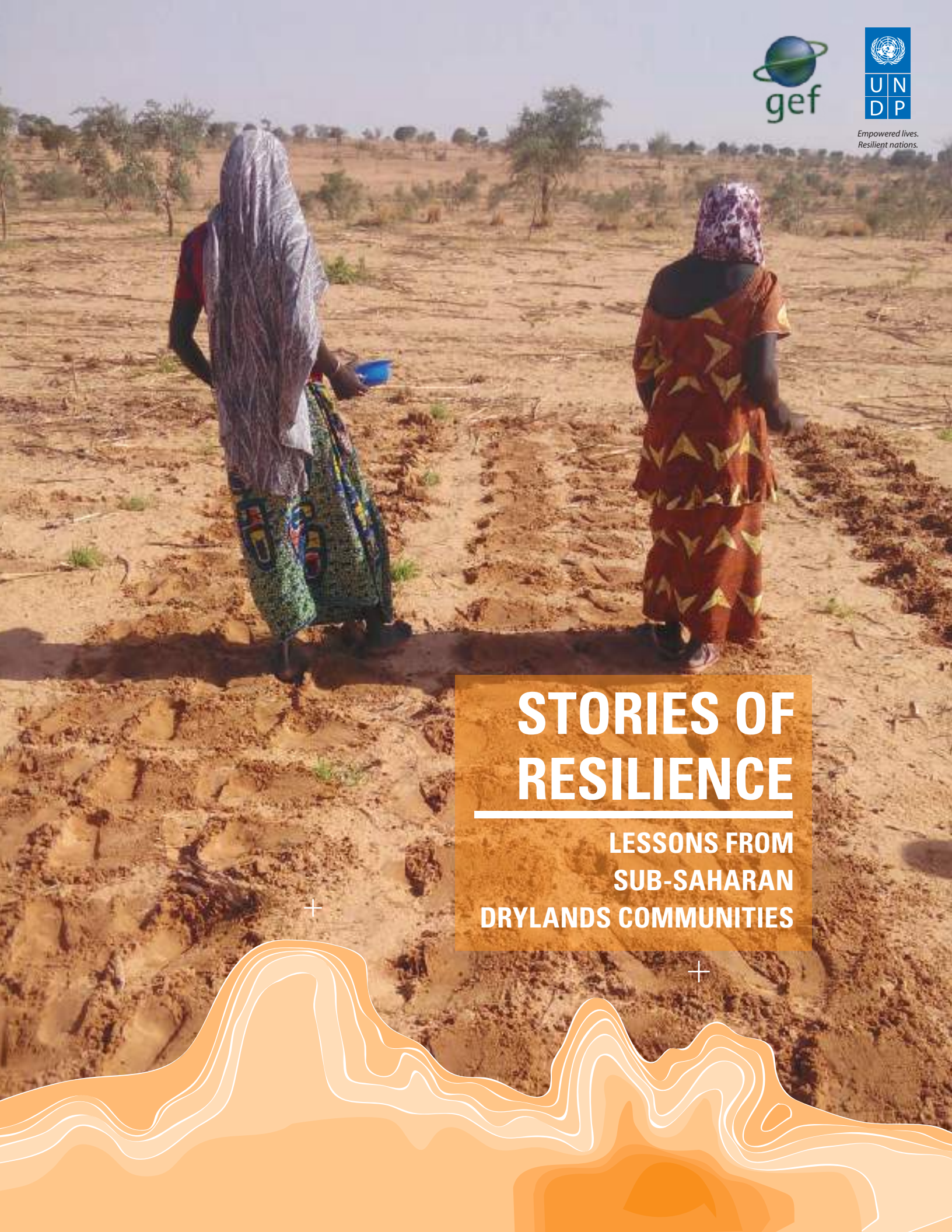

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STORIES OF RESILIENCE

LESSONS FROM SUB-SAHARAN DRYLANDS COMMUNITIES

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PREFACE

In September 2015, the United Nations General Assembly adopted the post-2015 Sustainable Development Goals, committing to an ambitious agenda that includes reducing poverty, improving gender equality, promoting inclusive economic growth, fostering sustainable production and consumption patterns, combatting climate change and halting biodiversity loss. The 17 Sustainable Development Goals represent a widespread acknowledgement by countries around the world that the challenges our world faces today are social, economic and ecological in nature. The Sustainable Development Goals stress that fundamental changes are needed in our approach to development, and these goals represent an unprecedented mandate for global collaboration and multi-stakeholder partnerships to address systemic barriers to sustainable development.

The United Nations Development Programme, tasked with supporting countries to simultaneously reduce poverty and achieve sustainable development, has an important role to play in the translation of the Sustainable Development Goals from policy to practice. UNDP's Equator Initiative partnership contributes to the SDG's by shining a light on outstanding community-based initiatives, making them visible to governments, policymakers, practitioners and other communities. This work catalyzes movement towards sustainability by simultaneously recognizing best practice on the ground, supporting data-based analysis of local initiatives to illustrate their applicability to other communities, and bringing these practices to the attention of national and international policymakers. These case studies also illustrate how local efforts in strengthening resilience can directly contribute to national sustainable development goals. For example, Niger's Fédération des Unions de Producteurs de Maradi Gaskiya helped to facilitate the production and marketing of more than 45 tons of drought-resistant seed, an important component of food security; and Madagascar's Initiative pour le Developpement et L'Adaptation au Changement Climatique (IDACC) Association's efforts in drip irrigation have reduced local agricultural water use by 70 percent, a major step toward water security.

UNDP's Equator Initiative, in partnership with ENDA Tiers Monde (ENDA), Open Society Initiative of Southern Africa (OSISA), United Nations Convention to Combat Desertification (UNCCD), and funded by the Global Environment Facility (GEF), identified examples of local ingenuity, innovation, and leadership in sustainable land management in drylands in sub-Saharan Africa. These case studies, as well as the lessons we can learn from their successes, are a testament to the importance and relevance of an interdisciplinary approach that involves local communities, organizations, and key policymakers. Recognizing the importance of such multi-stakeholder engagement, we have chosen to release this publication at the UNCCD COP-12 in Ankara, Turkey. The cases shared here have the potential to inform policies and programs that focus on combatting desertification at COP-12 and beyond.

Magdy Martínez-Solimán
Assistant Administrator and Director
Bureau for Policy and Programme Support
United Nations Development Programme

FOREWORD – THE GLOBAL ENVIRONMENT FACILITY

Sub-Saharan Africa is a region predominantly characterized by dryland ecosystems, in which about two-thirds of the population depends directly on agriculture and natural resources for their basic needs and livelihoods. The severe vulnerability of drylands to climate change, combined with widespread dependence on natural resources for subsistence, lead the region to be threatened by a self-enforcing cycle of poverty and land degradation.

The ultimate causes of both poverty and land degradation in sub-Saharan Africa are complex and require an integrated response that engages local communities, non-governmental organizations, governments and policy-makers to highlight and promote sustainable land management practices.

As an international partnership of 183 countries, international institutions, civil society organizations and the private sector, the Global Environment Facility (GEF) is uniquely positioned to address the intertwined issues of poverty and land degradation in sub-Saharan Africa. Over the past 20 years, the GEF has engaged with communities in Africa through the UNDP-implemented GEF Small Grants Programme (GEF SGP). Working in over 125 countries, the GEF SGP promotes community-based innovation, capacity development and empowerment through sustainable development projects.

One of SGP's signature areas of work is sustainable land management in areas affected by desertification and deforestation. The SGP portfolio supports developing countries to understand and implement the UNCDD and its ten-year strategic plan at the community level. To date, this portfolio has supported activities that create and demonstrate good practices in adaptive community-based land management, integrating local knowledge and modern practices to address the degradation of agricultural lands, rangelands and forest landscapes.

SGP's work to support sustainable land management addresses two strategic objectives of the GEF: maintaining or improving the flows of agro-ecosystem services to sustain livelihoods of local communities, and reducing pressures on natural resources from competing land use at the landscape level.

This publication brings together the experiences from 15 communities — selected through a rigorous process by the GEF partners the Equator Initiative and ENDA Tiers Monde — that demonstrate local ingenuity, innovation and leadership in sustainable land management.

It is my hope that the experiences and lessons learned captured in this publication will help inform other drylands communities and national and international policymakers. The GEF will also look to find ways to incorporate the key messages from this publication into our newly-approved flagship program on food security and resilience in Sub-Saharan Africa.

As the world moves forward with implementation of the Sustainable Development Goals it is my hope that national governments and international bodies alike will work to ensure that policies reflect on-the-ground realities in order to support community and ecosystem resilience in the sub-Saharan Africa region.

Dr. Naoko Ishii
CEO and Chairperson
The Global Environment Facility

FOREWORD – STOCKHOLM RESILIENCE CENTRE

The many interlinked ecological, economic and social issues affecting our planet today – climate change, loss of biodiversity, growing inequality, food and water shortages, and conflicts over natural resources – make it clear that we cannot continue with a "business as usual" approach to growth and development. We are entering an unprecedented era where major human-driven pressures affect our ability, and that of the planet itself, to adapt to and cope with change.

It was with this in mind that a diverse team came together to propose a framework based on "planetary boundaries" that define a "safe operating space" for humanity with respect to the Earth's major systems, including climate change, ocean acidification, stratospheric ozone depletion, the nitrogen cycle, the phosphorus cycle, global freshwater use, change in land use, biodiversity loss, atmospheric aerosol loading, and chemical pollution. Because these systems are nonlinear, behaving in unpredictable and abrupt manners, they can become volatile if we pass certain boundaries. Passing these thresholds can have critical impacts on systems that affect humans directly – such as the duration and timing of rain in the drylands. Ensuring that we stay within these thresholds requires concerted effort at a range of scales, from global to local.

