CHAPTER 3 CASE STUDIES

ROUTES TO RESILIENCE

IN THIS REPORT WE ARGUE THAT COMMUNITY-BASED NATURAL resource management that springs from genuine community demand can nurture enterprises that both generate considerable income and improve the state of local ecosystems. Under the right conditions, these enterprises can scale up, achieving a significant poverty reduction effect. The case studies in this chapter chronicle three instances where significant scale and income effects have been achieved. The cases detail the governance conditions, principal actors, and enabling conditions that allowed these successes to go forward, as well as the challenges they have faced and must continue to deal with in order to sustain their success.

The cases also demonstrate that enterprises founded on a basis of good environmental governance can not only improve the livelihoods of the rural poor but increase their resilience to continuing challenges. They can become more economically resilient—better able to face economic risks. They and their communities can become more socially resilient—better able to work together for mutual benefit. And the ecosystems they live in can become more biologically resilient—more productive and stable.

The three case studies in this chapter are as diverse in their geography as they are in the ways the communities involved have worked to improve their lives through the management of local natural resources. They illustrate the power of self-interest and community ownership, the enabling value of intermediary organizations, and how communication and networks can provide new ideas and support.

These cases also illustrate simply how hard this all is—that nothing achieves the perfection of plans on paper, that progress takes time and support, but that lives can improve and communities can get stronger.

Fisheries for the Future: Restoring Wetland Livelihoods in Bangladesh
A change in how the government grants access to freshwater fisheries in three major watersheds has restored these fisheries and the lives of the poor in the communities around them. Page 112.

Green Livelihoods: Community Forestry Enterprises in Guatemala
Government-granted forestry concessions in the Maya Biosphere Reserve have reduced illegal deforestation while slowly improving the economies of the communities responsible for them. Page 126.

Turning Back the Desert:
How Farmers Have Transformed Niger's Landscapes and Livelihoods
Long-term engagement by NGOs has transformed traditional and sustainable agricultural practices and in the process has literally changed the landscape of this arid country even as it has improved lives. Page 142.

FISHERIES FOR THE FUTURE

Restoring Wetland Livelihoods in Bangladesh

EIGHT YEARS AGO, A FULL FISHING NET WAS A RARE SIGHT ON THE EASTERN SHORES of Hail Haor wetland in remote northern Bangladesh. Even the wildfowl for which the area was renowned had been driven away by shrinking habitat and hunters. For the very poor villagers who made up the majority of local residents, and whose food and income depended on fish and aquatic plants, life was increasingly desperate. Households competed fiercely to buy fishing rights from the local elite. These few people, mostly large landowners and businessmen, controlled access to local water bodies (known as *beels*) that contained water year round, purchasing government leases which they then offered to the highest bidder.

Today the residents of Hail Haor area enjoy food and income security. Conflict over fishing rights has been replaced by cooperation, with villagers patrolling a no-fishing sanctuary and voluntarily paying dues to harvest a newly excavated beel. Degraded bird and fish habitat has been restored by local labor. Fish catches have almost doubled, and two locally extinct species have been successfully reintroduced (MACH 2005a; MACH 2005b).

This turnaround in fortunes has been achieved under an innovative pilot program in people-led wetland management that is drawing attention from policymakers across South Asia. Based on the "co-management" of wetlands by new community institutions and local government, the Management of Aquatic Ecosystems through Community Husbandry (MACH) program, funded by the United States Agency for International Development (USAID), has revived fisheries in three degraded wetlands, improving the circumstances of 184,000 of Bangladesh's poorest citizens (MACH 2006:2).

Success is rooted in community self-interest and ownership. In return for adopting conservation measures and sustainable fishing practices, community organizations (each representing several adjacent villages) receive 10-year leases to manage local waterways as well as grants to excavate silted beels and create wetland sanctuaries. To offset the hardships caused by fishing restrictions, poor households also receive skills training and micro-loans to start new enterprises. Between 1999 and 2006, fish catches in project villages rose by 140 percent, consumption went up by 52 percent, and average daily household incomes increased by 33 percent (MACH 2007:10,12,32; Whitford et al. 2006:7).

While the long-term sustainability of these benefits cannot be judged yet, community-led wetlands management and livelihood diversification have improved the ability of some of Bangladesh's poorest inhabitants to survive economic downturns, environmental disruption, and the potential impacts of climate change on the country's low-lying floodplains. By protecting wetlands from further overexploitation and degradation, communities have also improved the environmental resilience of the resources on which their lives and livelihoods depend.

So clear-cut have been the ecosystem and anti-poverty benefits that the government of Bangladesh has replicated key elements of MACH's approach in other fishing areas and in a pilot program for community-led management of protected forest areas. It has also adopted MACH's co-management model in its new Inland Capture Fisheries Strategy, reversing a decades-old policy of centralized control over the floodplains

that cover half the country and on which 70 million people depend for food and income (Whitford et al. 2006:5; MACH 2007:47; Thompson 2006:1).

A Road Map for Wetland Revival

Located at the confluence of three major rivers—the Ganges, the Brahmaputra, and the Meghna—Bangladesh is rich in natural resources, especially water and fertile soils. Its freshwater wetlands are among the world's most important, harboring hundreds of species of fish, plants, and wildlife and providing a critical habitat for thousands of migratory birds (MACH 2007:1). But their productivity has come under increasing pressure as the population has increased, exceeding 140 million people in a territory of only 144,000 km²—an area the size of Nepal with nearly five times the population (Whitford et al. 2006:7).

Siltation caused by forest clearance, drainage for agricultural development, and the construction of flood embankments has shrunk inland fishing grounds, especially during the area's six-month dry season. Overexploitation and pollution have decimated fish stocks and other aquatic life, including edible plants harvested by the poor (Thompson 2006:1,3). The consequences have been devastating for millions of fishing households, one of the poorest segments of Bangladeshi society. Between 1995 and 2000, freshwater fish consumption fell by 38 percent among the poorest 22 percent of Bangladeshis (World Bank 2006:46), and in 2000 the World Conservation Union (IUCN) classified 40 percent of Bangladesh's freshwater fish species for which data are available as threatened with extinction (IUCN Bangladesh 2000 as cited in Thompson 2006:1).

Long-standing government policies intensified this ecological crisis. Bangladesh's ruling classes traditionally viewed wetlands as wastelands to be "recovered" for agricultural production, which fostered indiscriminate development. Between the mid-1960s and the mid-1980s alone, about 0.8 million ha of floodplain were drained (Sultana 2006a:1). Fishing rights were also geared to maximizing government revenue rather than conserving natural resources. Most inland fishing waters in Bangladesh are government property, and the Ministry of Land leased short-term harvesting rights to the highest bidder. This not only encouraged overfishing, it was also fundamentally inequitable. Fishing rights were concentrated in the hands of those wealthy enough to afford the prized leases, while depriving poor fishing households of access (MACH 2006:1).

Recognizing these shortcomings and encouraged by foreign donors, including USAID, Bangladesh's government began restricting wetland drainage in the late 1990s (MACH 2006:2-1, 4-2). It also launched several experimental wetland restoration projects that devolved management rights to communities or local government, with national and international nongovernmental organizations providing capacity-building and technical support (MACH 2006:1).

The nine-year, US$14-million MACH program was perhaps the most successful and high-profile of these projects. Jointly developed and funded by the government of Bangladesh and USAID, MACH's objective was to act as a national testing ground for community-led natural resource management, with field operations in more than 110 rural fishing villages (Whitford et al. 2006:18; Thompson 2006:1).

Four highly experienced NGOs were selected by the Bangladesh government and USAID to implement the program and act as intermediary organizations between communities and local and national government. US-based Winrock International, which specializes in sustainable resource management projects, devised the new institutional arrangements and provided overall program management, while three national NGOs implemented the field work.

The Bangladesh-based Center for Natural Resource Studies (CNRS), which specializes in community-based floodplain restoration, helped communities establish Resource Management Organizations (RMOs), decide environmental priorities, and monitor the impacts of project activities. Caritas Bangladesh, a Catholic human development agency with a long record of working with poor, landless, marginalized communities across the country, oversaw income generation and microcredit lending among poor wetland users. The Bangladesh Center for Advanced Studies, a leading environmental research group, provided short-term specialists in hydrology and fishery biology to inform physical restoration works and fish restocking. Its staff also undertook research and advocacy on water quality, pollution, and cleaner practices in the textile dyeing industry and advised on policy reform (MACH 2007:3-4).

As the program will be completed in 2008, it is too early to assess either the long-term sustainability of the new institutions it established or the durability of benefits to fish stocks and habitats. Still, MACH's success to date has been impressive enough for international donors and government policymakers to view its co-management approach as a potential model for natural resource management beyond Bangladesh's borders (Thompson 2008).

Wealth from Water: The MACH Approach

The three wetlands targeted in the MACH program faced a representative range of development pressures and ecological threats. Hail Haor in the Sreemangal administrative subdistrict in northeast Bangladesh is a wetland region fed by 59 hill streams and renowned for its fish and birdlife but threatened by siltation and soil erosion caused by farming practices in the surrounding hills. Turag-Bangshi, a low-lying floodplain in Kaliakoir just north of Dhaka faces encroachment by agriculture, irrigation works, and industrial pollution. And Kangsha-Malijhi in the Sherpur district of north central Bangladesh is prone to flash floods worsened by the deforestation of surrounding hills (MACH 2003:ix; MACH 2007:5).

Out of 450 villages using these intricate ecosystems of rivers, streams, and beels, the 184,000 people living in 110 communities most dependent on wetland resources were targeted for project activities (MACH 2006:2). Average household income was US$500 a year in 1999 when field operations began (Deppert 2006a). Most families relied either fully or partly on fish and aquatic plants for food and income (MACH 2006:1). Wetlands in Bangladesh are highly seasonal, making year-round livelihoods precarious, a fact of nature exacerbated in the project areas by the overexploitation of dry-season water. In an average year, water coverage shrinks from a wet-season peak of 13,000 ha to a dry-season minimum of 3,000 ha in Hail Haor, from 8,000 to 700 ha in Turag-Bangshi, and from 8,000 to 900 ha in Kangsha-Malijhi (MACH 2007:5).

MACH's approach to reviving these fishing grounds and boosting local incomes was simple but radical: enabling communities to co-manage wetlands and gain access to fishing rights on a secure and equitable basis through new institutions that represented all local stakeholders.

