



ADAPTATION FUND

**Lessons learned from the Adaptation Fund
Experience in Strengthening Long-term Resilience
Through Food Security**

DECEMBER 2022

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List of Acronyms

ACREI	Agricultural Climate Resilience Enhancement Initiative
AF	.....	Adaptation Fund
APFS	.....	Agro-pastoralist Field School
CDA	.....	Community development association
CDM	.....	Clean Development Mechanism
CER	.....	Certified emissions reduction
CSA	.....	Climate-smart agriculture
CSV	.....	Climate-smart village
DRR	.....	Disaster risk reduction
EbA	.....	Ecosystem-based Adaptation
ESMP	.....	Environmental and Social Management Plan
ESP	.....	Environmental and Social Policy
FAO	.....	Food and Agriculture Organization of the United Nations
FS	.....	Food security
GHA	.....	Greater Horn of Africa
IDDRSI	.....	Intergovernmental Authority on Development Drought Disaster and Resilience Sustainability Initiative
ILK	.....	Indigenous local knowledge
IPCC	.....	Intergovernmental Panel on Climate Change
PMM	.....	Project Monitoring Mission
MIE	.....	Multilateral Implementing Entity
MPA	.....	Marine Protected Area
MUS	.....	Multiple-Use Water Service
NbS	.....	Nature-based Solution
NGO	.....	Non-governmental organization
NIE	.....	National Implementing Entity
PROFONANPE	.....	Fondo de Promoción de las Areas Naturales Protegidas del Perú
RIMA	.....	Resilience Index Measurement and Analysis
SLM	.....	Sustainable land management
SME	.....	Small and medium-sized enterprise
UNFCCC	.....	United Nations Framework Convention on Climate Change
UNDP	.....	United Nations Development Programme
UNEP	.....	United Nations Environment Programme
WUA	.....	Water User Association
WB	.....	World Bank
WFP	United Nations World Food Programme
WMO	World Meteorological Organization

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Executive Summary

Natural disasters and climate change shocks disproportionately affect the world's poorest and most vulnerable and are a leading cause of food insecurity. **In recent years, practitioners, policy-makers, and researchers have focused increasingly on climate change adaptation approaches to food security.**

Emerging perspectives suggest that a multipronged approach focused on climate change adaptation, disaster risk reduction, and diverse toolkits ranging from social protection policies to international financial and institutional instruments is required to strengthen resilience at both the local, household, and macro food systems levels.

The study examines a range of interventions to strengthen resilience to climate change through food security. Its overarching objective is to accelerate learning about approaches that lead to successful interventions related to food security in the context of climate change adaptation. The study is produced within the Learning and Sharing pillar of the Medium-Term Strategy for 2018-2022 of the Adaptation Fund (the Fund). The strategy focuses on enhancing the Fund's processes and activities, as well as those of others.

Findings of the study will be of interest to Fund's stakeholders, current and prospective multilateral and regional imple-

menting entities, executing entities, non-governmental organizations, and practitioners interested in approaches to food security addressing the challenges posed by climate vulnerability and impacts.

The study was undertaken in three phases. The first phase involved a desk study of policy and project-related documents, including monitoring and evaluation reports, annual performance reports, and mid-term evaluations. A second phase focused on garnering more specific information through interviews on the strategies deployed and lessons learned. Finally, a third phase reviewed, consolidated, and validated data and findings.

Since becoming operational 15 years ago, the Fund has remained one of the few international actors tackling food security in a context of climate change, approving around USD 118.2 million in grant funding for 15 food security-related projects and programmes spanning 22 countries.

This study draws on seven case studies from the Fund's portfolio. These cases offer a range of resilience-building interventions and methodologies to ensure food security in the context of climate change. There are common elements and strategic priorities among such interven-

tions, including a focus on stakeholder engagement and social and financial inclusion, and strengthening risk management. An analysis of their chosen adaptation practices and technologies and lessons learned reveals commonalities in the enabling conditions that need to be created through capacity building, institutional strengthening, and markets for building long-term resilience through food security.

First, the study shows that **co-design and co-management approaches are critical in ensuring local ownership and long-term food and climate resilience.** Participation of communities in the design of interventions and management of their natural resources, notably through local adaptation plans, is key in addressing food security in a context of climate change. Empowering farmers and fishers through participatory engagement to make informed decisions can better ensure interventions are appropriate to local conditions. This also helps develop capacities of local and regional governments to integrate food security interventions into local adaptation practices and strategies.

Second, **integrated natural resource management approaches represent a critical adaptation strategy to strengthen food security.** Adaptive measures in crop, livestock, agroforestry practices, and water management combined with early warning systems can foster the resilience of food systems and

contribute to food security. Interventions rooted in traditional and local knowledge, such as crop rotations, intercropping, and agroforestry improve soil fertility, reduce erosion, and improve crop yields and food production. In this context, securing farmers' rights to land empowers and incentivizes them to invest in equipment and training, qualify for loans, or join farmers' associations. Land administration policies to ensure land rights and govern land use can therefore play an important role in food security.

Third, **early warning systems are a key adaptive measure to counter the unpredictability of climate shocks on food systems.** Climate and weather services and early warning systems enable early awareness and actions. They constitute an important risk management tool to counter the unpredictability of climate shocks and impact on food production. **Tailoring such information to local languages and dissemination through various locally adapted media enables wider access of such critical information.** By being informed of climate and weather events, farmers can make changes in sowing dates, alternate crops, employ adaptive management for fisheries, or use heat-resistant or heat-tolerant seeds to adapt their production system to mitigate the impacts of such events.

Fourth, **financial and institutional instruments and mechanisms to catalyse investment are essential to**

strengthen food security. Indeed, climate adaptation strategies can be expensive and represent a considerable investment for smallholder farmers, fishers, and food-insecure communities. As such, governments and private sector must adopt models that build synergies among public and private institutions through multi-stakeholder coordination. Such models must also enable vulnerable communities to access financial services such as crop/livestock insurance to allow them to withstand shocks. Vocational training and capacity building for communities can help create market linkages. Governments can provide insurance schemes and contract guarantees to support loans and ensure that communities are fully covered for loan payback periods. Revolving lending schemes can provide the funds to encourage use of climate-resilient seeds or participation in other income-generating activities to improve crop yields, encourage alternative livelihoods, or incentivize entrepreneurship.

Fifth, **innovative approaches that involve communities and harness local knowledge, science, and technology can be powerful tools for building long-term food security.** The context-specific nature of food systems requires creative approaches to meet

local challenges and opportunities and ensure long-term food security. Examples include participatory tools to enhance the integration of traditional knowledge and scientific information into the baseline of adaptation measures, innovative pedagogical partnership approaches that foster dialogue and knowledge exchange among stakeholders, and socially inclusive activities to encourage the empowerment of marginalized groups.

In the years to come, given the multiple and far-reaching effects of climate change and the complex nature of food systems, a holistic approach is needed to maximize synergies, reflect on the food-water-energy nexus, and integrate climate drivers when addressing food security. This study demonstrates that community involvement is fundamental for ensuring the uptake and sustainability of food security-related interventions, and that this is best achieved by building local capacities for communities and governments on climate adaptive strategies. Financial and institutional instruments and mechanisms are critical to enable the uptake of these strategies. Finally, the context-specific nature of food systems requires creative approaches to meet local challenges and opportunities and ensure long-term food security.

1. Introduction

Climate change is a leading cause of rising global hunger affecting the poorest and most vulnerable communities. Rising temperatures, changing precipitation patterns, and more unpredictable and extreme climate events will continue to threaten every dimension of food security – from access and availability to utilization and stability.