The United Nations post-2015 Sustainable Development Goals encompasses all of the Planetary Boundaries, directly or indirectly, in relation to combatting climate change, conserving oceans, and protecting and restoring terrestrial ecosystems (Goals 13-15), and they contribute to a broader agenda that together addresses the ecological, economic, and social drivers of poverty and ecosystem decline.

But this is only one part of the solution. We must also look at the local level, identifying solutions that promote transformative change towards sustainability within dynamic socio-ecological landscapes and communities. One way to do this is to seek out and understand the factors that lead to resilience. Resilience, as defined by the Stockholm Resilience Centre, is "the long-term capacity of a system to deal with change and continue to develop." The Stockholm Resilience Centre leads efforts to develop resilience theory, to understand elements that contribute to resilient communities and ecosystems, and to support the integration of science, policy, and practice in favor of long-term sustainability and resilience in local and global ecosystems.

Dryland ecosystems pose particularly interesting systems in which to evaluate this capacity for social and ecological resilience. In the drylands of sub-Saharan Africa, poverty and food insecurity are widespread (83 percent of people live in extreme poverty and 35 percent are food insecure), and population growth is among the highest in the world, with the population expected to double within 40 years. Land degradation, recurring droughts, and the direct dependency of local communities on ecosystem services for their livelihoods means that they are increasingly vulnerable to a self-enforcing spiral of increased environmental degradation and increased poverty.

However, as research by the Stockholm Resilience Centre and the case studies presented in this publication reveal, there are outstanding examples of initiatives that have demonstrated incredible resilience at the local community level. This compilation of case studies presents a valuable opportunity to learn from best practices at the local level in sustainable land management in dryland ecosystems, and to attempt to understand why some communities demonstrate the resilience necessary to cultivate ecological, social, and economic sustainability against all odds. By starting on the ground, and sharing these insights at the national and international level, we have the best chance of connecting research, policy, and practice to foster global sustainability.

Johan Rockström
Executive Director
Stockholm Resilience Centre

PROJECT PARTNERS

Better Land Use, Better Future for All is a GEF-funded project, implemented by UNDP's Equator Initiative, the Open Society Initiative for Southern Africa (OSISA), ENDA Tiers Monde, and UNDP Namibia. The project seeks to improve the socio-economic development of rural communities in sub-Saharan Africa through sustainable land management, and to empower local grassroots organizations in sub-Saharan Africa to participate and influence the implementation of the United Nations Convention to Combat Desertification (UNCCD), TerrAfrica, and other SLM processes, programs and policies.

The Global Environment Facility (GEF)

The GEF is an international partnership of 183 countries, international institutions, civil society organizations and the private sector to address global environmental issues. The GEF, an independently operating financial organization, provides grants for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer and persistent organic pollutants, and is the largest public funder of projects on global environmental issues.

ENDA Tiers Monde (ENDA)

ENDA Tiers Monde (Environmental Development Action in the Third World), is an international NGO based in Senegal. Engaged in the fight against poverty, ENDA is working with grassroots groups in Asia, Latin America, the Caribbean and Africa, researching and promoting sustainable development.

Equator Initiative

The Equator Initiative is a partnership that brings together the UN, governments, civil society, businesses and grassroots organizations to recognize and advance local sustainable development solutions for people, nature and resilient communities.

Open Society Initiative for Southern Africa (OSISA)

The Open Society Initiative for Southern Africa (OSISA) is committed to deepening democracy, protecting human rights and enhancing good governance in southern Africa. OSISA's vision is to promote and sustain the ideals, values, institutions and practice of open society, with the aim of establishing a vibrant southern African society, in which people, free from material and other deprivation, understand their rights and responsibilities and participate democratically in all spheres of life.

United Nations Convention to Combat Desertification (UNCCD)

The UNCCD is the sole legally binding international agreement linking environment and development to sustainable land management. The Convention addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found.

United Nations Development Programme (UNDP)

UNDP partners with people at all levels of society to help build nations that can withstand crisis, and drive and sustain the kind of growth that improves the quality of life for everyone. On the ground in 177 countries and territories, UNDP offers global perspective and local insight to help empower lives and build resilient nations.

EXECUTIVE SUMMARY – NOTE TO POLICY MAKERS

In September 2015, the United Nations General Assembly adopted the post-2015 Sustainable Development Goals, committing to an ambitious agenda for sustainable development around the world. At the same time, researchers at the Stockholm Resilience Centre clearly show that we have surpassed two of nine planetary boundaries (biospheric integrity and biogeochemical flows), and that we are on track to pass at least two more (land-system change and climate change) – our current trajectory is not toward sustainable development.

Perhaps no system is as under as much stress as drylands systems; two-thirds of productive land is affected by land degradation and desertification, 83 percent of the population lives in poverty and the population is expected to double by 2050. On top of this, dryland ecosystems face enormous impacts from climate change -- higher temperatures, water scarcity and higher rainfall intensities.

In this context, resilience – the ability of systems to adapt to change – is increasingly important, yet it can be difficult to discern exactly what the term actually means. The Stockholm Resilience Centre has helped to sharpen our understanding by identifying seven major principles of socio-ecological resilience. It is from these principles that this publication draws key lessons, including:

- **Promoting diversity:** Diversification of agricultural systems and livelihoods spreads risk and improves community resilience, and diversification of diets improves health and lowers rates of malnutrition
- **Managing connectivity:** Community initiatives can manage buffer zones and wildlife corridors around and between protected areas
- **Managing variables that result in feedback loops:** Restoration of degraded sub-Saharan Africa drylands prevents the collapse of ecological systems and reduces the threat of desertification
- **Fostering adaptive, complex thinking:** Revitalization of traditional land management practices provides drylands farmers with time-tested methods to adapt to climate change
- **Encouraging learning:** Collaborative research is a practical and inclusive way to foster community-driven learning in sub-Saharan Africa drylands
- **Broadening participation:** Improving women's access to land mitigates environmental degradation, improves community food security and supports local livelihoods
- **Promoting diverse and effective governance:** Inclusion of traditional authorities in the design and implementation of development initiatives in sub-Saharan Africa is critical to their long-term success and viability

This document draws from 15 case studies, as part of a GEF-funded collaborative project on improving sustainable land management between the United Nations Development Programme, Equator Initiative, ENDA Tiers Monde, United Nations Convention to Combat Desertification and Open Society Initiative for Southern Africa. The case studies, selected by the Equator Initiative and ENDA Tiers Monde, demonstrate local ingenuity, innovation and leadership in sustainable management of drylands. The first half of this publication highlights key lessons in each of the seven resilience principles, drawing from the case studies, and the second half of this publication provides a summary of each of the 15 case studies.

KEY LESSONS IN STRENGTHENING RESILIENCE IN SUB-SAHARAN AFRICA DRYLANDS COMMUNITIES

Introduction

The concept of resilience – of the ability of a human or natural system to adapt to change – has become increasingly recognized as an essential property that communities, nations and ecosystems must have if they are to face the multiple challenges of the 21st Century. However, because resilience is often used in very different ways, and is applied in such very different contexts, knowledge of the specific elements of resilience is often fragmented. This document attempts to provide an overall definition of socio-ecological resilience in the context of communities adapting to stresses from environmental pressures. In this context, resilience can be defined as the extent to which communities can design, plan, manage, restore and monitor biodiversity and ecosystems in order to minimize the impacts of stresses and shocks; and the extent to which they can anticipate, prevent, prepare for, withstand, recover from, learn from and thrive after ecosystem stresses and shocks occur.

The Stockholm Resilience Centre (see Simonsen et al., 2014) provides further clarity by offering seven principles of socio-ecological resilience that help to consolidate and operationalize concepts of resilience. These principles, which guide this section on lessons in resilience from the drylands case studies, include:

- **Promote diversity:** This principle, in its broadest sense, means enhancing diversity – whether diversity of species, livelihoods, knowledge or social systems. Systems with more diverse components are generally better able to cope with disruptions and change than systems with fewer components; when one component of a system fails, another component can compensate, making the system more able to rebound and thrive.
- **Manage connectivity:** The concept of connectivity can be applied broadly to landscapes and seascapes, to communities, to markets and to any system where there are interactions between and across the system. Well-connected systems can often recover from disturbances more quickly because there are alternative pathways for the flow of the system components, whether migratory species, local knowledge of seed diversity, or markets for locally-grown products. Yet overly-connected systems can sometimes lead to undesirable changes, such as the introduction of disease, the rapid spread of fire or the contagion of market crashes. Therefore connectivity needs to be carefully managed to ensure that the system functions properly.
- **Manage variables that result in feedback loops:** Some feedback loops, such as the spread of an invasive species that results in long-term ecosystem changes, or an economic incentive that creates widespread and unintended perverse consequences, can be difficult to reverse. Such feedback loops, and the variables that trigger them, must be recognized and managed to ensure that a system does not spiral out of control.
- **Foster adaptive, complex thinking:** Adaptive complex thinking means recognizing that within any socio-ecological system, there are many systems operating and interacting simultaneously, leading to unpredictability and uncertainty. Adaptive, complex thinking means considering an issue from the perspective of many different systems.
- **Encourage learning:** Because socio-ecological systems are by nature dynamic and in constant flux, we must be able to continually learn and adapt to new information, whether through the use of innovative technologies and data, formal learning structures, new forms of social media or collaborative learning processes.
- **Broaden participation:** Groups with effective and broad participation are likely to communicate more effectively, have greater trust and learn faster than groups with low participation.

- **Promote diverse and effective governance:** Diverse forms and modes of interacting systems of governance can help promote collective action, distribute decision making across a wider array of actors, and can enable faster learning and adaptation.