Traditionally, highly-sought-after fishing rights to *jalmohals*—government-owned areas that hold water year-round—were leased to the highest bidder for three years by the Ministry of Land. Fisheries were therefore controlled by well-off lessees, who either hired professional fishers to work for them or charged poor fishers tolls. This system created little incentive to conserve local fish stocks or protect wetland ecosystems, and many poor people were deprived of access (Hughes 2006).

The first step in devolving wetland management was two years of intensive community consultations to identify local wetland threats and develop a consensus on solutions in the form of Participatory Action Plans. In each cluster of villages, field officers from the Center for Natural Resource Studies were careful to bring all stakeholders into the process, including local councilors, small businessmen, landowners, and teachers as well as poor fishing families and the landless (Sultana 2006b:4). While this approach ran the risk of local elites dominating the process, it helped ensure that the new wetland management institutions and their programs for action had full community support. It was applauded by independent evaluators who visited MACH villages in 2006 and described collaboration across interest groups as "essential if the Resource Management Organization is to articulate a credible management plan and stand up to powerful interests, such as former leaseholders or government officials" (Whitford et al. 2006:6–7).

BENEFITING PEOPLE AND NATURE: KEY MACH ACHIEVEMENTS 1999–2006

Building Environmental Capital

- Sixty-three sanctuaries established, covering 178 ha; 57 ha of beel wetland and 31 km of water channels excavated.
- Fishing restrictions have aided habitat and fish stock recovery.
- Fishing pressure in 110 project villages fell by 2,500 person hours per day.
- Some 644,000 trees planted to replace lost swamp forest and reduce erosion.
- Wetlands restocked with 1.2 million fish from 15 native species, including 8 threatened fish species (MACH 2007:11–13; 15; Sultana 2006b:2).

Building Economic Capital

- Members of 5,202 wetland-dependent households received training and credit to start new livelihoods (MACH 2007:32–33).
- Project works provided 2 million days of local employment (MACH 2007:13).
- Average daily household incomes rose by a third, to US$1.31 (MACH 2007:33).
- Fish production rose 140 percent and consumption increased by 52 percent (Whitford et al. 2006:7).

Building Social Capital

- New community institutions provided a forum for cooperation among different interest groups, including poor fishing families, better-off landowners, and local businessmen (MACH 2007:57).
- Co-management arrangements with local government provided support and sustainability for the new community institutions.
- Endowment and revolving credit funds enabled these new institutions to function independently after project finance ended (MACH 2007:45; MACH 2006:4.13–4.17).

Creating Institutions, Empowering Communities

The next step involved establishing the institutional framework for communities and local government to co-manage the wetlands on their doorsteps. Three new types of institutions were created—at the village, wetland, and local government levels, as well as one village-level federation. *(See Table 1.)*

The first priority was establishing 16 Resource Management Organizations to take over day-to-day control of wetland management. These represented a radical departure from the status quo, as community institutions had rarely played a role in natural resource management in Bangladesh. Each organization had jurisdiction over part of the wetland ecosystem, incorporating several villages. All local wetland users—fishers, farmers, women, aquatic plant harvesters, and other resource collectors—were represented in its membership, along with other local stakeholders such as farmers (MACH 2006:2; Sultana 2006b:1–5).

After each RMO had drawn up a constitution, annual budget, and wetland management plan, with MACH assistance, it was registered with the government's Social Welfare Directorate and awarded 10-year leases to manage and harvest local water bodies by the Ministry of Land. The only condition was prompt payment of annual dues, which were set at lower rates than those charged to individual leaseholders (MACH 2006:2; MACH 2007:19–22).

This granting of medium-term tenure rights was critical to engaging communities' self-interest in the success of the fledgling resource management institutions. Previously fishers and other wetland harvesters could only receive annual permits and had no say over wetland management. Awarding villagers a measure of control over the natural resources on which they depended gave them a compelling reason to invest time and resources in the new governance institutions. By 2006, RMO memberships (ranging from a few dozen to several hundred people) and their elected executive committees had successfully developed, implemented, and enforced wetland restoration plans and equitable harvesting rights across 25,000 ha of permanent and seasonal wetlands (MACH 2007:v, 20).

A second tier of local wetland governance—the co-management institution—was established at the *upazila* (subdistrict) administrative level, in the form of Local Government Committees (renamed and formalized by the Bangladeshi government in 2007 as Upazila Fisheries Committees). These brought together local administrators, elected local councilors, and community representatives from both RMOs and village-based wetland user groups representing poor households. Their role was to coordinate wetland management activities within their boundaries, approving RMO management plans and measures and arbitrating conflicts. They therefore had the final say over wetland development, marking a significant departure from the status quo in which wetland management decision-making was passed down from ministries in Dhaka to local government administrators, bypassing communities (Deppert 2006a).

TABLE 1 WETLANDS MANAGEMENT INSTITUTIONS, MACH PROGRAM

Management Institution	Membership	Role
Resource Management Organization (RMO)	All local wetland users and local stakeholders	Exercises day-to-day control of wetland management
Local Government Committee (Upazila Fisheries Committee)	Local administrators, elected local councilors, community representatives from RMOs and RUGs	Coordinates wetland management activities within their boundaries, approves RMO management plans and measures, arbitrates conflicts, has final say in wetland development
Resource User Group (RUG)	Poor fishing families, aquatic plant collectors, and landless people	Creates opportunities for skills training, microcredit loans
Federation of Resource User Groups (FRUGs)	Resource User Groups	Helps RUGs become self-sufficient through training in literacy, record-keeping, and other skills

Sources: Deppert 2006a; MACH 2006:2; MACH 2007:30; Sultana 2006a:2-4; Sultana 2006b: 1-5

Five such committees were established, each chaired by the senior local administrator—the Upazila Nirbahi Officer—with the Upazila Fisheries Officer acting as secretary. Other members included the elected chairmen of local councils (Union Parishads) and local government officials responsible for land management and agriculture as well as the leaders of local RMOs and Resource User Groups (RUGs). Every member had equal voting rights, and the committees provided a new forum for communities to exert influence and voice their needs (MACH 2007:3).

Darrell Deppert of Winrock International, who headed the MACH program until late 2007, describes the innovative Upazila Fisheries Committees as the key to the program's success and long-term sustainability. "They are the backbone required to support community-based institutions in sustainably managing wetlands for the benefit of all users. I am often told by poor community members that to sit at the same table as elected officials and government administrators is very important and empowering" (Deppert 2006a).

While the co-management committees fostered local government investment in sustainable fisheries, the third tier of new institutions created by MACH helped win over the poor. Drawing on existing successful microcredit programs in Bangladesh, Caritas organized village-level Resource User Groups (RUGs), targeting poor fishing families, aquatic plant collectors, and landless people. Each group elected a chairperson, and members applied for skills training and microcredit loans to start new livelihoods. These activities were managed by Caritas Bangladesh, which also provided literacy and nutrition programs (Sultana 2006a:2-4).

The objective was twofold: to prevent the poor being penalized by fishing restrictions imposed by RMOs to regenerate wetlands and to reduce pressure on fisheries by helping the poor gain access to new and more profitable livelihoods. By the end of 2006, project villages boasted 250 RUGs with 5,202 members, bringing income benefits to more than 25,000 people (Sultana 2006a:2; MACH 2007:30; Deppert 2006a). In 2004, the village groups were organized into 13 Federations of Resource User Groups (FRUGs), which employed staff to help member groups become self-sufficient via training in literacy, record-keeping, and other key skills. By 2007, these federations had been registered as independent organizations with the Bangladesh government's Social Welfare Department, had taken control of the revolving microcredit funds built up by the project, and were operating independently of Caritas (MACH 2007:30).

Wetland Management by the People, for the People

Each Resource Management Organization was given jurisdiction over a distinct area of one of the three project wetlands. These were typically made up of a series of beels and streams and a floodplain that were connected during the monsoon months but isolated in the dry season (MACH 2003:25-26).

After it was legally registered, an RMO's first step was to hold community planning meetings to identify the main problems affecting local wetlands. These generally included the following concerns: siltation due to soil erosion, overharvesting and use of harmful fishing gear, destructive fishing methods such as the dewatering of deeper pockets in the floodplain to catch fish sheltering in the dry season, industrial pollution, and blocked fish migratory routes.

To address these problems, the RMOs adopted wetland management plans dictating when and where fishing could take place, banning harmful practices, and outlining physical interventions, such as excavating corridors between dry-season water bodies. These were developed by the membership following community consultations and were implemented by elected executive committees of 10–20 people. Once their plans were approved by Local Government Committees, the

TYPICAL COMMUNITY WETLAND MANAGEMENT MEASURES

- Creating small sanctuaries, usually of 10 ha or less, where fishing is banned year-round, enabling fish and other aquatic organisms to repopulate the wider floodplain during the wet season.
- Excavating silted-up channels to create new dry-season habitat and increase water flow and fish movement in the wider wetland.
- Observing two- to three-month fishing bans during the early monsoon fish spawning season.
- Banning damaging practices such as dewatering in the dry season.
- Banning hunting of wetland birds.
- Planting indigenous wetland and riparian swamp trees.

Source: MACH 2006:4.1–4.5

new community organizations were awarded leases for local water bodies, which they paid for by collecting dues from fishers. MACH NGOs provided guidance, technical support, and grants to implement the conservation plans (MACH 2003:xii, 29–31). Field staff from Caritas and the Center for Natural Resource Studies also trained RMO committee members in wetland conservation and tree restoration techniques, accounts and record-keeping, good governance practices, and other key skills (MACH 2003:20).

Promoting Ownership and Equity

Implementing these measures called for significant community investment, cooperation, and sacrifices before the benefits started flowing. Fishing was banned in the sanctuaries that formed the cornerstone of most RMO plans, and fishers had to stop using equipment that encouraged overfishing, such as fine mesh nets that caught immature fish before they had time to reproduce. In some areas, poor families accustomed to supplementing their diet by hunting birds or collecting plants could no longer do so (MACH 2006:4.1–4.2). Those who wanted to join RMOs were expected to volunteer their time free of charge and usually to pay annual dues of about 5 taka (US$1=70 taka) (MACH 2005b).