The impacts of climate change on food systems are multi-faceted. Temperature increases and changes in precipitation patterns directly affect agricultural production. Droughts can lead to an increase in livestock and pest diseases. Watersheds are negatively affected by increased flooding and landslides and drought-associated decreases in river flow, with implications for both upstream and downstream communities. Further, coastal marine ecosystems are negatively affected by increasing climate variability, and the associated changes in water temperature and resulting losses in biodiversity, impacting fisheries and other ecosystem services (IPCC, 2019).

The populations at greatest risk are those whose livelihoods depend on agriculture and natural resources, who are highly exposed to climate change impacts, and who have limited capacity and access to adaptation options. Discriminatory gender and social behaviours limit people's access to information, such as weather and climate data. Women, faced with systemic barriers and disadvantages, have often limited

access to resources. Similarly, Indigenous Peoples, who depend on the environment and its biodiversity for their food security and nutrition, are uniquely vulnerable (FAO, 2015).

Food systems are also threatened by non-climate stressors such as arable land-use changes and degradation, conflicts, lack of market access and opportunities, and poor farming practices (IPCC, 2019). COVID-19, for example, has demonstrated the multiple reinforcing ways in which specific drivers of vulnerability interact both in compounding risks and shaping who is more or less able to recover. The global pandemic caused widespread disruptions to domestic food and agricultural supply chains and loss of employment and incomes, which impacted people's ability to buy food (World Bank, 2021).

Resilience to these emerging shocks and multitude of threats is a global and regional priority. It requires a multipronged approach focused on adapting to climate change, reducing disaster risk and using diverse toolkits, ranging from social protection policies to international instruments, to strengthen resilience at the level of both households and global food systems.

The Adaptation Fund (the Fund) is a multilateral climate finance fund focused on financing country-driven, localized, concrete climate change adaptation actions in countries vulnerable to climate impacts,

which includes least developed countries and Small Island Developing States. The Fund reaches and engages the most vulnerable groups, and integrates gender considerations to provide equal opportunity to access and benefit from its resources. Its diverse portfolio of innovative projects, covering multiple sectors, its integrative approach, and its strategic commitment to

learning and sharing knowledge uniquely position it to gather and share best practices for replication and scaling up. Since its creation, the Fund has supported a wide range of initiatives tackling food insecurity in a context of a changing climate and accumulated lessons that are compiled in the present study.



Rural women working in tomato sun-drying unit during the harvest season.
Photo by Adaptation Fund

2. Objective

The present study offers an overview of food security-related adaptation actions and interventions supported by the Fund since 2015. Its overarching objective is to accelerate learning about approaches that lead to increased food security through adaptation to climate change. It includes the following sub-objectives:

- provide an overview of measures deployed by the Fund's accredited entities in pursuing efforts related to food security
- document case studies that demonstrate approaches and methodologies that promote food security in practice and outline broader food policy implications for resilience building
- highlight challenges and opportunities encountered by implementing entities and their partners in delivering food security.

The study relies on lessons learned from seven Fund-supported initiatives that offer innovative approaches to building resilience through different aspects of food security. The study stems from the Learning and Sharing pillar of the Fund's Medium-Term Strategy (MTS) for 2018-2022. This pillar focuses on enhancing the quality of adaptation interventions and the Fund's own processes and activities and supports scaling-up of proven innovative adaptation practices and technologies across countries and regions (Adaptation Fund, 2018). Its findings will be of interest to Fund stakeholders, project developers, current and prospective multilateral and regional implementing entities, executing entities, non-governmental organizations, and practitioners interested in food security-related approaches to addressing the challenges posed by climate vulnerability and impacts.



Farag (Luxor) is cultivating hibiscus, a popular short-term cash crop in Luxor, following improved agricultural recommendations to increase productivity and adapt to elevating heat
Photo by Adaptation Fund

3. Methodology

The study was undertaken in three phases. The first phase relied on desk study of policy and project documents and involved the following steps:

- a literature review of academic and policy articles related to climate change impacts on food systems and climate adaptation strategies
- a synthesis of Fund policies and guidelines, including the Strategic Results Framework, Environmental and Social Policy; MTS 2018-2022; and the Fund's 2019, 2020 and 2021 annual performance reports
- an examination of projects with food security aspects and their respective project/programme documents, including project performance reports, mid-term reviews, project completion reports, and project monitoring mission reports.

A second phase focused on gathering more specific information through interviews involved the following steps:

- semi-structured remote interviews with representatives of the Fund's national, regional, and multilateral implementing entities for the relevant projects
- targeted surveys distributed to representatives of relevant implementing entities.

A third phase was dedicated to reviewing, consolidating, and validating data and findings.



Egypt: Upper Egypt Resilience Project
Photo by Adaptation Fund

4. The role of the Adaptation Fund in strengthening long-term resilience through food security

The Fund is a unique climate finance fund, originally established by the Kyoto Protocol of the United Nations Framework Convention on Climate Change to finance concrete adaptation initiatives. At the Katowice Climate Conference in December 2018, the Parties to the Paris Agreement decided the Fund would also serve the Paris Agreement, effective January 2019.

Since it became operational, the Fund has prioritized actions that benefit the most vulnerable, in line with its mandate to finance concrete adaptation projects and programmes. By virtue of its pioneering use of the Direct Access modality of financing, and its robust environmental and social frameworks and gender policy, the Fund fosters country ownership, social inclusion, and strengthens the adaptive capacities and resilience of the most vulnerable communities to climate change shocks. The Fund has had a comprehensive Environmental and Social Policy (ESP) since 2013, which was updated in 2016. The ESP ensures that AF-funded projects and programmes promote positive environmental and social benefits and mitigate or avoid adverse environmental and social risks and impacts (Adaptation Fund Secretariat, 2016). Another critical feature of the Fund is its MTS 2018-2022. Among its strategic pillars is Learning and Sharing knowledge, driving its mission

to identify scalable solutions to be replicated across countries and regions.

In 2009, the Fund Board established a guidance document for implementing entities, outlining its strategic priorities and policies. It mandated them to develop a results framework that ensures interventions deliver economic, social, and environmental benefits to those communities (Adaptation Fund, 2009). The Fund's Strategic Results Framework, updated in 2019, is based on eight outcomes focused on reducing exposure to climate-related hazards and threats; building local adaptive capacity; building ecosystem resilience to climate change impacts; increasing adaptive capacity within relevant development sector services and infrastructure assets; promoting community ownership; diversifying livelihoods; strengthening institutional capacity, policies, and regulatory frameworks; and promoting innovative practices and technologies (Adaptation Fund, 2019a). As of 30 June 2021, the Fund's portfolio spreads across 13 sectors: agriculture; coastal management; disaster risk reduction and early warning systems; disaster risk reduction; ecosystem-based adaptation (EbA); food security; forests; innovation; multi-sector; rural development; trans-boundary water management; urban development; and water management,

across a variety of regions. The largest flow of approved grant funds went to Africa, followed by Latin America and the Caribbean (LAC) and Asia-Pacific (Adaptation Fund, 2021). Food security projects supported by the Fund aim to build long-term resilience of communities by ensuring the availability, access, utilization, and stability of food systems, while preserving, sustaining, and enhancing vulnerable ecosystems.

As per the 2021 annual performance report, the food security sector accounted for the second largest overall allocation of USD 118.2 million, with 15 projects in 22 countries. It represented the largest grant allocation in both the Africa and LAC regions, and the

second largest allocation in Eastern Europe. The projects employ a range of sustainable land management approaches, such as agroforestry, ecological intensification, crop rotations and intercropping, seedbanks for native species to reverse land degradation, and mangrove restoration. Additionally, given the far-reaching impacts of climate change on food systems, and the interdependence of the food-water-energy nexus, several of the Fund's multi-sector projects include a food security component. The interventions employ crosscutting approaches to achieve food security, paying particular attention to the food-water-energy nexus.