Promote Diversity

Diversity – whether diversity of species, livelihoods, knowledge, crops or economies - fosters strength and resilience within ecological, economic and social systems. Systems with more diverse components are generally better able to adapt to disruptions and disturbances than systems with fewer components; when one component of a system fails, another component can compensate, enabling the system to rebound and thrive. Promoting diverse agricultural production systems and livelihoods in sub-Saharan Africa is critical to the long-term stability of communities, particularly in the face of climate change.

- **Production systems with high biodiversity –** Deforestation, overgrazing, collection of firewood, sand mining for construction and poor agricultural practices have caused serious land degradation in many areas in sub-Saharan Africa drylands. Innovative drylands community responses to land degradation include anti-erosion measures, implementation of organic agriculture and tree planting. Five of the 15 case study organizations (Union AVIGREF, Heiveld, Kasisi Agricultural Training Centre [KATC], Association Tchadienne des Volontaires pour la Protection de l'Environnement [ATVPE] and Integrated Development in Focus [DIF]) promote organic agriculture as an adaptive strategy to withstand future environmental stresses caused by climate change. Organic methods, such as no-till farming, mulching, crop rotation, improved fallows and the use of compost and cover crops, build soil micro-biodiversity and improve water retention, making soils less susceptible to drought and erosion. Organic farming methods also wean subsistence farmers from costly inputs of synthetic fertilizers and pesticides, yielding substantial savings over time. Inter-cropping, use of drought-resistant species and alley cropping with trees increases agricultural biodiversity, attracts beneficial insects, improves diets and provides a buffer against over-reliance on a single crop.

  Nine of the fifteen case studies (SOS Sahel, Fédération Woobin Senegal, Shewula Trust, Utooni Development Association [UDO], KATC, AVTPE, Association Zoramb Naagtaaba [AZN], DIF and Association des Pépiniéristes et Planteurs de Tône-Ouest) include tree planting as a central feature of their initiatives. Trees sequester carbon, improve soil fertility and attract birds and insects. Trees provide valuable services (they are used as windbreaks in Burkina Faso and South Africa), produce marketable goods (gum arabic in Chad, moringa leaves in Zambia, lamp oil and biodiesel in Burkina Faso and fruits in Kenya), organic pesticides (neem leaves in Zambia) and firewood.

- **Genetic diversity –** Sub-Saharan Africa drylands are on the front line of climate change. Many communities are already experiencing more erratic rainfall patterns, making subsistence farming more complex and unpredictable. Managing the genetic diversity of staple crops, wild plants and wild crop relatives gives farmers in drylands greater options for coping with climate change. In Niger, FUMA Gaskiya is working with farmers and agronomists to identify locally-adapted varieties of plants and to distribute seeds of the most promising varieties to farmers. On-farm seed trials have identified several promising varieties of millet, including an early-flowering plant that provides food during the "hunger gap" in the early months of the growing season when late crops have not yet matured. Kasisi Agricultural Training Centre in Zambia promotes the conservation of local seed varieties through seed fairs. Sustaining local seed systems ensures that farmers have access to seed that is adapted to local soils and climatic conditions. Unlike hybrid seed, the seeds of local varieties of plants can be saved after harvest and used for the following year's planting. In the Suid Bokkeveld Plateau in South Africa, the Heiveld Co-operative has created innovative guidelines for the management and harvest of wild rooibos. Wild rooibos tolerates drought much better than cultivated rooibos and is also more resistant to pests. In situ conservation of the wild rooibos genetic pool gives the community greater flexibility for the future, particularly if strains of cultivated rooibos are unable to withstand future droughts brought about by climate change.

- **Nutritional diversity -** Malnutrition is a serious problem in sub-Saharan Africa drylands, particularly for children. Diversifying local diets is one way to combat malnutrition. In Kenya, Utooni Development Organization (UDO) has taught farmers to augment staple crops such as maize and beans with drought-resistant crops (e.g., sorghum, millet, green grams, lablab and cowpeas) and nutritious fruits from planted trees. Access to water provided by sand dams constructed by UDO has increased fodder production, leading to healthier livestock that produce more milk and meat. The diversification of local diets has had an immediate positive impact; UDO reports that rates of childhood malnutrition have dropped from seven percent to zero percent in one region where it works. In Zambia, Kasisi Agricultural Training Centre (KATC) promotes diversification of diets through trainings in dairying, apiculture, organic agriculture and agroforestry. KATC promotes nutritional diversity for people living with HIV/AIDS because balanced diets fortify the immune system and the body's ability to fight the disease.

- **Livelihood diversification –** Unemployment and poverty are endemic to many areas in sub-Saharan Africa drylands. Job creation is central to dryland community stability and can reduce the out-migration of youth. Union AVIGREF in Benin, the Shewula Trust in Swaziland and MBOMIPA in Tanzania are using ecotourism to create local jobs. Ecotourism provides work for guides, guest house owners and cooks and creates outlets for locally grown produce and locally made handicrafts. In addition to ecotourism-related jobs, Union AVIGREF in Benin has helped villagers diversify their livelihoods through the introduction of organic cotton production and the creation of micro-enterprises (e.g., non-timber forest product co-operatives, apiculture, market gardens and livestock). The diversification of livelihoods gives villagers fall-back options for work during the rainy season when ecotourism wanes.

Lessons in promoting diversity:

- Diversification of agricultural systems and livelihoods spreads risk and improves community resilience; if one crop or livelihood fails, back-up options ensure continuity.

- Sustaining local seed systems, conserving locally-adapted varieties of staple crops and in situ management of wild species and wild crop relatives is critical to the long-term success of agricultural systems in sub-Saharan Africa.

- Diversification of diets in sub-Saharan Africa improves health, lowers rates of malnutrition and improves quality of life for people living with HIV/AIDS.

Manage Connectivity

Many communities in sub-Saharan Africa drylands live in isolation – isolation from neighbors, innovations, education, healthcare, markets, transportation, electricity, reliable water supply and security. As human population increases in drylands, assemblages of plants and animals are also becoming more isolated and are more prone to endangerment. Isolation can be mitigated in human and natural communities by strengthening connectivity and interactions between actors within systems. Well-connected systems often recover from disturbances more quickly than poorly-connected systems because there are alternative pathways for the flow of system components, be they ideas, migratory species, traditional knowledge, germplasm or markets for locally-produced products.

- **Ecological connectivity –** Connectivity is important in ecological systems because it prevents habitat fragmentation and improves the flow of animals, seeds and genetic material. In general, larger patches of habitat support greater biodiversity and sustain minimum viable populations of plants and animals, particularly in cases of range-limited endemic species and wide-ranging species such as carnivores and migratory birds. Community-based natural resource management initiatives by the Shewula Trust in Swaziland, Union AVIGREF in Benin, MBOMIPA in Tanzania and the Northern Rangelands Trust

(NRT) in Kenya are contributing to wildlife and habitat conservation and connectivity by supporting and maintaining park buffer zones, wildlife corridors and the reintroduction of rare or extirpated species (e.g., pepper-bark tree and Lebombo cycad in the Shewula Nature Reserve and black rhino in one of NRT's member conservancies). The creation of the Shewula Nature Reserve in the Maputaland-Pondoland-Albany biodiversity hotspot, for example, is safeguarding the conservation of endemic species and providing connectivity to protected areas within Swaziland, such as the Lubombo Conservancy, as well as to conservation areas in Mozambique. These initiatives demonstrate the value of incorporating communal lands into protected area strategies and landscape-level planning.

- **Social connectivity –** In the Suid Bokkeveld region of South Africa, members of the Heiveld Co-operative live in isolation, many without transportation. However, since the founding of the co-operative, members now have numerous opportunities to interact with each other and exchange information at community events such as farmer trainings and climate change workshops. These interactions produce greater social cohesion and foster a sense of communal interdependence. Seed fairs in Niger (FUMA Gaskiya) and Zambia (Kasisi Agricultural Training Centre) sustain local seed systems and also give community members opportunities to exchange ideas and knowledge about local varieties of plants, thereby improving community adaptation to climate change. Association Zoramb Naagtaaba in Burkina Faso holds a "Festival of the Rural World" every year for all 10 member villages. The event includes dancing, music, dramatizations and an awards ceremony to celebrate the best farmers in the area. The festival provides a vehicle to celebrate agriculture skills and local culture and instills friendly competition amongst farmers to improve their agricultural practices. In northern Kenya, the Northern Rangelands Trust inaugurated an annual marathon as a way to bring youth from rival ethnic groups together to communicate and form connections. The night before the marathon, the participants share a meal, tell stories and sing together. Such a harmonious gathering of different ethnic groups would have been unthinkable only a few years ago and is a small but significant step toward bringing peace to a historically violence-plagued part of the country.

- **Market linkages –** Many rural communities in arid and semi-arid lands have limited options for marketing their products. In Benin, Union AVIGREF has forged market linkages between local organic cotton producers and international markets. The link to international organic cotton markets provides reliable demand and gives producers a premium price (up to 20 percent higher than chemically-intensive grown cotton). The Heiveld Co-operative in South Africa also uses organic and fair trade certification to avoid middlemen and to secure premium prices for their rooibos tea in the international market. Since its inception, Heiveld Co-ooperative workers' daily minimum wages have nearly tripled and excess profits are channeled into infrastructure projects that improve community wellbeing. In Kenya, National Rangelands Trust established NRT Trading, an enterprise development engine that links women's groups producing beadwork and handicrafts to international markets, including gift shops at zoos. In 2013, NRT Trading netted nearly one million USD for the women, giving them steady employment and an independent source of income.