To win over skeptical citizens, RMOs supported by field-workers from Caritas and the Center for Natural Resource Studies used a variety of measures. In the public arena, these included rallies, public meetings, and street theater to raise awareness of conservation benefits. To foster transparent decision-making and allay suspicions of corruption, RMOs held open meetings from the outset and set two-year term limits for executive committee members. Following early experiences in which relatively wealthy individuals dominated decision-making, they also mandated that a majority of members must be poor resource users, owning less than 0.2 ha of land (Deppert 2006a; MACH 2007:24–25). Most RMOs also use secret ballots to elect office-holders. Regular meetings are held with fishers and landowners to agree on management plans and rules and to set user fees. In order to broaden participation, most RMOs have also set up subcommittees for financial audits, sanctuary management, and tree plantations (MACH 2007:21).

Perhaps most important for their constituencies, RMOs have provided fair and equitable access to harvesting grounds for all resource users, while adopting a pro-poor approach that has favored a majority of local citizens. Commercial fishers are charged a one-time annual toll during the harvesting season, while those fishing for subsistence receive free access. Dues are lower than those charged by former profit-seeking leaseholders, with executive committees seeking only to cover operational costs and the annual leasing fee (MACH 2007:v–vi, 48).

Independent evaluators commissioned by USAID to visit MACH villages in 2006 reported that the new governance arrangements had significantly empowered the poorest citizens. "The project has been notably successful in improving the social standing of poor fishermen, traditionally near the bottom of the social ladder." One beneficiary eloquently described the improvement of his lot to the evaluation team: "'Before, we were nothing, but now our dignity has increased so that we can shake hands with all kinds of people'" (Deppert 2006a; Whitford et al. 2006:25).

The experience of the Jethua Resource Management Organization in Hail Haor is typical. Its 42 founding members elected a 13-strong executive committee that organized public meetings and won community approval to lease and excavate a 2.4 ha perennial beel, guaranteeing a year-round harvest to local

fishers. Within the beel, a 0.5 ha sanctuary was created where fishing was banned in order to regenerate the wider wetland, and two species of locally extinct fish have been successfully reintroduced. The RMO borrowed 42,000 taka (US$600) from MACH to create the sanctuary, which it repaid through user dues within two years. Within five years, fish catches had almost doubled, to 231 kg/ha. In 2004, having proved its sustainable management credentials and boding well for the future, the RMO obtained leasing rights to a much larger neighboring beel, covering 250 ha (MACH 2005a).

In the few areas where enforcing new rules such as seasonal fishing bans and no-fishing sanctuaries has been a problem, communities have responded by organizing volunteer wetland patrols to deter rule-breakers (MACH 2005c). With community approval, CNRS also pioneered the design and use of concrete fish shelters, using local labor to construct more than 22,000 hexapod-shaped devices and place them in sanctuaries. These both provided additional feeding habitat and made it very difficult to catch fish, which congregate and hide among them (MACH 2006:4-4).

Resource Management Organizations have also exercised newfound influence by successfully overcoming resistance from powerful former leaseholders who did not want to hand over control of wetlands. Such successes have often been achieved with the support of local fisheries officials or council chairmen, underlining the worth of the new co-management arrangements in strengthening communities' hands. Although fisheries law in Bangladesh is generally poorly enforced, in three cases RMOs supported by Upazila Fisheries Committees have succeeded in upholding fines on groups of fishers that broke harvesting rules (MACH 2007:59–61). The evaluation team commissioned by USAID also noted that the co-management structure had "equipped the poor to resist pressure from the powerful" and that they found "no examples of elite benefit capture" in the project villages (Whitford et al. 2006:8).

Whether this remains the case after project funding ends is an open question. But in 2006–2007 MACH boosted RMOs' survival prospects by awarding the Upazila Fisheries Committees endowment funds whose annual returns could be used to continue making grants to RMOs for habitat restoration and management. By guaranteeing a future revenue stream, these provided a clear incentive for communities to retain their loyalty both to the institutions and to sustainable wetland and fisheries practices (MACH 2007:vi).

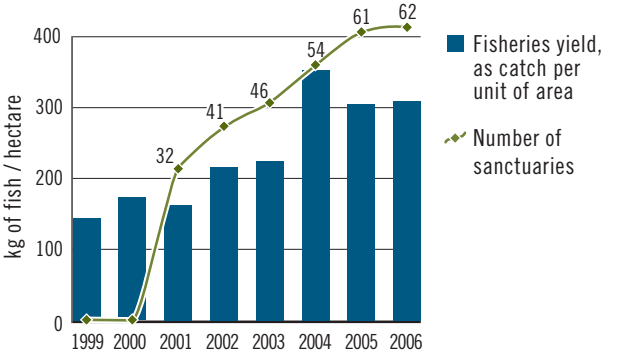
Community Dividends: More Fish, New Livelihoods

As a pilot government program, close monitoring of social and environmental impacts was an essential component of MACH's activities. To establish a baseline, NGO field staff set up 23 monitoring locations in 1999, representing all types of wetland habitat. Every 10 days during the project, field staff and village monitors designated by RMOs recorded the number of people fishing, their hours, and the weight of the catches (MACH 2007:35).

The resulting data were dramatic and unequivocal. Fish yields more than doubled with wetlands in community hands, from average catches of 144 kg/ha in 1999 to 327 kg/ha in 2007 (MACH 2007). Fish consumption, recorded every three days by local women in 29 villages, rose by 52 percent overall between 1999 and 2004, from 32 to 48 grams per person a day (MACH 2006:2–3). Wetland diversity also expanded, with threatened fish species successfully reestablished, migrating birds returning, and aquatic plants recovering, including the shingra fruit harvested by poor families (MACH 2007: 12, 112).

For families used to unpredictable fish harvests, the most important benefit has been the revival of fish catches. By 2004, fishing effort had fallen by almost 2,500 hours a day across project

FISH YIELD AND FISH SANCTUARIES, MACH SITES, 1999–2006



Source: MACH 2007:11, 53

villages due to harvesting restrictions and a shift among fishing households to alternative livelihoods that offered greater income and stability (Sultana 2006b:2). Yet MACH communities still earned US$4.7 million more from local fish sales in 2004 than they did in 1999 due to the revival of wetland habitats and, consequently, of fish stocks (MACH 2006:4-18). MACH has also speeded this process by funding the reintroduction, under RMO supervision, of almost 1.2 million fish from 15 native species (MACH 2007:12).

New livelihoods have also played a significant role in rising prosperity and ecosystem recovery, underlining the importance of linking conservation activities to income generation. Modeled on established community microcredit schemes in Bangladesh, the first micro-loans were awarded by Caritas a year after MACH began operating. To qualify, households had to own less than 0.2 ha of land, join their local men's or women's Resource User Group, and agree to save a minimum of five taka a week (MACH 2007:34; Costa 2006:2). Members were encouraged to take up new or part-time occupations to compensate for times of year when fishing was banned and to reduce pressure on wetland fisheries against the backdrop of a rising population. They were given access to training and loans covering 35 occupations ranging from poultry, duck, and goat rearing to nursery plantation, mechanics, electricians, and sewing (MACH 2006:4-17). Most beneficiaries sold their goods or services locally, but some reached wider markets. Clothing traders, for example, have begun buying items tailored by RUG members, while wholesalers collect eggs from their poultry farms (Begum 2007).

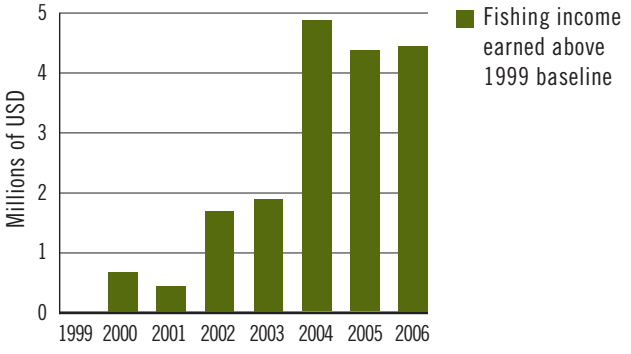
Between 2000 and 2006, a total of 14,829 loans were handed out to RUG member households, supporting enterprises that collectively brought in more than US$800,000 (MACH 2007:33,53). Four thousand of the borrowing families reported that their incomes rose by at least 70 percent thanks to their new alternative activities (MACH 2007:33). Credit recovery rates are an impressive 96 percent, reflecting the successful outcome of loans and community buy-in (Whitford et al. 2006:8).

MACH infrastructure activities also generated short-term employment for poor households, particularly through the excavation of 31 km of link channels between dry-season water bodies and 57 ha of shallow beels. These excavations provided 2 million days of manual labor while enriching thousands of hectares of wetland by creating new perennial waterways (MACH 2007:13).

Dividends for Women

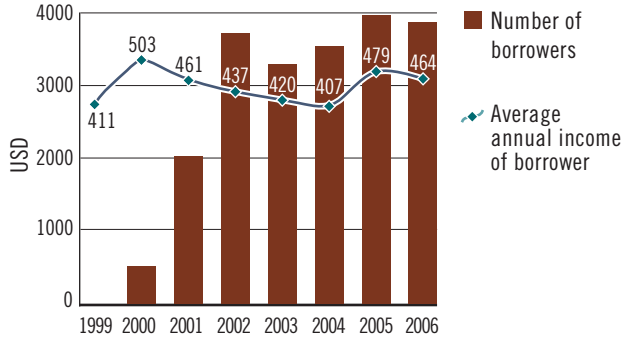
Women's participation in decision-making of any kind is rare in Bangladesh, particularly in the conservative rural areas where MACH operated. As Bangladeshi women do not fish (although they collect other aquatic resources such as plants), many communities argued that they had no place in wetland management. MACH field staff, however, worked hard to overcome these cultural norms and set a 25 percent target for female membership of resource management organizations. By 2006 all

ADDITIONAL INCOME FROM FISHING IN MACH COMMUNITIES



Source: MACH 2007: 53

BENEFITS OF ALTERNATIVE INCOME LOAN PROGRAM



Source: MACH 2007: 53

Sofia Begum started a home-based poultry business with a loan from her local Resource User Group.

16 RMOs included women on their executive committees and about 20 percent of all members were female (MACH 2006:4-7, 20). Caritas also established 83 women-only resource user groups, to encourage wives to embark on new independent livelihoods (MACH 2007:31).

The evaluation team commissioned by USAID described these efforts to empower poor women as an "outstanding achievement" of the project. "By insisting that a proportion of positions be filled by women…the project has forced the pace of social change," its stated report. "At several sites, the team encountered women members willing to speak forthrightly about their concerns and their role in the project—even interrupting the men" (Whitford et al. 2006:25).

