conservation, regulation and supply of water resources; (iv) design and installation of infrastructure to adapt to climate change; and (v) participation of women and young people.

The competition modality will encourage communities to develop adaptation initiatives that have viable business potential. The techniques employed by each community may differ as they address a specific climate risk; however, all interventions will primarily aim to build self-sufficiency in agricultural or livestock production.

It is expected that communities will implement a mixture of options as part of either a diversification or sustainable intensification model. The choice to undertake new economic activities or invest heavily in modifying production to increase resilience will be largely based on local knowledge of uncertainty, as well as climate forecasts. Direct transfers will be allocated based on an ex ante assessment of the project conducted by municipal and community authorities.

Technical assistance will also be extended to municipalities, where ACCESOS will hire staff to guide the integration of climate risk management into normal municipal planning processes.

Economic and financial analysis

The economic benefits of the programme will be borne out by improved arable land, watersheds, rural roads, afforestation, water harvesting, aggregate production and employment, value addition and construction of small irrigation systems.

The indicators that are used to establish financial benefits to family farming systems are: net family income and employment, financial internal rate of return (FIRR) and net present value (NPV).

Tables 1 and 2 show the estimated net benefits — with and without business plans — of seven family farming models that ACCESOS will support.

Table 1
Financial analysis of seven family farming systems (with business plan)
(United States dollars per year)

Models with business plan	Gross income			Net benefit		
	WoP	WP	Incremental benefit	WoP	WP	Incremental benefit
1	4 455	6 016	1 561	409	1 063	654
2	3 900	4 550	649	1 570	1 913	344
3	3 016	3 414	398	957	1 457	501
4	6 323	8 238	1 914	1 432	2 953	1 520
5	2 308	4 229	1 921	625	1 989	1 364
6	1 888	4 963	3 075	514	1 107	593
7	5 191	6 550	1 359	2 467	3 036	569

Source: IFAD, 2013d.
Abbreviations: FIRR = financial internal rate of return; WoP = without project; WP = with project.
Notes: Financial indicators calculated for a period of 10 years and a discount rate of 12 per cent.

Table 2
Financial analysis of seven family farming systems (without business plan)
(United States dollars per year)

Models without business plan	Gross income			Net benefit		
	WoP	WP	Incremental benefit	WoP	WP	Incremental benefit
1	2 808	3 357	550	105	611	506
2	2 466	2 933	467	465	822	358
3	2 134	2 304	170	682	991	309
4	2 206	2 633	427	569	871	302
5	2 435	2 795	420	635	865	291
6	1 865	2 145	280	631	949	318
7	1 466	1 831	365	519	859	341

Source: IFAD, 2013d.
Abbreviations: FIRR = financial internal rate of return; NPV = net present value; WoP = without project; WP = with project.
Notes: Financial indicators calculated for a period of 10 years and a discount rate of 12 per cent.

Family revenue			FIRR (%)	NPV	Cost/ benefit ratio
WoP	WP	Incremental benefit			
1 907	2 962	1 055	45	1 920	2.51
2 958	3 464	506	20	408	1.32
2 020	2 593	572	33	1 178	1.93
4 107	5 764	1 657	66	4 776	4.77
1 444	3 077	1 633	44	3 324	3.63
1 447	3 132	1 685	40	1 630	2.29
5 082	6 301	1 219	38	1 508	2.19

Family revenue			FIRR (%)	NPV	Cost/ benefit ratio
WoP	WP	Incremental benefit			
1 344	1 825	481	97	2 007	5.33
1 471	1 810	339	68	1 284	3.78
1 298	1 650	352	59	1 046	3.26
1 392	1 722	330	57	1 009	3.17
1 419	1 608	310	55	955	3.06
1 401	1 719	318	60	1 088	3.35
1 663	2 079	416	65	1 199	3.59

- **Model 1:** Traditional banana production, with increased pineapple production and a business plan for crafts and tourism.
- **Model 2:** Increased pineapple production, with supplementary rice production and a business plan for dairy production.
- **Model 3:** Potatoes and cereals production through improved traditional irrigation systems, organic onions and peanuts business plan.
- **Model 4:** Potato production with supplementary traditional corn and onions, and a business plan for perennial fruits and peanuts through improved irrigation system.
- **Model 5:** Potato production with supplementary corn and traditional onions, and a business plan for crafts and perennial fruits.
- **Model 6:** Potato production with supplementary traditional carrots, and a business plan for trout.
- **Model 7:** Potato production with supplementary traditional beans, and dairy business plan.