- **Potential downsides to connectivity -** The examples above demonstrate how sub-Saharan Africa drylands communities have improved resiliency through strengthening environmental, social and economic connectivity. However improved connectivity also poses a danger. Humans living in proximity to national parks have more frequent contact with wildlife, which can lead to human-wildlife conflict. In such situations, adaptive thinking, such as the use of chili pepper-greased fencing (as employed by members of Union AVIGREF and MBOMIPA) to reduce crop damage from raiding elephants, is needed. Increased social connectivity can likewise produce negative consequences when prolonged social contact ignites personal, political or ethnic rivalries, to the detriment of the community. However, good governance, such as the use of conflict resolution teams (as employed by NRT in Kenya), can prevent such issues from escalating to the point of fracturing the community. Connecting local communities to international markets may increase local profits but also exposes communities to global market volatility. For example, global downturns or political instability may potentially damage ecotourism-dependant livelihoods in Benin (Union AVIGREF), Tanzania (MBOMIPA) or Swaziland (Shewula Trust).

To prevent economic disruptions caused by exogenous economic events, communities need to diversify local livelihoods to provide greater stability and flexibility. The potential downsides to promoting greater connectivity within ecological, social and economic systems demonstrate the need for applying holistic development strategies that address multiple aspects of resilience principles to ensure long-term sustainability.

Lessons in managing connectivity:

- Community-based natural resource management initiatives can play a key role in supporting ecosystem services and functions by managing buffer zones and wildlife corridors around and between protected areas.
- Social events such as seed fairs, sporting events, festivals and climate change workshops facilitate the exchange of information within drylands communities and promote social cohesion, resulting in stronger community resilience to economic, social and ecological stressors.
- Co-operatives, certification, ecotourism and other economic strategies facilitate connectivity to national and international markets, potentially improving local livelihoods in sub-Saharan Africa drylands by diversifying market outlets for local products.

Manage Change

Sub-Saharan Africa drylands are fragile and must be carefully managed to avoid negative feedback loops that cause lasting damage to ecological and social systems, such as desertification or migration to urban areas. Drylands communities must recognize negative feedback loops and the triggers that cause them, and appropriately respond to change to ensure that systems do not go beyond tipping points and spiral out of control.

- **Restoration –** Ecological restoration activities halt negative feedback loops and prevent natural catasprophes. In South Africa, the Heiveld Co-operative is removing alien species from the highly diverse but fragile fynbos biome to prevent a permanent shift in vegetation. Alien species in the fynbos biome use more water than native species, burn hotter during fires (causing greater mortality to native plants) and gradually alter the habitat unless thwarted. In Kenya, the Northern Rangelands Trust has halted rangeland degradation by implementing bunched, rotational grazing, removing invasive species and reseeding areas with native perennial grasses to improve grazing for livestock and wildlife. In Ghana, women farmers in the Greater Accra Region are using organic agriculture and agroforestry to restore more than 350 hectares of wastelands created by sand mining. The newly-established farms support livelihoods, protect a Ramsar site watershed and create greenways in the peri-urban environment.
- **Avoiding poverty traps -** Perverse governmental subsidies to the agriculture sector can lock subsistence farmers into an unhealthy cycle of dependency on chemical fertilizers, pesticides and hybrid seed that slowly degrade soil fertility over time and cost farmers increasing amounts of income to sustain each year. The Kasisi Agricultural Training Centre (KATC) in Zambia has been able to break this poverty trap by providing farmers with training in organic agriculture, agroforestry and the use of open-pollinated varieties of crops. Organic agriculture uses locally-available inputs, such as compost and manure, to build soil fertility, thereby reducing farmer expenses for fertilizer. Open-pollinated varieties of crops produce seed that can be replanted the following year, obviating the need to buy hybrid seed. These cost-saving measures, combined with increased yields produced by organic farming methods, have helped subsistence farmers accumulate wealth and raise themselves out of poverty.

- **Monitoring –** Monitoring provides critical information about shifts in ecological and social systems and can help identify patterns that lead toward greater instability. In the early 2000s, Union AVIGEF village members in Benin noticed that chemical pesticides applied to cotton fields appeared to also kill insects in nearby rice fields. Subsequent investigations detected the presence of Endosulfan, a highly toxic endocrine disruptor that has the ability to bio-accumulate in the environment, in agricultural fields, ponds and streams at the periphery of the Pendjari Biosphere Reserve. This discovery precipitated the adoption of organic cotton production practices to avoid further contamination of agricultural fields and aquatic habitats, safeguarding the health of human and wildlife communities. In Kenya, NRT rangers implement a wildlife monitoring system that provides the organization with data about the size of wildlife populations within member conservancies. This data enables NRT to track annual increases or declines in populations and adjust their wildlife management plans and strategies accordingly.

  In Swaziland, the Shewula Trust established a voluntary counseling and testing center for HIV/AIDS. The center helps the community monitor the spread of the disease and provides anti-retroviral (ARV) treatment to infected members in the community. In Ga West Municipality in Ghana, Integrated Development in Focus established a system that enabled women farmers and their children to received quarterly health screenings. The screenings identified health issues, such as malnutrition and inadequate prenatal care, which were subsequently addressed. Health screenings and basic health education programs improved "health literacy" within the community; during a recent outbreak of cholera in Ga West Municipality, none of the trained farmers were sickened.

Lessons in managing change:

- Restoration of degraded sub-Saharan Africa drylands prevents the collapse of ecological systems and reduces the threat of desertification.
- Appropriate ecological and social interventions prevent negative feedback loops and rebalance systems.
- Monitoring provides communities with critical information about ecological and social trends and facilitates adaptation, planning and implementation of interventions.

Foster Adaptive Thinking

Adaptive thinking entails challenging people's assumptions, implementing innovations to address ecological and social stressors and changing community perceptions and actions. Sub-Saharan Africa drylands communities have employed a mix of traditional and modern solutions to adapt to climate change and strengthen local resilience.

- **Reviving traditional practices –** Revitalization of traditional resource management practices is providing many drylands communities with time-tested strategies to cope with climate change. In Kenya, Utooni Development Organization re-introduced the sand dam, a centuries-old water retaining device, to local communities as a solution to chronic water insecurity. Sand dams built across seasonal river beds capture and store water during the rainy season, creating a reliable, artificial aquifer of potable water for communities year round. Water security has improved community wellbeing, increased agricultural yields and resulted in a greening of formally degraded lands. In Western Africa, farmer members of Fédération Woobin in Senegal and Association Zoramb Naagtaaba in Burkina Faso have revitalized the Zaï cultivation technique, an indigenous water and soil conservation method. In Zaï cultivation, farmers dig holes into barren, encrusted soils during the dry season, create a circular ridge around the top of the hole to retain water and fill the hole with compost and seeds. When the rainy season commences, the holes fill with water and the ridges prevent the seeds and organic matter from

washing away. The surrounding hardpan soil acts as a pot, concentrating the nutrients in the compost and keeping the holes moist and drought-resistant during the dry season. Implemented over several seasons, the Zaï technique gradually restores soil structure, fertility and water-retention capacity.

- **Embracing new innovations –** Revitalization of traditional land management techniques in sub-Saharan Africa drylands can be complemented by incorporating modern innovations that reinforce resistance to climate change. In the Vakinankaratra region of Madagascar, IDACC Association is spreading the use of drip irrigation among rural farmers. Drip irrigation reduces water usage by nearly 75 percent, minimizes the spread of plant diseases and increases crop yields and local incomes. Drip irrigation is a culturally and ecologically appropriate technology for implementation in African drylands and provides communities with an effective means to manage water resources and adapt to climate change. In Senegal, SOS Senegal is disseminating the adoption of fuel-efficient stoves as a means to address deforestation and poverty. The fuel-efficient stoves have gained acceptance among local women, but only after the stoves were shown to be superior to the traditional "three stones" cooking system used in traditional rural homes. Adoption of the fuel-efficient stoves decreases the threat of fires in homes, reduces smoke generation and associated health impacts and minimizes the amount of time women spend collecting firewood.

- **Renewable energy –** Electrical services to rural communities in sub-Saharan Africa are sparse, often unreliable and expensive. Some communities have turned to renewable energy systems, such as solar energy, to provide power. Although renewable energy systems have relatively high installation costs, they have proven to be cost-effective in the long term and have gained local acceptance. In South Africa, the Heiveld Co-operative uses solar panels to power its tea processing facility and local water pumps, and in Swaziland, the Shewula Mountain Camp relies on solar energy to light its boma (the communal area of the ecolodge). AZN in Burkina Faso uses solar panels to power electrical fences that prevent livestock from straying into agricultural fields and to provide local students with lights to study by at night. In Zambia, biodigesters installed by KATC provide farmers with smokeless heating, lighting and cooking and reduce demand for firewood. In addition, the biodigesters, which use livestock manure as a fuel, produce a bio-slurry that can be used as a fertilizer. These examples demonstrate how communities faced with a lack of basic governmental services have embraced renewable energy as a way to achieve independence and self-sufficiency.

Lessons in fostering adaptive thinking:

- Revitalization of traditional land management practices provides drylands farmers with time-tested methods to adapt to climate change.
- Adoption of new innovations, such as drip irrigation and fuel-efficient stoves, reduces demand for water and firewood and improves community well being.
- Renewable energy gives communities energy independence and enhances self-sufficiency.

Promote Learning

Leaning is central to resilience because it provides drylands communities with the tools and skills needed to cope with, and adapt to, impacts from climate change and human pressures, such as drought, food shortages, disease and market disruptions, among others. Access to education is limited in many rural communities in sub-Saharan Africa drylands, necessitating innovative methods to create and distribute knowledge and skills within communities. Because social and ecological systems are by nature dynamic and in constant flux, many drylands communities have developed nimble strategies to disseminate new information, whether through traditional media, social media, innovative technology or other pathways.

- **Environmental education –** Environmental education is a key component of many successful drylands initiatives because it is one of the most effective ways to change perceptions and address harmful practices such as deforestation. In Chad, the Association Tchadienne des Volontaires pour la Protection de l'Environnement (ATVPE) uses environmental education to sensitize adults and youth to climate change, desertification and the importance of halting deforestation. Environmental education programs in communities bordering protected areas, such as in Shewula (Swaziland), Union AVIGREF (Benin) and MBOMIPA (Tanzania), help to prevent poaching and highlight the need to protect wildlife as a source of income.