MACH's integrated livelihoods program has also offered a concrete route to female empowerment. A third of village user group members are women, hundreds of whom have benefited from skills training and micro-loans (MACH 2007:31).
Toyobul Islam, president of the Kalapur Federation of Resource User Groups in Sreemangal district, has overseen dozens of loans successfully disbursed for new enterprises, including poultry, duck, and goat rearing, tree nursery management, and sewing. "This support has opened up new opportunities for members, especially women," he says. "Traditionally women are confined within the four walls of their houses. Now with money in their hands they have become economically empowered and more confident" (Tanvir 2006:10).

Sofia Begum (see photo above), a former housewife from Chenguria village in the Sherpur district of northern Bangladesh, is a good example. She joined the local women's resource user group in 2002, borrowing 3,000 taka (US$43) to buy wood that her husband made into furniture and sold for a profit. The couple then took out a second loan to open their own small furniture shop. "I knew if we could build more things, better things, we would make more money," she says.

With the shop flourishing, Sofia took out a third loan, for 10,000 taka (US$143), to start a home-based poultry business. She attended a two-day training course and bought 144 chickens. The hens bring in around 11,500 taka (US$164) per month, and Sofia's children now attend school. Once Sofia repays her latest loan, the family will be self-sufficient, now a common pattern in her village. Among the 20 members of the Chenguria women's group, which Sofia chairs, 15 live in households that no longer need to fish for an income (MACH 2005e).

Conservation Dividends

The main job of the 57 sanctuaries established so far by communities was to allow fish to breed and repopulate the wider floodplain, but they also yielded benefits for the ecosystem. A richer diversity of aquatic life as well as bird populations was harbored in the protected waters, with 47 plant species reestablished. In 2003 the government designated eight of the most ecologically sensitive areas as permanent sanctuaries (Thompson 2008; Whitford et al 2006:18; MACH 2006: 4.1–4.2).

The most spectacular example of this trend is the renaissance of Hail Haor's internationally renowned birdlife. The wetland's migratory waterfowl population, once numbering in the tens of thousands, had shrunk to a few dozen by the late 1990s, decimated by overhunting and human disturbance. In 2003 the Ministry of Land agreed to set aside a 100 ha permanent sanctuary in Baikka Beel and to forgo leasing payments, handing over management responsibility to Borogangina RMO,

MACH NGOS AND DONORS: AGENTS FOR CHANGE

The NGOs that implemented the MACH program were not only critical to its success in the 110 project villages. In acting as intermediaries with government agencies, national policymakers, donors, and the wider NGO community, they also had an impact well beyond the program's geographic boundaries. Their work has thus been a practical example of the kind of value added by intermediary NGOs, as discussed in Chapter 2.

Due to MACH's status as a pilot project for potential replication in various natural resource sectors, the government of Bangladesh and the United States Agency for International Development (USAID) decided from the outset to involve prominent and highly experienced organizations in its implementation. Winrock International, a nonprofit NGO with technical experience in natural resource management in 40 countries, was contracted not only to oversee program implementation but also to devise the detailed framework for the makeup, responsibilities, and operation of the new co-management institutions. Likewise, the recruitment of Caritas, the Center for Natural Resource Studies, and the Bangladesh Center for Advanced Studies (BCAS)—three national NGOs with proven track records (in, respectively, livelihood development, fishery and wetland management, and environmental policy) and with highly qualified staff—was based on the desire to lay the groundwork for success in the field.

This approach was costly, both in terms of finances and field staff per hectare (Whitford et al. 2006:18). However, a 2006 evaluation of MACH's effectiveness by independent consultants acknowledged the critical role of intermediaries in its success, stating: "The project correctly recognized that creation and sustaining of beneficiary organizations would require frequent face-to-face contact from project staff with considerable training in rural development and social awareness. Thus the combination of a major consulting firm, with considerable experience in the technical aspects of the project, with three prominent NGOs, with excellent organizational skills, has proved very effective" (Whitford et al. 2006:18). The evaluation did warn that the "intensity of financial and staff resource use does raise some questions for replicability" (Whitford et al. 2006:18). MACH's final report to USAID estimated, however, that the agency's investment would achieve a "more than healthy" internal rate of return of 56 percent and a benefit-cost ratio of 4.7, based mainly on the documented upsurge in fishing income (Thompson 2008).

The reach, experience, and networking ability of the MACH NGOs also enabled the program's positive lessons to be absorbed by both government officials and other NGOs and to be widely disseminated. Personnel from Caritas and the Center for Natural Resource Studies organized site visits and seminars for policymakers from the Ministry of Fisheries and Livestock and the Ministry of Land and for donors and community development NGOs. They also replicated MACH's physical interventions in nine sites near Dhaka as part of a separate community-led wetland management project implemented by the Department of Fisheries (MACH 2007:38–41).

At a macro policy level, the government of Bangladesh has asked MACH staff to advise on a range of natural resource programs, including the high-profile Coastal and Wetland Biodiversity Management Project funded by the United Nations Development Programme and the Global Environment Facility (MACH 2003:xiii). Representatives from Winrock and the Bangladesh Center for Advanced Studies also played a key role in the development of the Ministry of Fisheries and Livestock's 2006 Inland Capture Fisheries Strategy (Whitford et al. 2006:17). BCAS, which helped formulate Bangladesh's environmental policy framework, and Winrock, which shared staff with another project that supported the Department of Fisheries in developing its strategies, were particularly well placed to exert their influence on the strategy, which embraces key MACH approaches (Thompson 2008).

As the program's reputation has spread in development circles, the MACH NGOs' influence and reach has also extended overseas, with delegations of policymakers from Nepal, Cambodia, Viet Nam, Brazil, and other resource-rich developing countries seeking to exchange ideas and learn lessons (Thompson 2008).

Role of USAID

As a major donor to the government of Bangladesh, the US Agency for International Development has developed a broad environmental agenda in the country, with impacts and influence well beyond the funding and scope of individual projects. Its latest Program Objective for Environment seeks to strengthen natural resource management by the Government of Bangladesh and national NGOs via key themes, including implementation of effective community-based resources management mechanisms, habitat restoration, policy promotion, and improved institutional capacity.

The MACH program, mostly funded by USAID, covered all these areas. Its success enabled USAID to influence national policymaking, both through the Inland Capture Fisheries Strategy and the government's latest Poverty Reduction Strategy Paper, its keystone development blueprint. The latter describes floodplain fisheries as having "particular significance for poverty reduction goals." In the future, it stated, the Department of Fisheries would "preserve…and make more productive use of inland capture fishery through community based participation of fishermen and fishery related stakeholders" (MACH 2007:75).

In 2003, USAID's community-led, co-management approach was also formally extended to terrestrial ecosystems, in partnership with the Ministry of Environment and Forests. A pilot program to preserve threatened tropical forests is centered on devolving power to new local institutions in five wildlife-rich protected areas (Whitford et al. 2006:14,19).

which has since banned all fishing, bird hunting, and harvesting of edible water plants (MACH 2007:47). By 2007, a midwinter census recorded more than 7,000 water birds in Baikka Beel, including such rare species as the Pallas' Fish Eagle and Greater Spotted Eagle (MACH 2007:38), and MACH had built a watch tower to accommodate an influx of ecotourists. The Bangladesh government is now applying for Hail Haor to receive international protected wetland status under the Ramsar Convention (MACH 2007:vi).

Land-based habitat management has also brought conservation dividends. Communities planted more than 600,000 trees from 48 native species to restore swamplands and wetland border forests and to counter erosion on the banks of rivers and streams. Over the long term, the tree planting program will also bring economic benefits to communities. While the swamp forests will be preserved, tree branches can be lopped for fuel and for brushwood that is placed in the water to attract fish. MACH also estimates a healthy return from the first felling cycle of non-swamp trees at US$1.04 million in today's prices between 2015 and 2020. Through benefit-sharing agreements a substantial part of this will go to community organizations, with the rest reserved for landowners and local government (MACH 2007:14-15; 53).

Career fisherman Jamir Uddin struggled to survive as once bountiful catches declined across Sherpur wetland in the 1990s. To make extra money he began collecting and selling peanuts, and in 2001 he took out a MACH micro-loan to start his own shop. Three loans later, his expanding general goods store makes 30,000 taka (US$428) a year in profits, a sum he describes as unimaginable in his former occupation: "I saw that if I quit fishing and devoted myself to a shop full time I could make more money," he says as he greets customers. "This shop has changed my life." (MACH 2005d)

Sustaining Success: Lessons and Challenges

Two clear advantages help to explain the MACH program's success as a conservation and anti-poverty initiative: the large sums of donor money invested and government support for decentralizing wetland management. But there were several other key elements that reflect the framework laid out earlier in this book and that have wider resonance.

First and most important, the program was built on communities' self-interests. Villagers were granted rights and powers to use natural resources and responsibilities to manage and protect them. If they failed, their livelihoods and investment (of user dues and time volunteered) were at stake. Second, because of the co-management arrangement with local administrators, these new institutions were not isolated; they worked well within the existing governance framework. Third, the implementing NGOs worked effectively as intermediary organizations—acting as a bridge between villagers and local and national governments to develop democratic, equitable, and effective community-based institutions. Fourth, effective networking, outreach, and organizational scale-up over the nine years of the program prevented the project villages from being mere temporary islands of good practice. Instead, the new institutions were left on a good footing to prosper after donor funds and NGO expertise began to be withdrawn in 2007. Fifth, endowment funds for RMOs and revolving credit funds for resource user groups provided financial security once the project funding dried up.

As a result, the community institutions nurtured by MACH are now self-sufficient enough not only to survive but to prosper. So concluded the team of consultants sent to evaluate the program in 2006, reporting that most resource management organizations and user groups "appear capable of managing the fishery resources and income generation activities respectively [and] should be able to sustain themselves financially for the indefinite future" (Whitford et al. 2006:27).

The slow project phase-out has also helped community

institutions to plan ahead. Several Resource Management Organizations have demonstrated maturity and forward thinking in establishing "post MACH funds," while others have leased additional water bodies to generate more income. Darabashia RMO in Sherpur district, for example, which collects 20 taka a year from its 122 members and rents out access to fish shelters, has saved 33,676 taka ($US481) in a post-MACH fund (MACH 2005b).