Egypt. Upper Egypt Resilience Program.
Photo by Adaptation Fund

5. Experiences from strengthening resilience through food security in the Adaptation Fund portfolio of projects/programmes

This section presents **seven case studies** from the Fund's portfolio that highlight innovative approaches and a range of adaptation activities. They relate to both single country projects and regional programmes for strengthening resilience through food security. While geographically diverse and context-specific, the case studies show similarities across food systems, and that effective interventions can address social, economic, and environmental drivers of food security. An analysis of lessons learned and implementation and knowledge gaps can offer insights and opportunities for scaling best practices to build long-term resilience through food security.



Celebration where farmers see tangible results of the different interventions, discuss and share experiences/Aswan governorate
Photo by Adaptation Fund

5.1 Egypt: Building Resilient Food Security Systems to Benefit the Southern Egypt Region

Project amount: USD 6,904,318

Implementation period: March 2013 – June 2020

Project Background

The southern zone of Egypt region, which is extremely vulnerable to climate shocks, is characterized by chronic poverty and higher temperatures. These are key factors contributing to lower crop production and leading to overexploitation of already stressed natural resources to compensate for low productivity. The region is projected to lose up to at least 30 per cent of its food production by 2050 because of climate change impacts. These include reduced crop and livestock productivity, increasing crop-water demand, reduced water-use efficiency, and increases in pest and disease infestation. The situation is

compounded by institutional weaknesses, including limited financial solutions and inadequate safety nets for farmers.

In 2012, the Fund approved USD 6.9 million for a project to improve the adaptive capacity of the southern zone to anticipated climate-induced food insecurity through two components: 1) adaptation through technology development and transfer; and 2) capacity building for climate knowledge and adaptation scale-up.

Strategies employed

This project adopted a multidimensional approach to food security, which rested on

three main pillars: 1) establishing a climate and food security monitoring system in target areas; 2) introducing water-saving irrigation techniques; and 3) building resilience through enhanced agricultural production.

Prior to the project, climate monitoring stations in the target areas were neither linked nor used to their optimal capacity. Similarly, the data monitored by these stations were not made available to farmers. As a result, the farmers, as well as regional and national authorities, were unable to take informed production-related decisions. The project supported the upgrade of climate monitoring stations' forecasting, analysis, and data-sharing capabilities, as well as the centralization of climate data for increased sharing and informed decision-making. To ensure a local anchorage, the project established NGO-led climate information centres in each target region to provide villages with regular climate forecasting and recommendations.

In addition, to tackle a chronic inefficient use of water and ensure community ownership, the project set up Water Usage Associations (WUAs). Further, it supported concrete construction and renovation work to improve the efficiency of irrigation systems. Irrigation canals were upgraded to reduce the overall irrigation needs and solar-power irrigation systems were introduced to reduce the costs of irrigation.

To complement the above pillars, a third one promoted sustainable land management (SLM) interventions. These included introduction of heat-tolerant crop varieties for staple crops such as wheat, maize, and

sorghum; dissemination of water-saving sugar cane varieties; piloting and dissemination of updated sowing dates; promotion of scientifically guided intercropping systems; and introduction of income-generating activities and organic farming for niche markets. Finally, the project catalysed land consolidation to tackle fragmentation of agricultural plots and thus help increase overall crop production.

Achievements

- 49 locally run, NGO-hosted, climate and food security information centres sharing early warning messages with 400,000 people. This led to a 60 per cent reduction in crop losses under extreme weather events.
- 4,000 metres of lined canals enhanced, and 98 WUAs established, supporting 20,336 farmers with enhanced water resources management over 6,960 acres; six solar-powered irrigation pumps installed and operationalized.
- 20-25 per cent increase in arable land availability thanks to land consolidation efforts; 25-30 per cent decrease in water and fertilizer usage thanks to the introduction of heat-tolerant varieties, changes in sowing dates, and promotion of intercropping.
- 146,000 vulnerable households with diversified and strengthened livelihoods; 36,767 loans issued through revolving lending schemes to support new income-generating activities and women's empowerment.
- 40 per cent increases in annual income across the target areas.

Lessons learned

The project offers several lessons on food security-related interventions in a context of climate change.

First, ensuring an **inclusive participatory approach** from project design through implementation is vital in building community ownership and sustainability of adaptation interventions. Although time-consuming, entrusting local partners to operate the climate and food security information centres and building the capacity of local NGOs to host WUAs proved to be effective in building ownership. It set the basis for sustained, locally led initiatives tackling food security challenges in a context of climate change.

Second, deploying **multidimensional and complementary** interventions (e.g. increasing crops and livestock productivity, reducing post-harvest losses, supporting water-saving technologies and income-generating activities) was particularly effective in improving households' food security. This was highlighted by the 40 per cent increase in annual income across the target areas.

Third, as illustrated by the **inclusion of heat-tolerant crop varieties by the national government in its National**

Wheat Campaign, disseminating these varieties allowed farmers to better cope with heatwaves, desertification, and decreasing availability of water and to mitigate the impacts from climate change on food security. Similarly, updating sowing dates, promoting scientifically guided intercropping and improved irrigation techniques, and disseminating early warnings and technical recommendations contributed to enhance agricultural productivity and, ultimately, improve food security.

Fourth, the project's pro-active inclusion of **women's participation** where their participation was culturally acceptable (primarily revolving loans mechanisms supporting livestock raising and agro-processing activities), enhanced their access to finance and capacity to generate additional income. This, in turn, allowed for purchase of staples and other food commodities.

Fifth, **food security and climate change are two intertwined challenges that need innovative and creative approaches**. The project has successfully mobilized communities through staged live theatre performances that attracted communities' attention. They were a unique opportunity to raise awareness on climate change and activities implemented by the project.



Acrei/Adaptation Fund project
Photo by Adaptation Fund

5.2 Ethiopia, Kenya, Uganda: Agricultural Climate Resilience Enhancement Initiative

Project amount: USD 6,800,000

Implementation period: August 2018 – under implementation

Project background

Under a changing climate, the frequency and severity of natural disasters, notably droughts, are expected to increase in the Greater Horn of Africa. These natural disasters severely impact food production given that most of agricultural production in the region is rain-fed. Persistent and deteriorating food and nutrition insecurity remain a major concern, particularly in arid and semiarid lands that are hotspots for the highest crises and emergency food insecurity levels. Along with conflicts and insecurity, prolonged dry spells and droughts have been the main drivers of food insecurity in

these areas. With an ever-rising population growth in the region, concerted efforts are needed to stabilize and increase agricultural production to ensure food security.

In 2017, the Fund approved the Agricultural Climate Resilience Enhancement Initiative (ACREI) to develop and implement adaptation strategies and measures to strengthen the resilience of vulnerable smallholder farmers, agro-pastoralists, and pastoralists in Ethiopia, Kenya, and Uganda. To achieve this objective, project implementation focused on three components: 1) community adaptation practice; 2) climate proofing of

extension systems; and 3) climate-informed decision-making. The ACREI project was the first regional project supported by the Fund through its pilot programme on regional projects and programmes.

Strategies employed

Overcoming the issue of food security under climate change required an integrated approach. This approach combined the adoption of agricultural practices that increase productivity, support to more reliable climate information for better decision-making, and the improvement of market opportunities to ensure improved food availability and increased incomes. Such innovative efforts linking upstream and downstream climate information and services to address food security in the region is ACREI's raison d'être.