- **Peer-to-peer learning -** Peer-to-peer learning is an effective and low-cost method to build and sustain critical capacities within communities. The Kasisi Agricultural Training Centre (KATC) promotes study circles as a means of spreading agricultural knowledge and skills within villages. A study circle leader, trained by KATC, acts as a facilitator for seven to twelve of his or her neighbors as they collaboratively work through a manual addressing a specific topic. The manuals are highly visual, simple to understand and contain practical exercises that the farmers can undertake. In Ghana, every woman who receives training in organic agriculture methods from Integrated Development in Focus is responsible for training ten of her neighbors. This condition ensures the transfer of sustainable farming practices in the Greater Accra region and sustains the initiative's impact into the future. Exchange visits are another vehicle that fosters peer-to-peer learning, networking and the building of communities of practice. In Benin, Union AVIGREF has hosted a number of exchange visits for communities living in proximity to protected areas in Togo, Niger, Benin and Burkina Faso. The exchange visits showcase Union AVIGREF's development initiatives (ecotourism, organic cotton, small-game hunting and non-timber forest products) and give visitors a firsthand view of how co-management of a protected area with government partners works in practice.

- **Collaborative learning –** Participatory action research provides a strong foundation for learning in drylands communities because it is an iterative, community-driven process assisted by technical input from scientists and NGOs. Rather than being a "top down" process, it is designed to be inclusive, even for members with limited formal education. The Heiveld Co-operative in South Africa used a participatory action research approach in the creation of guidelines for the harvest of wild rooibos. The results were particularly empowering because they validated local and traditional knowledge and allowed community members to demonstrate their expertise with scientists. In Niger, farmer members of FUMA Gaskiya are directing participatory research with agronomists to develop locally-adapted cultivars of staple crops. The process enables farmers to decide their preferences for certain plant traits and production systems over others, engendering strong local ownership of the results.

- **Demonstration sites –** Demonstration sites are a particularly powerful tool for education because learners can instantly visualize and comprehend concepts in practice. In Togo, Association des Pépiniéristes et Planteurs de Tône-Ouest created a demonstration plot to show local farmers how reforested land can transform soil fertility and the agricultural landscape. Kasisi Agricultural Training Centre in Zambia uses demonstration plots to educate farmers about the advantages of organic agriculture and the productivity of open-pollinated varieties of maize. In the peri-urban village of Yaoman in Ghana, Integrated Development in Focus runs a demonstration and learning center for the raising of ruminants which educates and inspires farmers in the region. In Burkina Faso, Association Zoramb Naagtaaba's pilot farm in Guié village shows farmers how installation of hedgerows and implementation of Zaï cultivation techniques can turn degraded land into productive farmland.

- **Using different media –** The use of different forms of media is an effective way to foster learning and fully reach and engage all members within a community. In Chad, Association Tchadienne des Volontaires pour la Protection de l'Environnement (ATVPE) uses television, film screenings and debates as a way to educate the public about climate change and strategies to combat desertification. In Niger (FUMA Gaskiya) and Zambia (KATC), community radio is used as a tool to educate farmers

about types and availability of locally-adapted seed varieties, seasonal forecasts, pest management, market prices for staple crops, the use of fertilizers and innovative agricultural techniques. The radio station is particularly important to women in rural Niger who rarely have access to independent sources of knowledge and are overly reliant on husbands, relatives and neighbors for information. Radio and television are also particularly effective in providing information to people with little formal education. The distribution of practical manuals, such as the anti-desertification manual produced by ATVPE in Chad and a series of study manuals on topics such as agroforestry, sustainable agriculture, manure handling and storage and organic cotton production produced by KATC in Zambia, are further examples of how learning can be fostered and disseminated in sub-Saharan Africa drylands.

Lessons in promoting learning:

- Collaborative research is a practical and inclusive way to foster community-driven learning in sub-Saharan Africa drylands.
- Multiple forms of media, such as radio, print and television, provide effective means to engage and educate different groups of people (e.g., youth, women and marginally literate populations).
- Peer-to-peer learning and exchange visits build local capacity and create communities of practice, ensuring that learning is perpetuated into the future.

Broaden Participation

Groups characterized by broad and active participation are likely to communicate more effectively, have greater trust, and learn faster than groups with low levels of participation. In sub-Saharan Africa, land degradation and limited employment opportunities have spurred out-migration of men and youth from many communities, leaving women to care for the young and elderly. Strengthening participation of women and youth in drylands communities is therefore particularly important for long-term resilience.

- **Providing women with greater access to land –** In many regions of sub-Saharan Africa, women face difficulties gaining access to land for farming, and in many cases when they are given access to land, it is often marginal or infertile. In Chad and Ghana, ATVPE and DIF, respectively, negotiated with local village chiefs to obtain access to degraded lands for local women. Women were trained in organic agricultural practices and were taught how to restore lands, for the betterment of themselves and their communities. In Benin, women members of Union AVIGREF have earned more than 250,000 USD by producing organic cotton on marginal and degraded lands. Women farmers in Niger who are members of FUMA Gaskiya have been taught to plant small-scale gardens near their homes during the off-season, resulting in diversified diets and improved nutrition. Restoration of degraded lands by women farmers in Senegal (Fédération Woobin) and Ghana (Development in Focus) has caused youth and men to return to their villages, thereby improving social cohesion and participation, and re-energizing communities.
- **Enabling women's participation –** Women bear the primary responsibility for gathering water and firewood for households in sub-Saharan Africa. Improvements in access to water and more efficient uses of firewood relieve women from household drudgery, enabling them to more fully participate in community life. In Kenya, Utooni Development Organization assists communities in the construction of sand dams. Sand dams provide communities with safe, potable water and dramatically reduce the amount of time women spend gathering water (from more than six hours a day to less than an hour per day). In Senegal, SOS Sahel teaches women in the Louga region to construct fuel-efficient stoves from locally-available materials. Use of the fuel-efficient stoves has reduced wood consumption by two-thirds and decreased

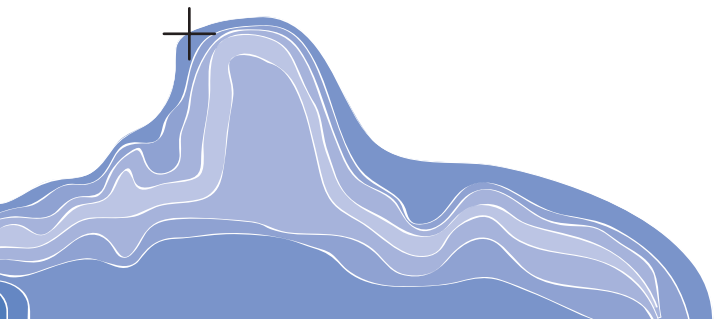
rates of deforestation. By decreasing time spent collecting water and firewood, these initiatives have given women more time to pursue an education, start alternative livelihoods and engage in community life.

- **Providing micro finance –** Women in sub-Saharan Africa drylands have few options for earning income. Micro finance facilitates access to capital and gives women the opportunity to establish small-scale businesses. In Kenya, Utooni Development Organization helped villagers create small loan programs that enabled women to establish businesses selling vegetables and fruits. Micro finance has similarly enabled women in Ghana (DIF) to purchase ruminants and diversify their diets and sources of income, and women in Zambia (KATC) to open grocery stands and shops selling second-hand cloth. Women in northern Kenya have accessed NRT's micro-credit scheme to establish handicraft enterprises, tailoring businesses and butcheries. One woman used a micro-credit loan from NRT to purchase a solar panel and establish a mobile phone charging business in her village. Women use the income from their new businesses to pay their children's school fees, buy household goods and pay for healthcare. The ability to own a business and secure an independent source of income broadens women's opportunities to participate in communities as economic actors. Such initiatives empower women, raise their status in the community and improve community stability and well-being.

- **Engaging youth –** Out-migration of youth is a serious problem in sub-Saharan Africa drylands and exacerbates community instability. Activities aimed at retaining youth broaden participation, strengthen communities and build long term capacity. Investments in education are critical to a community's long-term capacity building, and more than half of the initiatives profiled (Shewula Trust, MBOMIPA, NRT, Union AVIGREF, Heiveld Co-operative, AVTPE, AZN and the Association des Pépiniéristes et Planteurs de Tône-Ouest) have significantly invested in construction of new schools, improvements to existing schools and the issuance of scholarships. In an effort to retain youth, Association Zoramb Naagtaaba established the Training Centre for Rural Planners (CFAR), a three-year apprenticeship in Sahelian agricultural practices for youths aged 14 to 18. The coursework leads to a certificate in rural development, providing a cornerstone for the long-term establishment of agricultural expertise in the region. Other AZN initiatives aimed at youth include the establishment of computer labs at local schools and the launching of Ciné-Yam, a program to create educational and environmental documentaries for local screenings and internet releases. The Association Tchadienne des Volontaires pour la Protection de l'Environnement (ATVPE) in Chad engages youth through online environmental contests, training in soil management and tree planting activities during National Tree Week. ATVPE created a special peer-to-peer learning program for youths called Savoir pour Sauver (Knowledge for Life) wherein youths are taught knowledge and skills (e.g., young girls learn how to become guides at the national tree nursery) and pledge to pass on their learning to their peers. These programs broaden participation of youth in society and give them valuable training for the future.

Lessons in broadening participation:

- Improving women's access to land mitigates environmental degradation, improves community food security and supports local livelihoods.
- Micro-credit loan schemes give entrepreneurial women opportunities to access capital and establish small-scale enterprises, thereby broadening economic participation.
- Investments in education and outreach to youth build community capacity and reduce out-migration of youth.