Some challenges remain. Literacy rates are very low in some Resource User Groups, which will need to lean heavily on their local federation to survive once project field staff leave (MACH 2006:4.16). Within RMOs there is a risk that female membership will slip or that local elites will seek to re-exert their authority once project oversight is removed. There is also the prospect that, with fish populations recovering, communities will be tempted to overexploit the wetland bounty once again, and RMOs may face challenges to their authority.

The bigger clouds on the horizon, however, are related to national policy and government commitment. While Dhaka has pledged to renew wetland leases to RMOs when they become due, uncertainty remains about how many years the government will commit to. This could undermine community support for sustainable use of wetlands, since interest in the institutions established by MACH is based on long-term tenure.

Competing development priorities are also jeopardizing the impressive fishery gains made by some communities. In Kaliakoir, polluted water from an eightfold increase in textile-related industries over the last three years has caused fish kills in sanctuaries (Chowdhury and Clemett 2006:3). Water quality and treatment regulations exist but are not enforced, despite visits from representatives of the RMOs and the MACH NGOs. To address this, the Bangladesh Center for Advanced Studies, a MACH partner NGO, is working to identify cleaner technologies. It is also adopting a two-pronged lobbying strategy: trying to persuade the polluting industries to install effluent treatment plants while pressing the government to enforce existing water quality standards (MACH 2007: 16–19, 62–63).

Meanwhile, in Hail Haor and Sherpur, continuing deforestation of hills throughout the wetland catchments will result in growing siltation problems unless there are widespread changes in land use practices used in forests, tea estates, and farmland. These problems are common across Bangladesh's floodplains, suggesting that MACH's impressive achievements may not be sustainable over the long term unless its co-management approach is scaled up and applied across larger ecosystems, with full government backing (MACH 2007:76).

Toward a Sustainable Future: Scaling Up Community Fisheries

MACH's success in increasing fish stocks and fishing income was all the more marked in that it occurred against a backdrop of continuing ecological crisis in most of Bangladesh's floodplains. While it remains early, the co-management of wetlands appears to offer a route to preserving their environmental resilience—and hence the fisheries productivity on which millions of poor people depend. Sustainable harvesting, coupled with alternative livelihoods programs, has also boosted communities' economic resilience, while the creation of new community institutions has increased their social capacity. With fishing communities suffering around the country, this lesson has not been lost on the national government, which, with donor support, has begun to replicate MACH approaches both in the field and in national policymaking.

Quantitative Scale-Up

In 2006, for example, MACH field staff began helping Department of Fisheries' officers and communities to copy its physical conservation techniques in 10 degraded wetlands close to Dhaka (MACH 2007:38–39). The villages involved were supported by the Fourth Fisheries Project, a major Department of Fisheries program aimed at reducing poverty through increased fish production, funded by the World Bank and the United Kingdom Department for International Development (Thompson 2007). This project and others overseen by the Bangladeshi Department of Fisheries and Department of Environment have also copied MACH's pioneering efforts to replant native swamp trees along wetland borders. In addition, government agencies directly operating floodplain community projects, such as the Local Government Engineering Department, have adopted MACH best practices such as sanctuaries and habitat restoration (MACH 2007:41–42).

In 2003, MACH approaches were also extended to terrestrial ecosystems, forming the basis for a groundbreaking project to safeguard Bangladesh's threatened forests by devolving power to communities (Whitford et al. 2006:14). Bangladesh has less than 0.02 ha of forestland per person, the lowest ratio in the world, and those fragments that remain are under intense

LEARNING FROM BANGLADESH'S FISHERIES INITIATIVE

Pilot projects can have broader impact. The demonstrable success of the MACH program has spurred its adoption by the national government to cover all inland freshwater fisheries. The government is also instituting a project based on the lessons of the MACH program to safeguard and enhance the country's dwindling forest areas. It remains to be seen how these national commitments will be kept, but national policy recognition establishes a certain measure of accountability that will be hard to abandon.

A long-term commitment is necessary. The kind of political, social, and environmental changes reflected in the MACH program take time to develop and take permanent hold. USAID and Winrock's involvement over 9 years is exemplary for its dedication but also as an object lesson. The World Bank has observed that the single most important factor in the lack of success in community development projects has been the absence of a long-term commitment by donors.

Sustainably-managed resources have limits. Such resources can only provide so much economic benefit; the expanding needs of growing populations have to be accommodated. MACH developed an alternative livelihoods program from the start to help create other options for economic growth for community members, thus avoiding the destructive consequences of overfishing. Villagers were exposed to a variety of potential livelihoods and offered appropriate training.

Accommodate and include women. The alternative livelihoods program was embraced by the women in the communities, traditionally excluded from male-dominated fishing. Engaging women in such enterprises can increase the social capital of a community and hasten its exit from extreme poverty. Microfinance efforts in these communities have also engaged and empowered women, by giving them an important new role in family finances.

Local government is important. The MACH program, while establishing several new organizations—RMOs, RUGs—that aided the restoration and management of the inland fisheries, made sure such groups were not seen as a threat to local governance structures already in place. The legitimacy of local government is critical to continued social stability even as efforts like MACH bring about significant change in livelihoods in a community.

space for new settlements (Whitford et al. 2006:13). Nevertheless, they shelter many threatened and important species, including tigers, elephants, and gibbons, and provide livelihoods and food for around 1 million people. The Co-management of Tropical Forest Resources in Bangladesh project, known as Nishorgo, has set up fledgling stakeholder co-management councils and committees at community and forest ecosystem level in five wildlife-rich areas covering 23,000 ha. If it proves effective, the new governance system, a bilateral initiative of USAID and the Ministry of Environment and Forests, will be replicated across all 19 protected forests in the country (MACH 2006:13, 18–21).

Organizational Scale-Up

MACH's success was also founded on the networks it assiduously built at local and national levels. In particular, setting up Federations of Resource User Groups was vital to the sustainability of the 250 village-based RUGs, most of whose members were poor, illiterate, and lacking in skills and confidence. The 13 federations have offices (built by MACH) and paid employees (including former Caritas field officers) who trained user group office holders such as chairmen and secretaries in such skills as literacy, numeracy, and book and account keeping (MACH 2007:14, 30–32). By mid-2007, revolving credit funds totaling more than US$420,000, set up by Caritas to promote financial stability after project funding ends, had been handed over to the federations to administer (MACH 2007:vi). Without their continued operation and support, the survival of the Resource User Groups—which have helped to lift thousands of people out of severe poverty—would be in jeopardy.

As described earlier, the vertical networking between community institutions and local government at union (local council) and upazila (subdistrict) level has also played an essential role on several fronts: providing a forum for citizens' voices, fostering better local government understanding of wetland problems, and rooting the MACH institutions in existing governance structures.

This has been achieved most obviously through the cross-memberships of poor people in Federations of Resource User Groups, Resource Management Organizations, and Upazila Fisheries Committees. But it has also involved contacts made by RMO leaders and MACH staff with elected local councilors and with upazila officers working in fisheries, agriculture, livestock management, engineering, and social welfare, whose services have been tapped to assist the community institutions (MACH 2003:xi).

Political Scale-Up

The measurable success of MACH's community-led recipe for reviving wetlands (and of other similar projects in Bangladesh and the region) has prompted Dhaka to embrace this approach for all inland waters. In January 2006 the Ministry of Fisheries and Livestock approved a new Inland Capture Fisheries Strategy that adopted key MACH components, namely:

- Co-management of wetlands and fisheries through Upazila Fisheries Committees and community-based organizations; awarding of long-term wetland leases to the latter, for nominal payments, provided they adopted conservation-based plans and practices.
- Promotion of the best practices pioneered by MACH communities, including sanctuaries, restricted fishing seasons, and excavations.
- Alternative income programs for the poorest fishers, although without specified funding sources (Deppert 2006b:3).

If implemented, the strategy would eventually bring some 4 million ha of seasonal floodplains and about 12,000 government-owned

year-round water bodies—lakes, marshes, rivers, and estuaries—under community-led control. At a higher policy level, MACH's community-led approach has also been broadly endorsed in the government's latest Poverty Reduction Strategy Paper, which describes floodplain fisheries as having "particular significance for poverty reduction goals" (MACH 2007:47–48).

Putting these paper commitments into practice, however, will require major infusions of political will and public money. Key lessons for successful regional or national scale-up identified by the MACH partners themselves form a daunting to-do list, including:

- Provide all community resource management organizations with endowment funds and wetland leases for at least 10 years.
- Mandate local government to step up support and services for community institutions and to hold themselves accountable to citizens for results.
- Develop criteria and systems for regular reviews of community institution activities, to be jointly conducted by local government and citizens.
- Facilitate the sharing of best practices among community organizations and with government agencies.
- Train community organization representatives in record-keeping, budget preparation, revenue-raising, and preparation of resource management plans.
- At a national policy level, involve all relevant agencies, including those responsible for land management, fisheries, environment, agriculture, and water resources (Sultana 2006b:6).

Azharul Mazumder, Environment Team Leader of USAID/Bangladesh, is confident that sustainable co-management of floodplain fisheries can work for poor communities. But he is under no illusions as to the scale of the task ahead. "Doing business as usual will hardly do the trick," he says. To muster the required political will, "critical wetland habitats should be declared protected areas and brought under an ecosystem-based protected area management system. This will require a mindset change among the policymakers and an institutional change in the way relevant agencies perform management functions" (Mazumder 2006).

The MACH program and similar projects have provided a promising national road map for protecting natural resources while enhancing livelihoods. Policymakers in both developing and donor countries will be watching closely to see whether these efforts will be successfully replicated in the years ahead.

GREEN LIVELIHOODS
Community Forestry Enterprises in Guatemala

GUATEMALA'S NORTHERNMOST REGION, EL PETÉN, HOSTS A UNIQUE BLEND of natural beauty, biological diversity, and archeological heritage dating back to ancient Mayan civilization. The Petén's 33,000 km² of relatively undisturbed lowland tropical forests shelter 95 species of mammals, among them spider monkeys, pumas, and threatened jaguars, and 400 species of birds, including the iconic scarlet macaw (WCS 2006). The region is also home to an expanding melting pot of Guatemalan citizens: indigenous descendants of the Mayans, political refugees who sought refuge during 20 years of civil war, and economic migrants from the country's overpopulated cities and degraded highlands (Pool et al. 2002:92).