The project supports the expansion of climate-smart agriculture practices that increase agricultural production and ensure food security through diversification of farming systems. Hence, they build resilience within target communities. Such practices include minimum tillage, contour ridging, increased use of organic manure, water harvesting, bush fallowing, agroforestry, rotational grazing, and reseeded of degraded rangelands, among others.

The project follows a highly participatory and integrated approach that strengthens social capital alongside investment capital and infrastructural support. Based on thorough assessment needs, community adaptation plans are developed, and communities fund and implement related adaptation invest-

ment proposals. In parallel, Agro-pastoralist Field Schools (APFSs) bring together farmers to learn how to shift towards more sustainable production practices under climate change. Farmers meet regularly during a production cycle, set up experimentation and engage in hands-on learning to improve skills and knowledge that help adapt production practices to their specific context.

Such interventions are coupled with efforts to support the appropriate production and use of accurate climate early warning information to guide production activities and tackle food insecurity. This involves timely provision of quality downscaled, well-interpreted, location-specific climate forecasts and related information and proper dissemination and use by target farmers.

Achievements

- 30 Community Adaptation Plans developed that include grant investments in climate-smart agriculture
- 62 APFS groups applying adaptation practices that support food security
- 29 APFS groups provided with rain gauges and receiving support on integration of climate information and climate adaptation into their activities
- 18 media-based partnerships (e.g. radio stations) developed to disseminate climate information
- all five target districts provided with localized seasonal climate advisories, and two government institutions and one NGO/CBO per country provided with seasonal downscaled forecasts from meteorological agencies
- 14 agro-climatic advisories disseminated

- three automatic weather stations delivered to target countries.

Lessons learned

The project offers several lessons on food security-related interventions in a context of climate change.

First, **relying on subnational agricultural extension services and meteorological teams** has tremendously helped with downscaling and disseminating climate information and agroclimatic advisories at local level, ensuring that such information is received and used by the most vulnerable communities facing food security chal-

lenges. ACREI demonstrated that **decentralized staff and offices have an advantage in terms of reaching and interacting with farmers on issues of weather and climate.**

Second, engaging local media (e.g. journalists, radio stations, media houses) in raising awareness and sharing information on climate, weather, and food security matters, yields effective results. It is **a cost-effective option** for agricultural extension services to help the most vulnerable in receiving and using information for decision-making in a context of climate change and food insecurity. ACREI established no fewer than 18 partnerships with media.



Woman taking part of maintenance works in the lowland of Mugogo
Photo by Adaptation Fund

5.3 Rwanda: Reducing Vulnerability to Climate Change in North West Rwanda through Community-Based Adaptation

Project amount: USD 9,969,619

Implementation period: June 2014 – 2019

Project background

High population density, land scarcity, and reliance on rain-fed agriculture in Rwanda has forced farmers onto increasingly smaller plots of land on steep, mountainous terrain. This has led to erosion, soil loss and infertility, and land degradation, negatively affecting agricultural productivity and, indirectly, food security. On top of facing among the highest rates of stunting among children under the age of five nationally, the northern and western uplands of Rwanda are considered the most vulnerable to erosion due to their steeper terrain and higher annual rainfall.

Unsustainable farming practices and significant unplanned settlement, combined with recent changes in rainfall variability, have exacerbated the already stressed areas, and led to more landslides and floods.

In 2013, the Fund approved the project “Reducing Vulnerability to Climate Change in North West Rwanda through Community-Based Adaptation”, implemented by the Ministry of Environment (formerly Ministry of Natural Resources of Rwanda, or MINIRENA). The project aims to increase the adaptive capacity of natural systems and

rural communities living in exposed areas of North West Rwanda to the impacts of climate change. Implementation focused on three components: 1) adaptation to climate change (rainfall intensity and duration) through integrated land and water management to support climate-resilient production and post-harvest systems; 2) support for the transition from exploitive farming practices to sustainable alternative off-farm livelihoods; and 3) capacity building of local institutions to improve understanding of climate change impacts and scale up effective adaptation strategies at the local level.

Strategies employed

The strategy of the project is to manage risks and impacts of recurring floods, landslides, and erosion through integrated natural resource management practices and support to alternative livelihoods. One of its unique features is the integration of scientific knowledge with indigenous knowledge to develop local adaptation plans, which encourages community involvement and ownership of project activities. By hiring community members, and prioritizing women from the poorest and most vulnerable households, the project raises communities' and farmers' awareness of climate change threats and the benefits of soil and water conservation for food security.

Erosion and flood control measures such as construction of contour trenches, terraces, and check dams, tree planting on gully banks, groundwater recharge structures, ponds, percolation pits, and sediment traps are used to combat land erosion and

declining productivity issues. In parallel, agricultural practices aiming at improving productivity and sustainability such as crop rotation and diversification are introduced and promoted through farm field schools.

Following a community-driven and participatory process relying on newly formed climate resilience groups, the project resettles communities from high-risk zones affected by landslides and floods to safe areas. Alternative livelihoods support resettled households with generation of alternative income in a bid to tackle food security. Additionally, rural development hubs were created to offer market development services, credit facilities, vocational training, capacity building for self-help groups, and creation of market linkages.

Achievements

- 70 per cent increase in the application of adaptation strategies
- creation of 30 early warning systems
- development of five national-scale disaster risk reduction policies
- protection or rehabilitation of 31,307 hectares of land
- 5,200 households adopted climate-resilient farming practices
- 21,429 individuals gaining new income sources, enabling them to open savings accounts among which 3,407 were hired to implement adaptive measures, with women representing more than 60 per cent of the workforce
- project activities replicated in other districts through the farmers-to-farmers knowledge-sharing "Come and See, Go and Implement" programme

- informing a Green Climate Fund's proposal approved in 2018, with some activities replicated in other parts of the country (GCF, n.d.).

Lessons learned

The project offers several lessons on food security-related interventions in a context of climate change.

First, **the participatory approach and involvement of community groups in implementation** was instrumental in communities gradually taking **ownership of the initiative**, hence **ensuring the sustainability** of its results. Indeed, the project adopted a "come and see, go and implement" approach to ensure full ownership of its

outcomes, involving beneficiaries in decision-making. Use of cleaning and maintenance assets to restore the lowland, for example, was a solution directly brought up by communities.

Second, **active participation of civil society organizations and NGOs at all stages of the project can help ensure its sustainability and effectiveness in meeting its food security targets**. Although not fully engaged in the early stages of the project, locally rooted NGOs that possess technical expertise and extension services on the ground can play an intermediary role between the cooperatives (most project beneficiaries are grouped in cooperatives and associations) and the government.



Kemitraan/Adaptation Fund project.
Photo by Kapabel

5.4 Indonesia: Community Adaptation for Forest Food Based Management in Saddang Watershed Ecosystem

Project amount: USD 835,465

Implementation period: October 2020 – under implementation

Project background

The trans provincial Saddang River that flows throughout the South Sulawesi and West Sulawesi Provinces of Indonesia is a priority watershed, vital for national food security. The watershed is increasingly vulnerable to climate change-related increases in temperature, flooding, and landslides during the rainy season, and periods of decreased river flow and prolonged drought during the dry season. Uncontrolled upstream forest conversion activities, including illegal logging, are further degrading the critical land area. A socio-ecological survey on the

identification of disaster risk in the Saddang Watershed recorded a 66 per cent decrease in food productivity of rice crop commodities, the national staple crop.