Ensure Effective Governance

Effective governance is essential to the basic functioning of communities in sub-Saharan Africa. It is central to garnering community support, ensuring security, promoting community development and implementing collective action. Well-governed initiatives foster learning and experimentation, broaden participation, build trust and enhance community resilience to perturbations.

The majority of the organizations profiled in the drylands case studies adhere to democratic principles and are overseen and implemented by general assemblies and boards of directors bound by constitutions and articles of incorporation. A number of the organizations, including NRT, MBOMIPA, FUMA Gaskiya, Union AVIGREF and AZN, have nested layers of governance wherein villages or farmers' unions elect representatives to a general assembly that oversees the umbrella organization. This multi-layered structure of governance enhances transparency, local access to representatives and community oversight. Inclusion of outside agents on the boards of local organizations further prevents conflict within communities. The Northern Rangelands Trust in Kenya, for example, reserves seats on its council of elders for members of the Kenyan Wildlife Service, NGOs, private sector companies and local authorities. This diversity of representation and perspectives within the council of elders adds strength to the governing process and tempers local political tensions. Independent third-party auditing of community financial accounts builds further trust and accountability with member constituents, as practiced by Union AVIGREF in Benin, NRT in Kenya, MBOMIPA in Tanzania and the Heiveld Co-operative in South Africa.

Democracy is a relatively new governance concept in some patriarchal communities in sub-Saharan Africa drylands. Some of the more successful drylands initiatives have gained political support by consulting with traditional authorities before implementing their programs. This is particularly true of rural development projects in Ghana (DIF) and Chad (ATVPE) where local NGOs were able to secure land rights for women farmers after intensive consultations with local chiefs and authority figures. The creation of the Shewula Nature Reserve in Swaziland would have been impossible without the support of the local chief. In Zambia, members of KATC annually meet with local headmen to promote the adoption of organic farming methods at the village level. The Northern Rangelands Trust's conflict resolution team is led by a retired senior chief and nine elders known for their skills in conflict resolution. Incorporation of traditional authority into the organization's structure legitimizes its authority and acceptance among member conservancies.

Lessons in ensuring effective governance:

- Democratic elections, transparent decision-making and independent auditing of organizational finances increases governance transparency and builds trust within drylands communities.
- Inclusion of traditional authorities in the design and implementation of development initiatives in sub-Sahara Africa is critical to their long-term success and viability.
- Multi-layered structures of governance improve transparency, local access to representatives and community oversight.

SUB-SAHARAN AFRICA DRYLANDS CASE STUDIES

Introduction

Drylands cover 40 percent of the Earth's surface and are home to over 2 billion people, 90 percent of whom live in developing countries. Sub-Saharan Africa is characterized by a high prevalence of drylands – defined as ecosystems that have limited precipitation – and 65 to 70 percent of its population is directly dependent on the harvest of rain-fed agriculture and other natural products.

Across the region, two-thirds of productive land is affected by land degradation and desertification, representing a direct threat to local livelihoods. This translates into an annual loss of over 3 percent of agricultural gross domestic product as a direct result of nutrient and soil loss due to poor land management practices, with associated economic costs estimated at 9 billion USD per year.

The ultimate causes of environmental degradation are complex, stemming from a combination of economic, social, and ecological factors. Ecological drivers such as deforestation, intensification of agriculture, and overgrazing are amplified by socio-economic challenges of the region, including high population growth (the population is expected to double, reaching 1.5 billion by 2050), exceptionally high rates of poverty (83 percent), high incidences of HIV/AIDS (25 million people living with HIV, nearly 70 percent of the global total), and political instability, all of which can reduce the resilience of local communities to environmental stresses. Environmental and socio-economic dimensions of the problem continually interact, leading to a reinforcing downward spiral of increasing poverty, higher pressure on scare environmental resources, and further environmental degradation.

This negative feedback loop is further complicated by the climatic variability of drylands ecosystems. Variability is a characteristic of all drylands, but many of the complexities of climate in the sub-Sarahan Africa are intensified by characteristics of the African continent itself, including the size of the land mass, high proportion of drylands, complex hydrological systems, and dust exported from the land surface to atmosphere. These factors contribute to drastic year-to-year changes – the Sahel experiences variations in annual rainfall of 30 to 40 percent, for example – that require continual adaptation by the local communities that depend on these ecosystems for their survival. This innate climatic variability also renders the region particularly vulnerable to the effects of climate change, such as higher temperatures, water scarcity, unpredictable precipitation, and higher rainfall intensities. It is clear that any attempt to address land degradation must also support community resilience, while simultaneously developing livelihoods, enhancing community well-being, restoring degraded environments, and bolstering the social, economic, and ecological resources needed to weather difficult years.

Previous interventions to halt land degradation have often been driven by top-down planning processes, where land users are not actively involved in identifying problems or finding solutions. Many interventions have been sector-based, such as high-input approaches to increase agricultural production, and have met with limited success in addressing what is a multi-dimension problem.

In recent years, however, the essential role of local and indigenous communities in promoting sustainable land management and fostering socio-economic wellbeing has come to greater prominence. The UN Convention to Combat Desertification explicitly recognizes the importance of community participation in sustainable land management and the fight against desertification. Indigenous groups, local communities, and civil society organizations can provide critical insight into the local context, using local-level experience to contribute to an improved understanding of sustainable land management and to inform land management policies.

The following case studies, which provide clear evidence of the importance of local communities, highlight 15 different community-based initiatives that illustrate best practices in sustainable land management across the sub-Saharan Africa region. Each of the different case studies tells the story of community leadership in addressing social, environmental and economic issues that are specific to drylands ecosystems.

The Case Studies

Association des Pépiniéristes et Planteurs de Tône-Ouest, Togo

Overview:

Family farming and mushroom cultivation are the twin tools of the Association des Pépiniéristes et Planteurs de Tône-Ouest (Association of Nursery Workers and Horticulturists of West Tone) in responding to the land degradation, low agricultural yields, and high rates of poverty that have resulted from decades of slash-and-burn farming. Local incomes have doubled, with new revenue streams invested in over 100 villages into education, health and childcare. Association activities have helped to reduce bush fires and uncontrolled logging and restore soil fertility. The group has also undertaken reforestation efforts in 20 communities that have improved forest cover and restored ecosystem functioning. Additionally, these actions have increasingly reinforced the level of solidarity among local communities on the ground, in a region where social cohesion suffers from an excessive demographic pressure on the lands.

Mushroom farming – a traditional agricultural practice that had fallen into disuse due to deforestation – has been successfully reintroduced in this dryland ecosystem to address poverty, improve soil fertility, promote organic agriculture, and reduce incidence of fires during the dry season.

Basic facts:

Equator Prize Winner: 2014
Founded: 2007
Location: Tône, Savanes region, northeast Togo
Beneficiaries: 105 villages, 9,000 people
Biodiversity: Shrub savanna

Key impacts and lessons:

- The association has planted over 57,000 trees and trained 50 farmers in nursery management, 46 in agroforestry techniques, and 8 farmer groups in mushroom composting.
- Community-run nurseries have sold 46,000 seedlings, bringing in over 10,000,000 CFA Francs (17,400 USD).
- Innovative outreach and media, including rural radio programs and door-to-door outreach have proven critical in the program's success.

Association Tchadienne des Volontaires pour la Protection de l'Environnement (ATVPE), Chad

Overview:

Association Tchadienne des Volontaires pour la Protection de l'Environnement (Chadian Volunteers' Association for the Protection of the Environment) trains women and youth in ecosystem restoration and agroforestry to combat drought, land degradation and desertification in Chad. The association negotiates with local chiefs to secure women's access to degraded plots of land, which are subsequently restored to productive farmland. Training in agroforestry and the manufacture of solar cooking stoves provides youth with alternative livelihood options. Youth are trained to serve as environmental ambassadors in the wider community – public, political and religious realms – and sensitize people to the importance of environmental conservation and land rights for women. Trainings have resulted in increased farmland production which is providing greater food security and reducing out-migration of youth in rural Chadian communities.

Basic facts:

Equator Prize Winner: 2014
Founded: 1996 (recognized as an NGO since 2004)
Location: Hadjer Lamis and Chari-Baguirmi Regions, western Chad
Beneficiaries: 37 villages, 43,000 people
Biodiversity: Sahelian ecological zone

Key impacts and lessons:

- The restoration of lands in Domboya has inspired villagers to try to double their yields in the next few years. In the village of N'gatoya, the women's group Al-Haya harvested 11,200 kilograms of rice, enough to provide food security for the entire year and a surplus for sale.
- The agroforestry training program for youth resulted in the tripling of crop yields in one village, improving community welfare and reducing out-migration of youth to cities.
- To address deforestation and promote rural livelihoods, ATVPE trained more than 80 craftsmen in the production of solar cookers, who in turn trained other workmen and youth in their villages.

Association Zoramb Naagtaaba (AZN), Burkina Faso

Overview:

Developed in response to water scarcity, environmental degradation, declining agricultural yields and high rates of poverty, Association Zoramb Naagtaaba brings together 10 villages to restore degraded land through the reintroduction of traditional agricultural approaches. In demonstration plots set up by local farmers, sorghum yields have tripled and space has been created for farmers to learn first-hand about pond and hedge techniques that restore land and improve productivity. Hedgerows have been used to recover storm water without any further erosion to the land. Tree-planting efforts are improving soil fertility and reducing run-off and degradation. Solar electric fences are used to protect crops from grazing livestock, while agricultural extension services are provided to reach farmers working their own land.