The most important socioeconomic indicator is incremental family revenue, which increases markedly in all models and reaches values of up to US$1,685 per year under model 6. It is expected that 53 per cent of families will invest in natural resource management with business plans, while 47 per cent will only access natural resource management (see Table 2). In the cases where communities modify their production but do not adopt a supplementary business plan, the incremental financial benefits are still positive, but less pronounced.

The modelling takes into account the distribution of crops, acreage per household and the land tenure system that exists in the project's target area. The proposed adaptation investments are, therefore, sensible given local circumstances.

Conclusion

Climate change poses a serious threat to the livelihoods of millions of smallholder farmers and agricultural workers in developing countries. Because they depend on ecosystems for their production, they are often the first to experience the impacts of variable and extreme weather. Smallholder farmers also tend to live on flood and drought-prone land, with limited ability to reduce their exposure to climate-related disasters. These factors place them in the highest risk category for climate change impacts.

Given that smallholders play a crucial role in the world's food supply, and that healthy and productive food systems are essential to a sustainable future, targeted investment is needed to help small-scale farmers institute the adaptive practices that will help them grow more food more sustainably, while avoiding crop losses and damage. Through the Adaptation for Smallholder Agriculture Programme (ASAP), IFAD aims to increase the adaptive capacity of smallholder farmers and their infrastructure to better withstand the effects of sea level rise, floods, extreme heat and droughts. This study also shows that ASAP is advancing an effort to quantify the economic and financial benefits that arise from investments in small-scale agriculture.

Economic benefits are often realized at the community level in terms of agricultural diversification (Turkey), protecting productive lands and facilities (Bangladesh) or climate risk management (Bolivia). Financial benefits are targeted at the farm or family level, with increases in production and income (Kenya, Viet Nam).

It is important to remember that investment in the agricultural sector is one of the most powerful ways to affect climate change adaptation. These investments do not just benefit smallholder farmers but contribute to wider development goals such as poverty reduction, functioning environmental services and cutting carbon emissions.

The measurement gaps around climate change do not detract from the imperative to take preventative action now. Decision makers have the appropriate tools to conduct

Measuring impact

This study accepts that there are challenges when reporting on the costs and benefits of adaptation. In particular, there is still uncertainty when it comes to the time scales related to climate change and its projected impacts. This makes it difficult to precisely measure the costs to smallholder farmers; however, this issue is being addressed through the use of composite models that are more complex but offer a more robust analysis.

Similarly, it can be difficult to attribute a monetary value to some adaptation practices. The benefits of preserving ecosystem services such as soil sequestration or clean water are not readily quantifiable. Nevertheless, in smallholder agriculture, where the link between healthy ecosystems and productivity is evident, there are well-founded methodologies available to demonstrate that there are many effective and efficient options for climate adaptation.

sound economic and financial analyses, which are capable of informing cost-effective adaptation investments. The future of ASAP will see a sustained effort to collect and evaluate data from a range of projects, deepening IFAD's understanding of the benefits of climate adaptation.

Adaptation techniques comprise both the traditional and the innovative. They can enable smallholder farmers to reinforce food security at the local level and globally. Innovative mechanisms like ASAP have been created to help channel finance towards smallholder farmers so that the necessary investments can be made. What is needed now is greater recognition among policymakers of the adaptation advantage, and a commitment of resources to transform agriculture.

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ASAP Donors and Partners

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

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

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