In response to these challenges, the Fund approved the “Community Adaptation for Forest Food Based Management in Saddang Watershed Ecosystem Project” implemented by the Partnership for Governance Reform (Kemitraan). In line with the objectives of the 2014 Climate Change Adaptation National Action Plan in Indonesia, the project aims to increase food security resil-

ience of the Saddang Watershed communities through climate change adaptation activities focused on four components: 1) strengthening social forestry to encourage forest food diversification in the upstream Saddang Watershed, improve the environment, and increase community livelihoods; 2) improving coastal governance and carrying capacity to support climate change adaptation in downstream watershed through mangrove restoration; 3) strengthening institutional capacity through cross-cutting policies to support sustainability of climate change adaptation activities; and 4) building the capacity of project stakeholders on climate change adaptation through knowledge dissemination and management.

Strategies employed

The project uses social forestry and agroforestry approaches relying on local ownership and cultivation of alternative crops through intercropping to improve agricultural productivity and increase forest cover. The development of alternative agroforestry-based crops is designed to provide communities with access to diversified crops for human consumption, as well as with processing equipment to increase the economic values of food crops, based on market demand.

In addition, the project aims to improve the watershed's coastal carrying capacity in the downstream watershed through rehabilitation of mangrove forests through Climate Change Care Groups established in each target village. Furthermore, it seeks to

strengthen the resilience of coastal communities by developing food diversification in the downstream part of the watershed.

The project promotes improved livelihoods across the upstream watershed communities through diversification of forest food. It does this by processing palm sugar into high-value sugar products, harvesting and packing honey, and planting upland rice within forest areas. Similarly, the project is creating alternative sources of income in the downstream section of the watershed. To that end, it is processing seaweed into agar¹ and seaweed chips, processing shredded fish, and turning plastic waste into hand-craft products.

Achievements

- 4,145 ha of forest area using social forestry scheme and 53 per cent of seedlings grown in nurseries developed by the project, contributing to communities' self-sufficiencies and resilience to food security.
- 18 forest farmer groups and 10 forest farmer groups formed, and legal rights secured to proceed with multi-use of forest resources and alternative food crops for income diversification.
- 10 units of forest food processing facilitating procured.
- 1.4 km of replanted land in the coastal region of the downstream watershed and 25,000 mangrove seedlings planted.
- The project facilitated access of social forestry farmers' groups to tap funding capital from "Bang Pesona", a programme initiated by the Ministry of Environment

1. Agar is a gelatinous substance obtained from various kinds of red seaweed and used in biological culture media and as a thickener in foods.

and Forestry to support farmers with agrobusiness capital and encourage social forestry enterprises. A marketing system providing market information and partnerships was established and integrated into the social forestry farmers' groups.

Lessons learned

The project offers several lessons on food security-related interventions in a context of climate change.

First, **coordination across ministries and institutions** is critical for both **accessing data and ensuring accountability**. Indeed, approaching climate change adaptation through the agroforestry lens was a new concept in Indonesia and required coordination among relevant parties with different priorities. **Information and data sharing was pivotal in ensuring a smooth collaboration among institutions**. Ultimately, it led to higher impacts on the ground in fighting food security.

Second, communities in South Sulawesi had low awareness of climate change impacts, making it difficult to liaise with food security

challenges. **Building awareness among target communities was critical in setting up the basis for sustainability of the project outcomes**.

Third, **encouraging the formation of working groups on social forestry at local/district level** is pivotal in addressing both climate change and food security. Through its social forestry working groups at local/district level, the project helped communities cope with local tenure conflicts, food security, and poverty challenges faced by vulnerable communities.

Fourth, **promoting an integrated watershed management approach** is critical to address watershed climate change and food security challenges. Through its integrated approach, the project was able to **assess both upstream and downstream watershed interests**. Indeed, the assessment of vulnerability and climate change risk in the Saddang Watershed document is now a reference document for both provincial and district decision makers. Based on this assessment, the project **formulated joint policies in integrated watershed management accordingly**.



In a fight to adapt to the changing climate, a nursery w/ 10 production & 34 transplant beds has been constructed in #Kalikot district.
Photo by WFP

5.5 Nepal: Adapting to Climate-Induced Threats to Food Production and Food Security in the Karnali Region of Nepal

Project amount: USD 9,527,160

Implementation period: October 2018 – October 2022 (under implementation)

Project background

Karnali Province of the mid-western mountainous region of Nepal is increasingly vulnerable to shocks related to climate change. The area's remoteness makes development interventions challenging. Lack of arable land, roads, and markets restricts food availability, causing widespread food deficits. The situation is exacerbated by more frequent natural disasters, high food prices, and stagnant economic growth. The population is dependent on subsistence agriculture and suffers chronic poverty and food insecurity.

In response, the Fund approved a grant to execute this project to increase the adaptive capacity of climate-vulnerable and food-insecure households. It sought to improve management of natural resources and livelihood assets in Kalikot, Jumla, and Mugu of Karnali Province. The key objectives are to strengthen local capacity to identify climate risks and design adaptive strategies, diversify livelihoods, and strengthen food security for climate-vulnerable communities, and to increase resilience of natural systems that support livelihoods to cope with stresses induced by climate change.

This is achieved through two components: 1) develop local, district, and national capacity to plan, implement, and monitor adaptation and risk reduction actions; and 2) build household and community resilience and increase adaptive capacity of climate-vulnerable poor.

Strategies employed

Building local awareness of climate change and adaptation strategies is grounded in innovative local adaptation plans for action. These plans evaluate vulnerabilities and use participatory methods to tailor context-specific adaptation actions through local and district-level partnerships. The project delivers trainings and improved extension services to build technical and financial monitoring capacity within relevant institutions and promote climate-resilient practices. It is grounded in a participatory climate-smart village (CSV) model that integrates resilience-building measures in a nexus approach for improved food security. Eight CSVs are developed as pilots to define and implement technological and institutional options for dealing with climate change in a food-insecurity context.

A wide range of climate-smart technologies and practices is deployed, including integrated water resource management practices implemented through a community-managed Multiple-Use Water Systems approach ("MUS", e.g. drip irrigation), landslide and soil erosion control measures, forest plantation, and agroforestry. To back these efforts, climate information and weather agro-advisory services provide farmers with climate and weather informa-

tion for better decision-making. This allows them to cope with the impacts of climate change on agricultural production.

The project uses economic models to fight food insecurity and promote economic opportunities. These provide farmers and entrepreneurs with access to financial services (credit/loans) and crop/livestock insurance, including weather index-insurance for apple farming schemes, for which the government provides a 75 per cent subsidy on the insurance premium. The Micro-Enterprise Development (MED) model is adopted by small and medium-sized enterprises (SMEs) in agroforestry to diversify livelihoods and develop resilient income sources. It includes provision of business development services (business plan, skills development, SMEs start-up, registration, marketing advice) and facilitates access to micro-finance services/credit from local cooperatives or banks.

Finally, the project implements activities to ensure that women and disadvantaged groups fully participate in adaptation planning and implementation. It mobilizes mothers'/women's groups in village development committees (VDCs). It also introduces a special segment to the local adaptation/food security plans for women-headed households and minorities as they are considered the most vulnerable. It constructs innovative "service centres" for women in each VDC. These provide clean, solar-heated water for washing and sanitation; clean, solar-powered cooking stoves; and facilities for childcare. The centres, constructed in state-owned or community-owned land,

are managed by women's cooperatives and provide local employment. The centres would also demonstrate multiple-use systems for water to inform and educate rural women on sustainable agricultural practices.