Basic facts:

Equator Prize Winner: 2014
Founded: 1989
Location: Oubritenga and Kourwéogo Provinces, Central Plateau District, Burkina Faso
Beneficiaries: 10 villages
Biodiversity: Land reclamation, Sahel region

Key impacts and lessons:

- To date, AZN has facilitated the establishment of more than 500 hectares of hedgerow-enclosed farmland on the Mossi Plateau in the villages of Guié, Cissé-Yargho, Douré and Doanghin, and another 155 hectare project is currently in progress.
- In 2013 plant production increased by 55 percent and sales increased by 153 percent compared to 2012. Over the past eight years, Association Zoramb Naagtaaba's nursery has produced more than 220,000 tree seedlings, 80 percent of which are native species.
- An annual "Festival of the Rural World" brings community members together from all 10 villages, promoting social cohesion, and spreading the adoption of sustainable technologies.

Fédération des Unions de Producteurs de Maradi Gaskiya (FUMA Gaskiya), Niger

Overview:

Fédération des Unions de Producteurs de Maradi Gaskiya (Gaskiya Federation of Maradi Farmers Unions) is a research-driven initiative that is bringing agro-ecological options to smallholder farmers. Comprised of 17 unions, 325 producer organizations and 12,742 members, the work includes promotion of high-yield crops, participatory planning, marketing of produce and organic certified seeds, as well as the diversification of agricultural production systems. Farmer incomes have improved significantly, with a percentage of union revenues invested into a revolving fund for community projects. Fast-growing and off-season crops are being introduced to provide food security and alternative sources of income for local women. Community radio has been used as a medium for information exchange, knowledge transfer and education.

Basic facts:

Equator Prize Winner: 2014
Founded: 2002
Location: Maradi region, Niger
Beneficiaries: 17 unions, 325 producer organizations, 12,742 members
Biodiversity: Sahelian agriculture

Key impacts and lessons:

- Between 2008 and 2012, the number of seed producers in FUMA Gaskiya increased from 8 to more than 200, creating job opportunities and ensuring that members receive high-quality seed.
- FUMA Gaskiya facilitated the production and marketing of more than 45 tons of certified, improved millet seed over the past five years, generating more than 36,000 USD and resulting in seeds that are more adapted to drought conditions.

- Engaging women in the selection of seed trials has proven extremely important; women's input and preferences were used in selecting varieties of okra, hibiscus and Cassia, and for a promising new millet cultivar that produced superior quality crops in subsequent plantings. The enthusiast response of local farmers to the new millet cultivar has helped improve the recognition and status of women's knowledge.

Fédération Woobin, Senegal

Overview:

In response to severe environmental degradation due to deforestation, soil erosion and mudslides that resulted in the loss of almost all fertile agricultural land, Fédération Woobin instigated an ambitious project to counter erosion, restore soil health and reforest their lands. The federation, which is comprised almost entirely of women (95 percent), has integrated scientific and local knowledge to implement a diverse range of techniques to foster environmental restoration and agricultural productivity, including: stone barriers, infiltration pits, bunds, reforestation, plant weirs and Zaï cultivation. The impressive impacts of this initiative include reduction of soil erosion, raises in the water table, rehabilitation of land for agriculture, return of native endangered species, diversified livelihood options and increased social cohesion and return of youth and men from the cities.

Basic facts:

ENDA Good Practice Initiative 2013
Founded: 2006
Location: Keur Moussa, Thies Deparatment, Senegal
Beneficiaries: 10 villages
Biodiversity: Sudanian ecological zone

Key impacts and lessons

- In cases of severe erosion and land debilitation, initial restoration efforts must include technical solutions to reduce runoff and increase water infiltration.
- Reforestation efforts, combined with other methods to improve soil fertility, can facilitate the return of native species and improve agricultural systems.
- Restoration of basic ecosystem services has powerful social and economic impacts for local communities, fostering social cohesion and the creation of alternative livelihoods.

Heiveld Co-operative Limited, South Africa

Overview:

The Heiveld Co-operative is a member-owned organization of socially marginalized, small-scale rooibos tea farmers in Northern Cape Province, South Africa. Formed in 2001, the co-operative's mission is to sell exceptional quality cultivated and wild rooibos tea to organic and fair trade markets for the betterment of their community. The co-operative pays fair prices to its members, produces local jobs, follows sustainable land management practices, promotes gender equity and reinvests profits back into the local community. As a result of its work over the past 14 years, Heiveld Co-operative members, once a disenfranchised group, have greater food security, higher incomes, greater self-esteem and tighter social cohesion.

Basic facts:

Equator Prize Winner: 2014
Founded: 2001
Location: Suid Bokkeveld (nearest village, Nieuwoudtville), South Africa
Beneficiaries: 74 members and their families
Biodiversity: Fynbos biome

Key impacts and lessons:

- Collective mobilization to access fair trade and organic markets has led to an increase in production from 30 to 70 tons of rooibos sold per year, tripled the income of co-operative members and acted as a job creation engine within the co-operative and on member farms.
- Participatory action research has enabled the community to set the standard for sustainable management of wild and cultivated rooibos, assess the impacts of climate change and disseminate information about topics including organic farming, resource mapping, water management soil conservation, pest control and climate change adaptation.
- Integration of biodiversity and climate change research, a focus on optimizing supply chain benefits and attention to community needs in times of scarcity can provide a robust model to achieve ecological, economic and social sustainability.

Initiative pour le Developpement et L'Adaptation au Changement Climatique (IDACC) Association, Madagascar

Overview:

Initiative pour le Developpement et L'Adaptation au Changement Climatique (IDACC) Association (Association for Development and Adaptation to Climate Change), in collaboration with a range of community, governmental and educational organizations, works to support local water management and adaptation to climate change in Madagascar through the implementation of drip irrigation. Drip irrigation is the most efficient irrigation technique known, with an 80-90 percent efficiency rate, and is therefore highly useful in dryland agricultural systems. By making this technology available to local farmers, the project has documented a 75 percent reduction in water use, an 80 percent reduction in plant disease risk, a 40 percent decrease in watering time and a 50 percent increase in revenue. By making drip irrigation accessible and facilitating community dialogue around water use and sustainable agriculture, the initiative provides a key contribution to climate change adaptation in the Vakinankaratra region.

Basic Facts:

ENDA Good Practice Initiative 2013
Founded: 2000
Location: Vakinankaratra region, Madagascar
Beneficiaries: Market gardeners and farmers
Biodiversity: Madagascar and Indian Ocean Islands Biodiversity Hotspot

Key impacts and lessons:

- Implementation of drip agriculture has led to a 75 percent reduction in water use, an 80 percent reduction in plant disease risk, a 40 percent decrease in watering time, and a 50 percent increase in income.

- High costs of installation are almost immediately offset by increases in income and water conservation.
- Installation of culturally and ecologically appropriate technologies is an effective means to foster broader dialogue around water management and adaptation to climate change.

Integrated Development in Focus (DIF), Ghana

Overview:

By equipping women with financial and technical resources to restore degraded lands and develop small-scale enterprises, Integrated Development in Focus is improving crop yields and local incomes. Women-led groups have planted three million trees and restored 350 hectares of land. Community members working in communal labor prepare and maintain individual plots of land on a rotating basis. Farmers are trained in organic farming techniques and are supported to access new and more lucrative markets for their produce. Growth is ensured through a model whereby each woman who receives training is responsible for training ten other women as a condition of support. Small-scale businesses have been launched in livestock rearing, composting and organic vegetable cultivation. Partnerships with local municipalities, chiefs and elders support fire management and environmental watchdog committees.

Basic facts:

Equator Prize Winner: 2014
Founded: 2005
Location: Ga West District, Greater Accra Region, Ghana
Beneficiaries: Farmers in six communities (300 and growing)
Biodiversity: Land reclamation

Key impacts and lessons:

- To date, farmers have planted more than 3 million trees on lands degraded by sand mining, within a watershed that feeds the Densu Delta, an internationally-significant wetland complex recognized under the Ramsar Convention.
- Seven hundred and fifty metric tonnes of domestic waste, once previously burned, are now composted and used to enhance soil fertility -- farmers produce nearly 15 kilograms of compost daily for use on farms as well as for sale, with the result that more than 70 percent of farmers are now re-investing income in small livestock and pens to further stabilize and diversify their livelihoods.
- The land reclamation initiative addressed a difficult environment problem and was accomplished by a formerly marginalized group of women with little or no education – via organic farming, agroforestry and small animal livestock, but also through creating new bylaws to protect reclaimed lands from sand mining, the formation of neighborhood environmental watchdog committees, and through participation and networking in district, regional and national conferences.

Kasisi Agricultural Training Centre (KATC), Zambia

Overview:

Reaching over 10,000 small-scale farmers, Kasisi Agricultural Training Centre (KATC) provides organic agricultural extension services, research, and marketing support to local farmers. Demonstration plots are used for hands-on learning and for agricultural research. The center maintains a production site where dairy cows, sheep and other livestock are raised and the milk is sold to a neighboring cheese factory. Through extension services and direct training to farmers, the center has helped improve local maize yields to levels well above the national average, resulting in greater food security and improved incomes. Crop rotation, reforestation, new irrigation schemes and agricultural diversification have all contributed to the conservation and sustainable use of local ecosystems. Biodiversity fairs have been used to help farmers share knowledge on crop diversity, apiculture, and agroforestry techniques. The center oversees a village saving initiative, which has enabled several women to start small-scale enterprises.

Basic facts:

Equator Prize Winner: 2014
Founded: 1974
Location: Chongwe and Rufunsa Districts, Zambia
Beneficiaries: 10,000 small-scale farmers
Biodiversity: Organic agriculture and sustainable land management

Key impacts and lessons:

- Conversion to organic agriculture using KATC methods has increased the cash income of local farmers by more than 800 percent over the course of two agricultural seasons.
- Outreach and training projects have increased food produced for household consumption by 170 percent, and promoted a diversified diet through the addition of products such as milk, honey, fruits, a variety of vegetables and moringa leaves, leading to an increase in food security, nutrition and community wellbeing.
- Initiatives that quantifiably demonstrate the significance of organic techniques to improve soil fertility, increase food security, and boost income can play a critical role in policy development, especially in a countries such as Zambia where organic agriculture is not formally recognized or supported.