A decade ago, deforestation had diminished biodiversity and threatened forest-based livelihoods in the region. But the northern Petén is now the setting for successful community-run forestry enterprises whose sustainably harvested wood and non-timber forest products (NTFPs) are attracting the attention of overseas buyers.

Under the supervision of non-governmental organizations (NGOs), donors, and government agencies, community-owned forestry enterprises steward more than 420,000 ha in the multiple use zone of the renowned Maya Biosphere Reserve (MBR) (Chemonics 2006:16). These enterprises are each in charge of one distinct parcel of land – a concession - that the Guatemalan government has leased to them. Forest product sales from these enterprises have brought new employment, infrastructure, social cohesion, and income.

Between October 2006 and September 2007, the concessions produced some US$4.75 million in certified timber sales and close to US$150,000 in sales of *xate* (palm leaves used for flower arrangements) and other non-timber forest products (Rainforest Alliance 2007a:1; Nittler 2007). Under village management, biodiversity has flourished and forest fires, illegal logging, and hunting have declined dramatically, while continuing unabated in neighbouring national parks (Nittler and Tschinkel 2005:3; Chemonics and IRG 2000: A-IV-8).

By 2000, the forest concessions in the reserve managed by these community enterprises had become the world's largest tract of sustainably certified and community-managed forest (Chemonics and IRG 2000:A-IV-8). Prior to 2004, 10 enterprises had met the international certification standard of the Forest Stewardship Council (FSC) for sustainably harvested wood, and several were selling high-income finished products such as decking and floor panels in addition to timber (Chemonics 2006:17; Rainforest Alliance 2007b:2-3).

This transformation of fragmented communities of farmers and illegal loggers into eco-entrepreneurs did not occur in a policy vacuum. Government decentralization policies, which awarded communities tenure rights and resource management responsibilities, provided an enabling environment and motivation for communities to protect their forests. Substantial assistance from donors and intermediary support organizations provided the funds and the technical expertise to make the concession model work.

Progress toward financial and organizational independence has been slow and sometimes challenging, and the community enterprises are not all assured of a long-term future. The more successful ones now show signs of increased resilience. The overall results have proved promising enough for policymakers to consider scaling up the effort across the

region. Already, communities in Honduras are replicating the concession model, while government agencies from Nicaragua, Panama, and Peru have hired members of Petén's community-owned enterprises as consultants in sustainable forest management (Chemonics 2006:41).

From Conflict to Conservation: A New Forestry Approach

Twenty years ago, the region's future looked far less promising. Harvesting of non-timber forest products such as chicle (used to make chewing gum) had been the mainstay of the local economy for decades and had left the bulk of the forest relatively untouched (Chemonics 2006:5). But during the 1980s huge areas were haphazardly cleared as population growth and economic pressures fuelled illegal logging and burning of forests to make way for crops and cattle (Chemonics 2006:5). Illegal land use among new and long-term residents in and around the reserve was also abetted by lack of land tenure, endemic corruption, and the absence of law enforcement (Pool et al. 2002:E-4).

By the end of the 1980s foreign donors, particularly the United States and Germany, were pressuring the Guatemalan government to slow the destruction of this key section of the chain of Mayan forest running through Central America (Nittler and Tschinkel 2005:2).

In response, a new national agency, the National Council of Protected Areas (CONAP) was established in 1989 to administer and regulate activity within Guatemala's System of Protected Areas (Chemonics 2006:5). A year later, with the approval from the international environmental community, the Congress of Guatemala designated 2.1 million ha in the northern Petén as the Maya Biosphere Reserve (Nittler and Tschinkel 2005:2). Of this, 767,000 ha were designated "core zones" where all extractive activity was banned; 848,440 ha became a "multiple use zone" for sustainable harvesting activities. The remaining 497,500 ha made up a surrounding buffer zone with a mix of state-owned and private lands (Stoian and Rodas 2006a:1). The United States Agency for International Development (USAID) signed an agreement with Guatemala's government to conserve biodiversity and improve management within the Maya Biosphere Reserve, donating about US$10.5 million in the first 10 years. An additional US$11.9 million was contributed by the government of Guatemala and international NGOs (Pool et al. 2002:E-4).

Communities Take Over

CONAP's initial efforts to carry out its mandate to protect the reserve concentrated on battling illegal deforestation in its two designated national parks—Sierra de Lacandón and Laguna del Tigre—and on slowing agricultural clearing in the Buffer Zone (Chemonics 2006:6).

Assisted by local and international NGOs, the new agency emphasized centralized control and enforcement, which alienated local communities. Local loggers unwilling to abide by restrictions attached to CONAP's permits were legally barred from harvesting timber, but the overstretched agency was unable to enforce these bans. Illegal felling and land occupation continued unabated despite the introduction of park guards and checkpoints, measures that angered some members of the local population. CONAP offices were burned, and one official was murdered (Pool et al. 2002:10). Estimates suggested that for every cubic meter of cedar or mahogany cut legally in the region, three meters were illegally felled (Pool et al. 2002: E-2). Intensifying the ecological crisis, the 1992 ceasefire in Guatemala's civil war and subsequent Peace Accords in 1996 prompted returnees from Mexico and other areas of Guatemala to settle in parts of the Petén that had been declared protected parks (Nittler and Tschinkel 2005: 2,5).

By 1994, it was clear that CONAP's punitive approach was not working. As the situation grew increasingly chaotic, a group of concerned foresters proposed awarding communities harvesting rights in the multiple use zone, thus fostering their self-interest in the reserve's success. Backed by national NGOs, their idea soon won support from USAID and the Guatemalan government (Nittler and Tschinkel 2005:3).

Since there was no model for sustainable use of mixed tropical forests in Guatemala, one forestry consultant prepared a management plan for the first concession—a 4,800-ha parcel of

forest allocated to a newly constituted legal organization established by the villagers of San Miguel la Palotada. Another consultant proposed how a larger concession scheme might operate, and a local lawyer translated these concepts into draft regulations and a prototype contract between CONAP and the community organization (Nittler and Tschinkel 2005:3–4). "We used the considerable experience on concessions from around the world, especially a study on those in Africa by the World Bank," recalls Henry Tschinkel, part of the founding group and a former Regional Forestry Adviser for USAID (Tschinkel 2008).

In 1994, these legal documents were approved by CONAP's board and the first concession was allocated (Nittler and Tschinkel 2005:4). This mechanism opened the floodgates for other local communities and industries to apply for legal rights to sustainably manage forests under 25-year contracts (Nittler and Tschinkel 2005:3). By September 2006, 11 more concessions were in the hands of communities and 2 more were run by local timber companies, placing the management of most of the multiple use zone in local hands (Pool et al. 2002:E-2). In its effort to slow deforestation in the buffer zone, CONAP has also developed a mechanism to support communities in the buffer that sustainably manage their private land (Chemonics and IRG 2000:A-IV-5). As of 2006, there were four such cooperatives in operation (Stoian and Rodas 2006a:2).

In the early years, most community-harvested timber—primarily high-value mahogany and tropical cedar—was sold as logs to local forest industries, often on unfavorable terms. But as the enterprises matured they began to cooperate across communities, strengthening their negotiating power. In 1999, the early community forestry enterprises, the legally consituted entities that held each forest concession (known as EFCs), formed an umbrella association, the Asociación de Comunidades Forestales del Petén (ACOFOP), which lobbied CONAP and donors on the concessions' behalf, giving member communities the capacity to sell products jointly and generally defend their interests (Chemonics and IRG 2000:A-IV-10).

As their skills and confidence grew, the community forestry enterprises added value to their product by diversifying into wood processing, using the proceeds from selling standing timber to buy chainsaws and later small sawmills (Nittler 2008). Ten enterprises took another step toward diversification and independence in 2003 by setting up FORESCOM, a collective forest products company. Initially funded by USAID, FORESCOM helped its concession members to make the leap from donor subsidy to profitability by providing affordable forest certification services and identifying new markets for timber and other products (Chemonics 2003:21; Nittler and Tshinkel 2005:1; Chemonics 2006:13–14).

By 2007, with some residual training from intermediaries and government agencies, a majority of enterprises were genuine, profit-making businesses, reaching markets in Mexico, the United States, and Europe (Rainforest Alliance 2007a:1).

COMMUNITY FORESTRY ENTERPRISES: KEY ACHIEVEMENTS

Building Environmental Capital

- Community harvesting rights were conditional on sustainable forestry practices; only 0.8–2.4 trees felled per ha (Nittler and Tschinkel 2005:17).
- As of 2008, 9 community concessions, 2 industrial concessions, and 1 cooperative - managing about 480,000 ha in total - maintained certification by the Forest Stewardship Council (Hughell and Butterfield 2008:6).
- Annual forest clearance rates within certified concessions fell sharply to only 0.04 percent of tree cover, one twentieth of the clearance rate in neighboring protected areas; squatting by settlers and illegal logging also declined (Hughell and Butterfield 2008:9).
- Diversity of birds, animals, and insects has been maintained or enhanced (Balas 2004 and Radachowsky 2004 as cited in Nittler and Tschinkel 2005:17).

Building Economic Capital

- More than 10,000 people directly benefit from forest concessions and 60,000 receive indirect benefits. Concession employees receive more than double the regional minimum wage (Saito 2008).
- Trade in timber reached US$4.7 million in 2007, with 2.6 million board feet sold. Sales of non-timber forest products further boosted income from concessions (Rainforest Alliance 2007a:1).
- By 2006, a total of 6,839 members of community enterprises had received intensive training in forestry and business management and in technical skills (Chemonics 2006:8).
- Environmental services payments to communities for avoided deforestation and carbon sequestration are under negotiation (Rainforest Alliance 2007b:3).

Building Social Capital

- Communities received legal rights to manage and harvest forests and security of tenure via 25-year management leases (Nittler and Tschinkel 2005:3).
- New local NGOs were established to assist communities, strengthening civil society (Nittler and Tschinkel 2005:11–12).
- EFCs established an umbrella association and a forest products company, FORESCOM, thereby extending their influence and sales reach (Nittler and Tschinkel 2005:10).
- A share of the revenue from forest products was used for community projects such as installing water supply systems and paying school fees (Rainforest Alliance 2007b:3).