Achievements

- 71,890 beneficiaries and 20,455 people oriented and sensitized on climate change adaptation and food security matters.
- 7 Local Adaptation Plan of Action in rural municipalities developed, which emerged from 55 consultative meetings reflecting views of more than 2,500 local government and community representatives.
- 69.1 per cent of households reported to have stable and climate-resilient income.
- 18 community infrastructure projects related to MUS (consisting of irrigation canals, water supply/taps and water collection ponds) completed, benefiting about 2,200 households and irrigating around 418 ha of agricultural land. This helps poor and vulnerable farmers to gain access to irrigation facilities and allows them to cultivate both seasonal and off-season vegetables even during dry season, hence increasing households' production.
- 324,535 seedlings/saplings of different non-timber forest products, fruits, citrus, fodder, and timber species planted in degraded lands, 6 multipurpose community nurseries established, and 16 community forestry operational plans updated/renewed to date.
- 7,243 poor and severely food-insecure households (35 per cent women) in receipt

of USD 968,919 in direct cash transfer through temporary employment/wage labour.

- 63 enterprises established that adopted the MED model and business registration, benefiting 3,849 individuals.
- eight CSVs implemented in seven rural municipalities that pilot (through participatory methods) technological and institutional options for building climate resilience in agriculture and food systems.
- five service centres targeted to women provide a space for training, washing, and childcare services, enabling women to participate in capacity building and income-generating activities.

Lessons learned

The project offers several lessons on food security-related interventions in a context of climate change.

Policy provisions can have significant impacts when implementing adaptation initiatives tackling food security issues. For example, the provision of at least **40 per cent female participation in project planning and implementation** did increase participation of women in project implementation and in meetings. Similarly, the equal pay between men and women for the same work increased women's sense of equity. This, in turn, led to increased participation of women in social activities. By **creating a safe space tailored to women's needs, service centres encourage women's involvement in project activities, putting them at the core of the fight against food insecurity**, and ensuring sustainability of the interventions.

Involving local government authorities is critical for mainstreaming climate adaptation in local strategies and catalysing action against food insecurity.

Indeed, the project's participatory approach among both local communities and government authorities created a strong sense of ownership by the government and enhanced impacts. This was illustrated by the uptake of project activities in annual workplans of local government, and their allocation of finance (more than USD 400,000) and human resources (staff for operation and maintenance of nurseries)

to interventions related to climate change adaptation.

A more sustainable use of water resources is pivotal in tackling food security under a changing climate.

Indeed, food production in the drought-prone target areas strongly depends on water availability and efficient use. The multi-use water systems are effective to deal with water scarcity in a holistic manner and lead to a sustainable improvement in productivity and income of the vulnerable communities.



Elvia relies on selling the shellfish she collects to feed her family.
Photo: WFP/Claire Nevill

5.6 Columbia-Ecuador: Building adaptive capacity through food and nutrition security and peacebuilding actions in vulnerable Afro and indigenous communities in the Colombia-Ecuador border area

Project amount: USD 14,000,000

Implementation period: May 2018 – under implementation

Project background

The border area between Colombia and Ecuador is one of the most climate-vulnerable and food-insecure regions in Latin America. The Inter-Tropical Convergence Zone and other meteorological and geographic conditions related to solar radiation, wind, and precipitation systems, as well as recurrent climate change effects from La Niña and El Niño, severely impact the region's ecosystems. Rising temperatures and decreased crop yields threaten the food

security of the increasingly marginalized Afro and Awá communities living in the two binational watersheds, which encompass the area's coastal mangroves and inland dry and humid forest systems.

This project responds to these challenges by strengthening food security and nutrition through climate change adaptation measures. It focuses on two watersheds on the Colombia-Ecuador border area in accordance with the priorities of Awá and

Afro communities. Its main objectives are to reduce the climate vulnerabilities of indigenous communities and the ecosystems they depend on, to promote food security and gender equality, and to strengthen the adaptive capacities of these communities.

The project is structured around three components: 1) increasing community awareness and knowledge on climate change risks and food security in two border binational watersheds; 2) increasing binational, institutional, and community capacities to sustainably address recurrent climate risks, particularly those that affect food security and nutrition; and 3) reducing recurrent climate vulnerabilities through innovative community and ecosystem-driven adaptation measures that improve food security.

Strategies employed

This initiative aims to generate local climate change adaptation responses with a focus on both community-based and EbA to promote food security and nutrition.

The project adopts a binational approach to consider the specific context and climate change threats facing the Awá and Afro communities in a culturally and conflict-sensitive manner. It recognizes that communities do not live within current territorial or administrative borders, and that their sense of territory is embedded in their historical lands.

It relies on the integration of climate change adaptation measures into both Afro and indigenous development plans (Life Plans and Local Governance Plans)

and binational watershed management plans. It also fosters community involvement and local ownership of project activities through Seasonal Livelihood Programming workshops and studies to recover native species. To that end, it relies on local executing partners to co-design locally driven plans and execution.

Using the **context-specific Community-based Participatory Planning (CBPP) approach of the World Food Programme (WFP)**, the project places food-insecure communities in the driver's seat of planning, while taking an active role in their resilience building and development (World Food Programme, 2014). Through the CBPP process, communities select a portfolio of feasible concrete adaptation activities, which **combines scientific and traditional and local Afro and Awá knowledge**. They then integrate these activities into community-based adaptation plans. These activities are designed with support from local technical experts, including local universities, scientific research organizations and local government. The local adaptation plans specify the roles and responsibilities for development and maintenance of community assets, including community contributions.

The project carries out numerous climate change awareness activities in the community. Fairs and reintroduction of traditional music promote collective memory and the role of women, and communicate climate threats and concrete response measures. The fairs are also an opportunity to sell harvested native plants and shellfish,

thus increasing communities' income and access to markets. The project diversifies risk and income sources by encouraging traditional farming techniques and farming of traditional crops. These include native plant and crop species used in traditional medicine such as cacao, banana, and the yuyo herb.² These are resilient to climate variability and remain critical for food security.

Achievements

- first-ever initiative in Colombia and Ecuador using traditional knowledge from Afro and Awá communities for environmental conservation and adaptation planning and engaging Awá and Afro organizations as executing entities to strengthen relationships and facilitate implementation of activities within targeted communities
- 32 communities and 79 leaders trained on climate change threats, and 75 communities and 105 leaders trained on food security and nutrition
- context-tailored CBPP manual designed, which includes a conceptual framework on climate change linked to food security and nutrition, methodologies on native species and plants inventory; elaboration of baseline and climate risks and water provision analysis and implementation plans for 120 CBPP
- feasibility assessment for potential products to be marketed, including (a) identification of four products: cacao, tilapia, cassava and ulo; (b) value chain analysis through strength-weakness-opportunity-threat analysis; (c) assessment of the organizational capacity

- index of community smallholder farmers' associations; and (d) working plan for the marketing of each identified product
- climate services through the first binational early warning system tailored to Afro and indigenous community needs and government priorities in Colombia and Ecuador.

Lessons learned

The project offers several lessons on food security-related interventions in a context of climate change.

First, in the context of this project, **engaging locally grounded organizations to implement activities earned the trust** of targeted communities and facilitated access to information and implementation of activities. This approach considerably helps implement activities on the ground, in a complex social, cultural, and economic context. At the same time, it reinforces the technical, organizational, financial, and administrative capacities of these organizations.

Second, **recording all agreements related to project implementation with formal tools (emails or meetings note for the records) in local languages** helps ensure effective monitoring and follow-up of activities.