Matumizi Bora ya Malihai Idodi na Pawaga (MBOMIPA), Tanzania

A community-based organization of 22 villages, Matumizi Bora ya Malihai Idodi na Pawaga (MBOMIPA), works with 56,000 people living adjacent to Ruaha National Park in Tanzania on sustainable natural resource management and anti-poaching efforts. The association established a community-run wildlife management area and is promoting wildlife-based livelihoods as a means to ensure biodiversity conservation. Revenue generated from the wildlife management area is split among member villages and has been invested in healthcare, education and infrastructure. Living fences are used to support food security by keeping elephants and other wildlife from destroying crops. MBOMIPA's wildlife management area was legally gazetted in 2007 and has been used a model for replication in other regions as a way to protect wildlife and promote sustainable livelihoods.

Basic facts:

Equator Prize Winner: 2014
Founded: 1997
Location: Iringa region, central Tanzania
Beneficiaries: 22 villages, 56,000 people
Biodiversity: Ruaha National Park; Rungwa-Kizigo-Muhesi ecosystem; iconic African wildlife

Key impacts and lessons:

- 21 villages have set aside 777 hectares of land for the creation of a wildlife management area to provide wildlife-based livelihoods.
- Profits from the wildlife management area are used to fund schools, build health clinics and improve local infrastructure, including water and roads, both of which are critical to health and livelihood.
- Hunting and ecotourism provide villagers with full- and part-time jobs and create markets for local goods; for example, 37 village game scouts are employed full-time by the Pawaga-Idodi Wildlife Management Area.

Northern Rangelands Trust (NRT), Kenya

Overview:

Northern Rangelands Trust is a network of 27 community conservancies – which together cover over 31,000 square kilometers of land in northern Kenya – driving a movement of community-based conservation that puts indigenous communities at the forefront of land management, wildlife conservation and sustainable livestock practices. Supporting more than 315,000 conservancy members, the trust has helped address endemic problems ranging from droughts, ethnic rivalries, a lack of access to government services (health and education) and wildlife poaching. New revenue streams through livelihoods diversification and improved land management practices have been directed towards local education and health infrastructure. Thousands of hectares of degraded pasture have been restored, along with a degree of peace and economic stability in this historically volatile region.

Basic facts:

Equator Prize Winner: 2014
Founded: 2004
Location: Northern Kenya
Beneficiaries: 27 community conservancies, 315,000 people;
Biodiversity: Rangeland restoration; iconic and endangered African wildlife

Key impacts and lessons:

- More than 1.8 million hectares of land in 14 conservancies are now under improved management, and the restoration of grasslands has brought back herbivores such as oryx and the endangered Grevy's zebra.

- In 2014, conservancies and related businesses employed 765 full-time and 641 part-time employees, and tourism produced another 186 full and part-time jobs for conservancy members, which contributed 47.6 million Kenyan shillings (461,000 USD) to conservancy coffers.
- A "Livestock to Market" program rewards conservancies that have implemented sustainable rangeland management practices and can significantly improve livelihoods; in 2014, 1063 pastoral households earned 68.3 million Kenyan shillings (660,000 USD) from cattle sales, representing a 300 percent increase from the previous year.

Shewula Trust, Swaziland

Overview:

The Shewula Trust is an innovative community-based natural resource conservation initiative based in northeastern Swaziland. The community oversees a 2,650 hectare community-owned nature reserve that complements ongoing conservation efforts in adjacent reserves through the creation of wildlife corridors, and that acts as an anchor for culture- and nature-based tourism. An eco-lodge attracts tourists to the area, providing jobs and income-generating opportunities for the community. Profits from the eco-lodge are re-invested in the community, supporting restoration of the nature reserve, eco-agriculture initiatives and the wellbeing of HIV/AIDs orphans. The success of the Shewula Trust provides an example of how community-owned reserves can become integral components of national and transboundary protected area strategies.

Basic facts:

Equator Prize Winner: 2014
Founded: 1999
Location: Lubombo Mountains
Beneficiaries: 13,000 people
Biodiversity: Maputaland-Pondoland-Albany Hotspot, habitat restoration

Key impacts and lessons:

- Ownership of wildlife conservation and ecotourism by the community, which previously viewed protected areas as elitist and exclusionary, has led to the protection of 2,650 hectares of land, provided livelihood options for nearly 100 community members and generates approximately 400,000 Rand (31,500 USD) per year.
- Collaboration with Hlane Royal National Park, the Mlawula Nature Reserve, the Mbuluzi Game Reserve and the Nkhalashane Siza Ranch, has led to the formation of the 60,000 hectare Lubombo Conservancy. This is the largest conservation area in Swaziland and is part of the broader Lubombo Trans-frontier Conservation and Resource area (South Africa-Swaziland-Mozambique).
- Trans-border initiatives, particularly that involve community-managed areas, are critically important for conserving wildlife corridors in biodiversity hotspots that span multiple countries, and for promoting sustainable livelihoods.

SOS Sahel Senegal, Senegal

Overview:

In the Louga region of Senegal, "Action Dakar" is an innovative program implemented by the non-profit organization SOS Sahel Senegal in partnership with local communities in order to address the twin issues of environmental degradation and poverty. The project focuses on working with women's groups to build fuel-efficient stoves with local materials, leading to a 2/3 reduction in wood consumption, reduction in firewood demand and deforestation, increases in household income, and empowerment of women. Complementary activities include reforestation (561,410 trees), home gardens (120 micro-gardening tables), and land restoration (1,204 hectares).

Basic Facts:

ENDA Good Practice Initiative 2013
Founded: 2002
Location: Louga region, Senegal
Beneficiaries: 341,000 individuals and their families
Biodiversity: Sahelian ecological zone

Key impacts and lessons:

- 5,267 fuel-efficient stoves have been built in order to decrease firewood demand that drives deforestation in the area.
- Land restoration work has planted 561,410 trees, protected 538 hectares of agricultural land, and rehabilitated 1,204 hectares of degraded land.
- By training women to build and use fuel-efficient stoves, the project has decreased time spent collecting firewood and empowered women to pursue alternative livelihoods.

Union des Associations Villageoises de Gestion des Réserves de Faune (Union AVIGREF) Pendjari, Benin

Overview:

In the buffer zone of the Pendjari Biosphere Reserve in northwest Benin, Union des Associations Villageoises de Gestion des Réserves de Faune Pendjari (Union AVIGREF) (Union of Village Associations for the Management of Pendjari Wildlife Reserve) achieved a milestone victory by petitioning and receiving government permission to co-manage the Pendjari Biosphere Reserve. In addition to ensuring that economic dividends from game hunting in the reserve reach local communities, Union AVIGREF promotes sustainable practices in reserve buffer areas by moving local cotton production towards organic and fair trade practices. In response to chemical pesticides and fertilizers that were having deleterious effects on ecosystems and human health, the union is promoting organic certification as a pathway to sustainable development. Although organic cotton fields produce smaller yields, the cotton can be sold at a higher price and farmers do not have to absorb the costs associated with chemical fertilizers. By investing in organic cotton, the association is creating a sustainable market supply chain for more than 450 producer groups. Crop rotation has improved food security and complements the cotton cash crop economy.

Basic Facts:

Equator Prize Winner: 2014
Founded: 2001
Location: Northwestern Benin;
Beneficiaries: 28 villages, 36,000 people
Biodiversity: Pendjari Biosphere Reserve, W-Arly-Pendjari complex

Key impacts and lessons:

- Co-management of the Pendjari Biosphere Reserve has given Union AVIGREF rights to 30 percent of all revenue from permitted game hunting within the biosphere reserve (38 million FCFA in 2013, 64,00 USD) which is used to fund schools, health centers, eco-guide salaries, and infrastructures.
- Land devoted to cotton production has risen from an initial area of 55 hectares in 2008 to 300 hectares in 2014 and produced 90 tons of organic cotton valued at 28,000,000 FCFA (47,000 USD).
- Integrated wildlife conservation must include livelihood benefits to communities living in reserve buffer areas, including dividends from protected area profits and strategies for sustainable activities in the buffer zone such as organic agriculture, collection of non-timber forest products, and small-scale livestock farming.

Utooni Development Organization (UDO), Kenya

Overview:

Utooni Development Organization (UDO) is a Kenyan NGO dedicated to improving the lives of subsistence farmers living in environmentally degraded, drought-prone, arid and semi-arid lands. The organization takes a holistic approach to development that promotes water and food security and environmental restoration through the construction of sand dams and the introduction of drought resistant crops, soil conservation strategies and tree planting. Sand dams provide ample, clean water to communities for decades, resulting in increased agricultural yields, environmental restoration, improvements in community health, and the creation of income opportunities.

Basic facts:

Equator Prize Winner: 2014
Founded: 2002
Location: Machakos, Makueni and Kajiado Counties
Beneficiaries: 75 self-help groups, 22,200 individuals
Biodiversity: Dry lands management, habitat restoration

Key impacts and lessons:

- More than 1,500 sand dams have been constructed in south central Kenya, each of which can hold as much as 10 million liters of water and support a community of 1,000 through an entire dry season.
- Complementary activities in terracing, reforestation and promotion of locally-adapted plant varieties have transformed arid and semi-arid landscapes into highly productive farmland.
- Simple technology based on traditional knowledge can provide critical services that are widely applicable to water conservation throughout an entire region.

RESOURCES

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Equator Initiative: www.equatorinitiative.org

ENDA: www.endatiersmonde.org

OSISA: www.osisa.org

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