The Concession Model: An Evolving Blueprint for Sustainable Enterprise

As the concession initiative originated from foresters and as the enabling regulations were rushed through by CONAP against a backdrop of donor pressure, communities living in the multiple use and buffer zones were not widely consulted at the start. As a result, they were initially wary of seeking concessions, with three years passing until a second community sought and received a contract in 1997 (Nittler and Tschinkel 2005:2). After that, as the benefits of forest harvesting rights became apparent, "communities were suddenly standing in line," according to Henry Tschinkel (Tschinkel 2007).

As only six small communities inhabited the densely forested multiple use zone—not enough to manage half a million hectares of land—the remaining concessions were granted to groups of villages in the adjoining buffer zone. The disadvantage of this was that seven of the communities had stronger backgrounds in farming than forestry and faced a steep learning curve for their new trade (Chemonics and IRG 2000:III-6-8). Two additional concessions were awarded to local timber companies, despite opposition from conservation NGOs, on the condition that their operations achieve certification under International Forest Stewardship Council guidelines within three years (Saito 2008). Unable to clear timber and then move on as in the past, these industrial concessions quickly became converts to sustainable forestry practices and formed alliances with community enterprises, buying their wood for processing and sale (Chemonics 2006:16).

Although the multiple use zone remained government property, the concession contracts granted usufruct rights to legally constituted community organizations for 25 years, with an option for renewal (Nittler and Tschinkel 2005:3; Stoian and Rodas 2006a:15). This was estimated as the time needed for the first parcels of land to be ready for a second harvest, thus creating community self-interest in practicing sustainable forestry management (Tschinkel 2008). It was also long enough for communities to envisage building healthy businesses, especially with significant donor subsidies.

The forest area in the concessions ranges considerably in size from 4,800 to 72,500 ha (Chemonics and IRG 2000:A-iv-7). In a rush to get the concession program established as soon as possible, their borders were drawn on the basis of lobbying by communities and NGOs and of proximity to the park's protected core zones, rather than by the presence and distribution of high-value tree species. As a result, some of the early community enterprises struggled to extract enough valuable trees from the small concessions they had been allocated to support a viable business (Nittler and Tschinkel 2005:4–5). By the late 1990s, due in part to lobbying from the newly formed EFC umbrella organization, ACOFOP, this problem was rectified for later concessions as the national parks agency began awarding larger concessions with greater commercial promise (Chemonics and IRG 2000:A-iv-8).

Each concession was allocated to a legally constituted organization—the community forestry enterprises. Every adult resident of the founding community was free to join, although in many communities, few villagers initially signed up due to concerns about the responsibilities involved (Tschinkel 2007). Early memberships ranged from 29 to 372 and included residents of up to nine villages (Chemonics and IRG 2000:A-IV-11).

Once CONAP approved an EFC's five-year sustainable forest management plan, that plan became part of the legal contract between the enterprise and the national parks agency. EFCs were then legally empowered to harvest and sell timber from their concession, in accordance with each management plan's conditions. They were also required to submit annual operating plans for CONAP's approval, detailing the species and volume to be cut (Chemonics and IRG 2000:II-12; Tschinkel 2008). Enterprises were legally empowered to harvest not only valuable tree species, such as mahogany, but also non-timber forest products, including chicle, allspice, and xate palm leaves (Chemonics 2003:23).

Crucially, the fledgling EFCs were also required by USAID and CONAP to achieve certification under international sustainable forestry standards within three years in order to qualify for continued donor assistance (Chemonics and IRG 2000:A-iv-12). To help them achieve this, the regulations for allocating a concession required that a qualified NGO assume

considerable technical and financial responsibility over the businesses and that directors and governing boards be elected for each enterprise (Nittler and Tschinkel 2005:11, 8).

Despite early suspicions about CONAP's intentions, these new tenure rights, combined with the desire to tap into growing donor assistance and to develop new livelihoods, created a powerful incentive among communities to bid for concessions and abide by the conditions set.

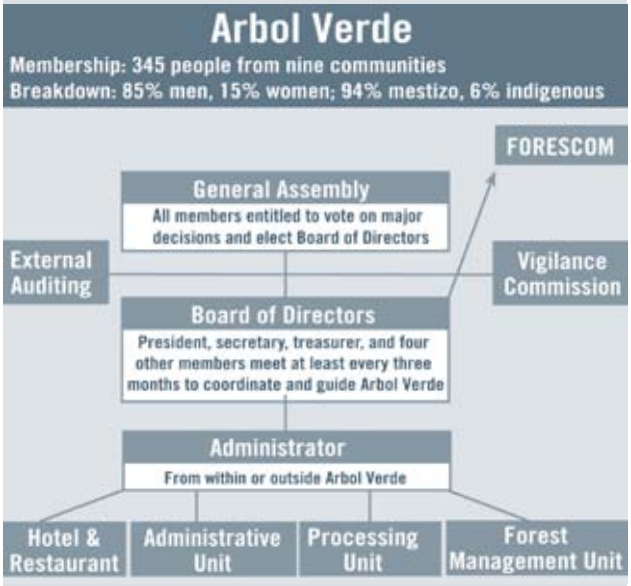
The concession holders pledged to assume a completely new role, transforming themselves from illegal loggers, farmers, and immigrants into natural resource stewards.

Even with considerable assistance, it took several years for these disparate and often fragmented communities to develop the good governance and resource management practices required to fulfill their contracts (Chemonics 2006:39-40). By December 2000, however, consultants reported to USAID that enterprise members "fully understood" that their economic sustenance depended on a well-managed forest, and they demonstrated this by "their availability for…unpaid jobs and their enthusiasm for learning the technical aspects of the operations" (Chemonics and IRG 2000:A-IV-9-10). It also took time for mistrust of government agencies to abate. But as the early EFCs began to earn income from timber, the perception of CONAP and its NGO partners held by local residents gradually evolved from that of adversary to one of an ally. The result was a marked reduction of tension in the region (Pool et al. 2002:10).

By the end of 1999, CONAP had signed 12 concession contracts covering almost the entire multiple use zone, with 355,000 ha under community management and an additional 132,215 ha managed by the two industrial concessions. Nearly 92,000 ha of the community concessions had been certified to international FSC standards, the largest tract of natural forest under community management in the world at that time (Chemonics and IRG 2000: A-IV-7-8).

ARBOL VERDE: ANATOMY OF A COMMUNITY FORESTRY ENTERPRISE

One of the most successful community forestry enterprises is Arbol Verde, which manages a 64,973-ha concession producing timber and sawn wood for domestic, Caribbean, and Mexican markets and runs a side operation in ecotourism. Certified in 2002, it has the biggest membership of any concession (345) people and its organizational and governance structure typifies how most enterprises have evolved. The administrator and board of directors, elected every two years, operate a sawmill, hotel, and restaurant in addition to managing the forest. In 2006, some 30 people were employed in seasonal timber jobs, 10 people worked in sawmilling, and 19 were in administration, forest management, and patrols and tourism (Chemonics 2006:10; Molnar et al. 2007:44).



Source: Molnar 2006: 167-8

MAYA BIOSPHERE COMMUNITY CONCESSIONS, 2005

Legal Status	Community Forest Enterprise	Members	Area Under Management (Ha)
Community Concessions	La Pasadita	121	18, 817
	San Miguel La Palotada	53	7,039
	Cruce a la Colorada	60	20,496
	La Colorada	50	22,067
	San Andrés (AFISAP)	176	51,940
	Cooperativa Carmelita	124	53,797
	Uaxactun (OMYC)	285	83,558
	Arbol Verde	345	64,973
	Impulsores Suchitecos	27	12,218
	Laborantes del Bosque	95	19,390
	Custudios de las Selva	96	21,176
	El Esfuerzo	40	25,386
Industrial Concessions	Paxbán		65,755
	La Gloria		66,460

Intermediaries Help Build Necessary Skills

Given that most EFC members were poorly educated and few had either organizational or business management experience, outside assistance was critical. This role was filled by local and international NGOs funded by donors, primarily USAID but also the UK Department for International Development and others. In the early years, international environmental NGOs including Conservation International, Centro Agrónomico Tropical de Investigación y Enseñanza (CATIE), The Nature Conservancy, CARE, Rodale Institute, and the Wildlife Conservation Society provided technical assistance geared mainly to forest protection (Saito 2008). These organizations had lobbied strongly for the creation of the Maya Biosphere Reserve and were heavily invested in its success.

Working on the basis of Cooperative Agreements and Letters of Implementation with USAID, these NGOs developed monitoring tools, performed environmental impact assessments, fostered conservation awareness, and helped enterprises achieve forest certification. Each international group also worked through local NGOs, whose personnel helped the fledgling enterprises establish basic self-governance procedures and provided basic training for elected officers in organizational management, record-keeping, accounting, and strategic planning (Chemonics and IRG 2000:II-8-9).

Three entirely new local environmental NGOs—ProPetén, Centro Mayo, and Nature for Life—were created to implement USAID-funded activities across the Maya Biosphere Reserve, in itself a major achievement (Chemonics and IRG 2000:II-9). Only one of these, Nature for Life, worked directly with the community enterprises, under the direction of CATIE and with support from The Nature Conservancy (Chemonics and IRG 2000:A-VI-1-2). Yet all three groups have flourished, providing additional representation for the Petén's isolated forest communities and increasing their social resilience.

The efforts of these early intermediaries, both international and local, were essential in making the concessions a reality. Working with farmers and loggers for whom forestry simply meant felling trees, their expertise in conservation policy and sustainable land management helped to foster conservation awareness and pride among local populations as well as to teach sustainable forestry practices. As a result, the young EFCs exceeded expectations in making the transition to sustainable forestry management. In December 2000, a review of USAID's efforts to preserve the Maya Biosphere Reserve by the development consultancy Chemonics International described the concessions in the multiple use zone as a "stroke of genius" that had "provided the most sustainable aspects of the program" (Chemonics and IRG 2000:III-5).

However, the same review highlighted the urgent need for the EFCs to become viable businesses in addition to successful forestry stewards. Generous subsidies by USAID and others had enabled the enterprises to make profits from timber sales in their first few years without putting sound business practices in place. But this state of affairs was not sustainable over the long term, and the review authors advised USAID that the conservation NGOs assisting the EFCs lacked the business, marketing, and management capabilities that were now required (Chemonics and IRG 2000:A-IV-24).