Third, **participatory tools enhance articulation and collaboration among community organizations and key stakeholders**, and increase communities' trust in government institutions. Participatory

2. Yuyo (weed) is a wild herb of South America, present mainly in the high plains of the Andes.

vulnerability assessments and planning processes facilitated implementation of activities and addressed priorities such as food security, nutrition, and gender equality. Such tools helped enhance communities' ownership of the project, raised awareness on the importance of adaptation to climate change, and enhanced integration of traditional knowledge and scientific information.

Fourth, **communication strategies and partnership are essential to enhance**

project outcomes and avoid conflicts.

Indeed, enhanced coordination efforts and signing of local agreements prevented conflicts of interest between organizations of the Great Awá Family in Colombia with other Awá organizations in Ecuador. In addition, their participation in the project governance bodies and inclusion in participatory studies fostered community empowerment and ownership of the project, thus further reducing any risk of conflicts.



Profonampe/Adaptation Fund project in Peru.
Photo by Adaptation Fund

5.7 Peru: Adaptation to the Impacts of Climate Change on Peru's Coastal Marine Ecosystem and Fisheries

Project amount: USD 6,950,239

Implementation period: May 2018 – under implementation

Project background

Peru is home to the most productive fisheries in the world, yielding nearly 10 per cent of global fish catch. The physical and chemical characteristics of its coastal upwelling bring cold, nutrient-rich water to the surface and provide the ideal setting for spawning, maturation, and trophic transfer for fishes. This, in turn, makes this region highly productive and critical for food security nationally. However, the two main coastal marine ecosystems and their artisanal fishing communities are subject to increased climatic

variability, as well as non-climate stressors, principally fishing pressure.

In 2018, the Adaptation Fund approved funding for the “Adaptation to the Impacts of Climate Change on Peru’s Coastal Marine Ecosystem and Fisheries” project to increase resilience of coastal marine ecosystems and communities to climate change impacts. This will be achieved through the following components: 1) interventions in pilot strategic areas to improve resilience of target coastal communities and key coastal marine ecosystems to climate change and variability-induced stress; 2) deployment of a modern

and efficient environment surveillance and prediction system in the coastal marine ecosystems at regional and local scales supporting fisheries adaptive management under the Ecosystem Approach to Fisheries (EAF) principles; 3) capacity building and knowledge management system for implementing the EbA and the EAF, and for dissemination of the project's lessons learned, targeting government officials, academia, local communities, and other stakeholders; and 4) management policies, regulations, and measures promoting the resiliency of coastal ecosystems and local communities to climate change and variability-induced stress.

Strategies employed

The project uses an EAF, employing a group of activities that help strengthen the adaptive capacity of artisanal fishing communities living along the coast, and reduce the vulnerability of coastal ecosystems. At the same time, they increase income of the communities and their participation in managing and protecting their natural resources.

The project considers three aspects directly related to adaptation capacities: a) implementation of a monitoring system that allows continuous adjustment of management actions; b) a multisectoral approach for governance of the coastal marine domain; and c) a socioeconomic approach towards improvement of the livelihoods of artisanal fishing communities through "win-win" measures that also benefit ecosystem resilience.

Modern and efficient surveillance, prediction, and climate information systems at local and regional scales are deployed to support early warnings for fishing, aquaculture, and ecotourism activities. In addition, the project draws on fisheries adaptive management based on long-term prevision under climate change scenarios. Project stakeholders are trained on the use of an ocean monitoring and surveillance system to monitor and identify local climate change scenarios, harmful algal blooms, sulfidic plumes, and extreme events such as El Niño.

By strengthening institutions and governance at national and local levels, the project provides environmental benefits to fishers by supporting sustainability of fishing practices under climate change. Moreover, it contributes to improve the adaptive capacity of vulnerable coastal communities to food security and ecosystems to climate change by performing specific interventions in the pilot areas. Sustainable fishing methods, restoration of natural banks, development of sustainable aquaculture, creation of ecotourism enterprises, production of bio-fertilizers from fishery, and aquaculture residues are among the range of tools deployed to support these efforts.

Achievements

- artisanal fishers trained to operate three gliders to automatically monitor oceanographic information such as temperature, salinity, oxygen, and chlorophyll, which enables the development of vulnerability scenarios of impacts of climate change on marine ecosystems and their fishery resources

- implementation of climate change adaptation measures by 140 artisanal fishers
- 20 per cent of artisanal fishers with increased revenues; 25 per cent of artisanal fishers' associations linked to artisanal fishing activity that reported increasing profits thanks to sustainable fishery methods
- 25 per cent of women's associations that incorporated sustainable tourism as a complementary economic activity
- an early warning system in Huacho and Mancor for harmful algal blooms, sulfurous plums, and marine heat waves as hazards associated with climate change
- a knowledge management strategy linked to the sectoral promotion of fisheries and aquaculture in the face of climate change, aligned with the Nationally Determined Contributions.

Lessons learned

The project offers several lessons on food security-related interventions in a context of climate change.

First, **community engagement through a co-management approach** allows fishers

to participate in management of monitoring, protection, and territorial exclusivity. This **enables effective sustainable use and conservation of natural banks.**


Second, the project's focus on **economic diversification** through aquaculture and ecotourism **strengthens the resilience of fisher communities.** It also enables declining marine resources to recover from overfishing, contributing to a more sustained food security. Bioconversion of fish landing and aquaculture residues also helps with economic diversification, while mitigating pollution for the coastal marine ecosystem.

Third, the project successfully considers the role of **land-based ecosystem stressors,** or threats to the **long-term sustainability of coastal ecosystems.** This supports the development and implementation of **land-use plans in coastal areas.** This effort also includes **developing management plans for Marine Protected Areas (MPA)** to secure "no-take" zones.

6. Synthesis of findings

The cases presented offer a range of interventions and methodologies for resilience building and food security. These combine integrated natural resource management practices with integration of local knowledge and climate-smart agriculture principles. They share several aspects and strategic pri-

orities, including a focus on participatory stakeholder engagement and social and financial inclusion, and strengthened risk management. An analysis of their approaches reveals commonalities in the enabling conditions that need to be created for building long-term resilience through food security.



Capacity building, including co-management and co-design approaches, ensures local ownership and long-term resilience of food security-related initiatives


The featured cases employed various co-management and co-design approaches to encourage local ownership and the long-term sustainability of activities. Strong inclusion of local and/or indigenous communities in the management of their resources and livelihoods enables context-specific and localized, bottom-up approaches. As these approaches consider social and cultural dynamics, they are more likely to build long-term resilience to shocks related to food security and climate change. Empowering farmers and fishers through participatory engagement to make informed decisions ensures interventions are relevant to local conditions. In Peru, fishers were trained and involved in monitoring and surveillance activities of local climate scenarios. In this way, they ensured community participation in the management and protection of their environment and livelihoods. Cooperatives and community associations such as

the APFSs in the ACREI project and the CBPP approach in Colombia-Ecuador involved communities in project design. This allowed communities to select a portfolio of feasible, effective concrete adaptation activities that helped cope with food insecurity through traditional and local knowledge that was then integrated into community-based adaptation plans. Similarly, in Nepal, MUS empowered communities to control and prioritize the allocation of their water resources to create an enabling environment to secure food production.

Capacity building activities aimed at local and regional governments enable the integration of project interventions into local adaptation practices and strategies. In Rwanda, government authorities were trained in climate risk management and landslide prevention methods. This provided tools to understand climate hazards and

enable government to assist communities facing higher than average stunting among children. In Egypt, community-based associations (CBAs) facilitated trainings of government technical staff to monitor irrigation activities and manage revolving lending

schemes for a more resilient agricultural production system. Government officials and local NGOs were trained on how to respond to and mitigate the impacts of climate-related events and minimize exposure to food security and climate variability risks.



Integrated natural resource management approaches represent a critical adaptation strategy to strengthen the resilience of food systems to external shocks

Soil degradation drives food insecurity through associated crop losses and reduced agricultural productivity. For instance, in Rwanda, unsustainable use of natural resources and increases in rainfall associated with climate change caused erosion and reduced soil fertility and crop yields. Erosion was particularly challenging in watersheds where upstream erosion can send soil-laden water downstream, causing landslides and flooding (Sulaeman and Westhoff, 2020). **Integrated natural resource management practices** help restore degraded lands, prevent soil erosion and, ultimately, contribute to food security. The cases employed several integrated natural resource management practices to build resilient food systems.

Crop rotation, an indigenous farming practice of growing different crops on the same land in successive seasons, reduces use of chemicals on farms and supports long-term soil fertility. As such, it contributes directly to food security. Similarly, water-saving irrigation is essential to increase farmers'

resilience to climate variability and ensuring sustainable food production. This was illustrated by the successful establishment of WUAs in Egypt, which helped farmers reduce water consumption through canal lining, laser levelling, and solar-powered irrigation.

Agroforestry is another important tool to reduce food security risks. The intentional integration of trees and shrubs with crops and livestock systems is a compelling adaptive measure that can address several challenges related to food security. Agroforestry practices replenish nutrients in soil and reduce erosion and the need for nitrogen fertilizers to improve crop yields. Projects in Indonesia and Nepal illustrate how agroforestry can play a pivotal role in combating food security and helping adapt to climate change.

Intercropping, a practice whereby two or more crops are simultaneously grown on the same field, is another important traditional farming system. It enhances both crop productivity and the efficient use of resources.

In Egypt, intercropping helped farmers diversify their incomes and economize the use of water, fertilizer, and pesticides. In the Indonesia project, intercropping was used to improve agricultural productivity and increase forest cover.

The use of **climate-resilient seeds** is an important adaptation measure to combat food insecurity caused by climate variability-related crop losses. The choice of climate-resilient seeds depends on the climatic context (IPCC, 2019). Heat-tolerant crops may differ from drought-tolerant varieties. In Egypt, the introduction of heat-tolerant varieties of wheat nearly doubled yields.

The cases also underscore the **link between land security and food**

security. Securing farmers' rights to land empowers and incentivizes them to invest in equipment and training, qualify for loans, or join farmers' associations. Hence, land administration policies to ensure land rights and govern land use can play an important role in food security. In Egypt, the project's land consolidation activities removed barriers between fragmented land plots, increasing land available for cultivation and reducing competition and tensions among farmers for arable land. In Indonesia, the social forestry component was grounded in farmers' access to and control over forest food benefits. To this end, the project established forest farmer groups to apply for and gain legal access to forest products.



Early warning systems are a key adaptive measure to counter the unpredictability of climate shocks on food systems

Reliable climate and weather services to enable early actions are an important risk management tool that enables farmers and fishers to cope with extreme weather events. In Egypt, the establishment of **climate information centres** in each directorate provided climate forecasting and recommendations, which were broadcasted by NGOs across target villages every five days. The centres provided early warning to around 400,000 people in 49

villages and led to a 60 per cent reduction in crop losses to extreme weather events. The improvement in crop yields and word of mouth led to replication of activities in other villages. In Peru, climate information generated through scientific and economic analyses helped identify local climate change scenarios and extreme events. It also supported early warning for fishing, aquaculture and ecotourism activities, as well as fisheries adaptive management.



Financial and institutional instruments and mechanisms to catalyse investment are essential to strengthen food security

The importance of **building synergies among public and private institutions** through **multi-stakeholder coordination** and private sector engagement aimed at building awareness and capacity to deal with climate adaptation is underscored across multiple project experiences. Sustainable agricultural practices can be expensive and represent a considerable investment for smallholder farmers and food-insecure communities. As such, governments and banks must enable farmers' access to technical and financial services.

In Nepal, the project **empowered local stakeholders through extension services**, building financial and technical monitoring capacity within relevant institutions and promoting climate-resilient practices. The project's MED model provided business development services and facilitated access to micro-finance services/credit from local cooperatives or banks. Additionally, the project provided farmers and entrepreneurs with access to financial services and crop/livestock insurance for apple farming schemes. The government provided a 75 per cent subsidy on the insurance premium.

In Indonesia, the project supported **community engagement** and **involved the provincial government** and targeted villages by facilitating **multi-stakeholder**


discussions on an inclusive social forestry scheme. The project facilitated access of social forestry farmers' groups to funding capital through a Ministry of Environment and Forestry programme to provide farmers with seed capital for social forestry enterprises. A marketing system providing market information and partnerships was established to support this scheme.

In Rwanda, **capacity building of local institutions** at the local level and the creation of rural development hubs offered market development services, credit facilities, vocational training, capacity building for self-help communities, and created market linkages. Financial instruments encouraged **access to renewable energy** such as solar power and biogas. These instruments ranged from contract guarantees to support loans from suppliers... to companies building and installing biogas digesters... to an insurance product. These schemes ensured that farmers or energy user groups were fully covered for the loan payback period.

In Egypt, **CBAs** facilitated trainings of government technical staff to monitor irrigation activities and manage revolving lending schemes for animal breeding. Government officials and local NGOs were trained on how to respond to and mitigate impacts of climate-related events and

minimize exposure to climate variability risks. A revolving loans scheme for women to engage in animal husbandry provided

alternative sources of income. This, in turn, enabled women to set up other SMEs for trading clothing and handicrafts.



Innovative approaches that involve communities and harness local knowledge, science, and technology can be powerful tools for building long-term food security

In the ACREI project, **a community-based APFS approach** to increase climate change and food security awareness helped harness local innovation building on indigenous knowledge. The APFS approach enabled the participation of farmers in forums to share their local knowledge, enabling peer-to-peer learning and dissemination of adaptation practices and local innovations in techniques.

An **innovative participatory approach** led to **tapping into traditional knowledge** of Afro and Awá communities for environmental conservation and adaptation planning in Ecuador and Colombia. This included the first binational early warning system tailored to these indigenous community needs. These participatory tools enhanced the **integration between traditional knowledge and scientific information** as the baseline for the design of adaptation measures to climate change in a food-insecure context.

In Peru, the **deployment of modern surveillance, prediction, and information systems** for monitoring climatic conditions and environmental risks, served as an early

warning system for fishing, aquaculture, ecotourism, and fisheries. Local project stakeholders were trained in the use of an ocean monitoring and surveillance system. It helped identify local climate change scenarios and extreme events such as El Niño, helping to anticipate climate shocks on food production systems.

Innovative, solar-powered “service centres” for women, managed by women’s cooperatives, were built in Nepal. They offered capacity building training, clean solar-heated water for washing and sanitation, cooking stoves, and facilities for childcare, as well as local employment. By providing a safe space tailored to women’s needs, service centres empowered women by enabling them to engage in income-generating activities and encouraging their involvement in project activities tackling food security issues.

Given the multiple and far-reaching effects of climate change and the complex nature of food systems, **a holistic approach is needed to maximize synergies**, reflect the food-water-energy nexus, and integrate climate drivers with social and

economic drivers to address the inter-dependent challenges of building long-term resilience through food security. The cases demonstrate that **community involvement is fundamental for ensuring the uptake and sustainability of interventions**. They show this involvement is best achieved by building local capacities for communities and governments on climate

adaptive strategies to manage risks and make communities and food systems more resilient. Financial and institutional instruments and mechanisms are critical to enable uptake of these strategies. Finally, the **context-specific nature of food systems requires creative approaches** to meet local challenges and opportunities to ensure long-term food security.

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