The consultants also raised two other red flags. They warned that governance failings of enterprises and turf wars among the many NGOs advising them were delaying progress and preventing lessons from being shared (Chemonics and IRG 2000:III-5-6). And they concluded that the free technical assistance to EFCs had "served to develop an unsustainable dependency of the communities on the subsidy and a specific NGO" (Chemonics and IRG 2000:A-IV-24).

A Second Start

These important early lessons caused USAID to streamline its Petén operations and channel all assistance through Chemonics International to local NGOs, thus strengthening local institutions (Chemonics 2006:1; Tschinkel 2007). CONAP also adapted the rules governing concession management to require that a qualified "forestry supervisor" should provide technical supervision, rather than specifically an NGO, enabling EFCs to work with more specialized advisers such as professional foresters (Saito 2008).

From 2002 to March 2006, Chemonics staff worked with local NGOs to improve the community enterprises' internal statutes and financial practices, teach technical forestry skills to improve cost effectiveness, and develop timber processing and marketing outlets (Chemonics 2006:1).

The most difficult problems Chemonics faced was tackling elite capture, corruption, and poor management within some of the community organizations. Institutional corruption remains a serious problem throughout Guatemala, and the new community organizations proved no exception. Making matters worse, the governance conditions required by USAID and the implementing NGOs had often been nominally met by communities in the rush to get enterprises going (Tschinkel 2007).

As a result, decision-making over timber management and sales and financial power were often concentrated among a few individuals, usually the board of directors, with little involvement of the wider membership. Some enterprises also refused membership to residents who had opted out in the early days, despite contractual requirements that all adults be allowed to join. While concession statutes generally required some investment in community-wide projects, these were often ignored, further alienating the wider community (Chemonics and IRG 2000:A-IV-17; Nittler and Tschinkel 2005:8). Communities' lack of understanding of how to run a good business also resulted in an insistence that new boards of directors and treasurers be elected every year, adding to the organizational disarray (Chemonics and IRG 2000:A-IV-17).

Chemonics took a three-pronged approach to developing the EFCs into viable businesses. First, it helped them to revise regulations along more effective, transparent, and equitable lines (Chemonics 2003:16). Second, it filled the skills void by focusing on intensive training and sales and marketing support. By 2006, some 6,839 enterprise members had participated in training courses and technical assistance events teaching entrepreneurial skills, including business and finance administration, tax and labor laws, banking and credit access, budgeting, sales management, and accounting (Chemonics 2006:8, 19–24). Third, EFCs were helped to develop five-year strategic business plans, weaning them off a year-to-year boom-and-bust approach to doing business (Chemonics 2006:8).

To fulfill its marketing mandate, Chemonics also subcontracted SmartWood, the certification program run by the U.S. nonprofit Rainforest Alliance, to certify the outstanding concessions so they could better tap into the growing global market in sustainable timber (Chemonics 2006:8). In addition, Chemonics'

ENTERPRISING WOMEN: A WORK IN PROGRESS

Among rural Guatemalans, forestry is traditional male territory, a cultural mindset that impeded early efforts to involve women in the community enterprises. In some cases, male leaders argued that forestry management tasks involved physical labor unsuitable for women; in others, wives and daughters were refused membership of EFCs granted to their husbands and fathers (Monterroso 2002:1).

Early NGO training programs also failed to emphasize women's rights. In 2002 only about 15 percent of EFC members were female, with their tasks mostly limited to harvesting non-timber forest products, including berries, xate, and wicker for baskets (Monterroso 2002:1). But addressing this gender gap became a major focus of training programs implemented by Chemonics International, and by 2006 eight EFCs had set up commissions to promote gender equity and appointed at least one woman to their Board of Directors (Chemonics 2006:18).

Chemonics and local NGOs also held workshops to enhance village women's self-esteem and provided day care services to boost their participation in EFC meetings. Practical job training and marketing assistance for non-timber products, such as handicrafts and tourism guiding, were also focused increasingly on women (Chemonics 2006:18–19).

technical support staff supported the establishment of FORESCOM as an umbrella forest products company and drafted its bylaws. FORESCOM began operations in January 2004 and took over certification of its member concessions in 2005. This centralized process for certification cut community costs significantly, enabling EFCs to pay for certification and technical assistance without donor subsidies for the first time (Chemonics 2006:2, 8).

In March 2006, the second phase of USAID-funded intermediary assistance ended and Chemonics withdrew. In a natural progression toward making the EFCs viable businesses, Chemonics was succeeded by a scaled-down USAID program targeted specifically toward diversifying wood and non-timber products from the concessions and expanding their markets. The long-term viability of the concessions depends on the success of this three-year, US$2-million phase, which is managed by the Rainforest Alliance and will end in August 2009 (Rainforest Alliance 2007b:1).

The Paternalism Trap

By August 2009, the US government's aid agency will have spent more than US$11 million on the Petén community forestry enterprises project alone (Nittler and Tschinkel 2005:12; Rainforest Alliance 2007b:1). While the many intermediaries working with the EFCs have helped them become both effective stewards and successful businesses, the scale of support also fostered a culture of donor dependency that has proved difficult to break (Tschinkel 2007). "Self-sufficiency goals were only put in place after Chemonics arrived," recalled John Nittler, a vice-president of Chemonics International who helped oversee the program. "In the early years…a dependency was created that remains very hard to overcome" (Nittler 2007).

Since 2006, the Rainforest Alliance and government agencies working with the enterprises have sought to foster independence with a "learning through doing" approach (Rainforest Alliance 2007b:2). This provides on-the-job (rather than theoretical) training in the production, processing, packaging, and sale of new processed timber and NTFPs. CONAP's requirement that all concessions hire a forestry specialist as technical supervisor has also helped to professionalize EFCs, as has a recent requirement by the SmartWood certifiers that concession governing boards must retain some members for more than one term of office (Saito 2008; Carrera 2007).

By late 2007, these strategies appeared to be paying off, with 8 of the 12 community enterprises functioning as self-sufficient businesses and facing prosperous futures after USAID subsidies end (Carrera 2007).

Conservation Dividend: Preserving Forests, Protecting Livelihoods

While community forestry enterprises have been slow in gaining organizational independence, they proved to be skillful in forestry stewardship. Aware of the link between sustainable forest management and the income potential of their new venture, virtually every EFC established a low-impact approach to harvesting both timber and non-timber forest products, based on a few common ground rules (Chemonics and IRG 2000:A-IV-9–10).

Ecologically fragile areas and those high in biodiversity were left alone. Elsewhere, harvest management cycles of 25 years were established, with one of 25 blocks of forest to be harvested each year, allowing 24 years for regrowth. Each EFC also prepared annual operational plans, based on a census of individual trees in the block to be harvested, which were approved by CONAP officials (Nittler and Tschinkel 2005:14–15, 11). On average, only 0.8–2.4 trees per ha have been harvested, due in part to a lack of commercial species of sufficient size (Tschinkel 2008).

The 25-year plans included detailed maps, some enhanced with satellite images and aerial photography, showing concession boundaries, vegetation and forest types, and fragile and archeological sites in need of particular protection. Most highlighted 15–20 "commercial" tree species, although until recent years almost all the wood felled was mahogany or tropical cedar (Nittler and Tschinkel 2005:14). This detailed planning also enabled logging roads to be cut efficiently, minimizing ecological impact.

Early fears voiced by some environmental NGOs that any felling activity could harm biodiversity soon proved groundless (Chemonics 2006:37). As one biological monitoring team reported in 2002: "At current extraction levels (0.8–2.4 trees/ha),

the ecological impacts of timber extraction are minimal. Modest changes in the community structures of birds, beetles, diurnal butterflies, and game species suggest that current logging practices do not preclude any species from logged areas, but rather increase species richness by augmenting habitat heterogeneity" (Balas 2004 and Radachowsky 2004 as cited in Nittler and Tschinkel 2005:17).

Giving local communities an economic stake in the forest around them has also proved a highly effective driver in curbing illegal activity in the Maya Biosphere Reserve (Saito 2008). To protect their capital investment, the 1,500 members of the 12 community forestry enterprises have invested time, personnel, and money into patrolling and safeguarding their concessions. Every year the EFCs jointly invest around US$150,000 in forest surveillance and fire control measures. Members patrol concession borders; they report fires, illegal logging, and new settlements; and they are compensated for their time from timber sale revenues (Chemonics 2006:37). "Our secret is that we have more than 150 people working in this forest, collecting palm leaves, chicle and allspice, and if one of them sees anything happening that shouldn't be, they report it to us and we send a delegation to that area immediately," says Benedin Garcia, founder member of the community organization that manages the Uaxactun concession (Rainforest Alliance 2007b:3).

The impact of community self-interest and investment in preserving the forests under their control has been dramatic. As early as 2000, deforestation fell sharply in the Maya Biosphere Reserve's multiple use zone, which contains the concessions; illegal deforestation continues in the core zones where development is banned (Chemonics 2003:10–11). From 2002 to 2007, this trend accelerated, with the average annual deforestation rate in the reserve's national parks (0.79 percent of land area) 20 times higher than that in the FSC-certified concessions (0.04 percent of land area) (Hughell and Butterfield 2008:10). The MBR's protected areas also suffer more wildfires, often set by farmers or illegal settlers, than the neighboring concessions. Since 1998, between 7 percent and 20 percent of forest cover in the Maya Biosphere Reserve has burned annually, while in FSC-certified concessions the figure has fallen steadily from 6.3 percent in 1998, when concessions were first established, to 0.1 percent in 2007 (Hughell and Butterfield 2008:1–2).

CONAP's requirement that EFCs achieve Forest Stewardship Council certification within three years of signing a concession contract also contributed to the speed with which communities adopted effective forest management and surveillance practices (Chemonics 2003: 26). By 2008, all 12 community enterprises and both industrial concessions had achieved FSC status at some point, and 479,500 ha of forest was currently certified (Hughell and Butterfield 2008:6).

While the Petén population's willingness to harvest sustainably depends on a continuing flow of economic benefits, they have laid the groundwork to preserve their forests for the indefinite future. As observers Nittler and Tschinkel reported in 2005: "In general the forest management and operational plans have evolved to a level of sophistication which, if followed, is almost certain to assure the sustained management and long-term conservation of the forest" (Nittler and Tschinkel 2005:15). This is particularly impressive given that tens of millions of dollars have failed to halt deforestation in other parts of the Maya Biosphere Reserve and the wider network of Central American parks to which it belongs.

ANNUAL DEFORESTATION RATE BEFORE AND AFTER 2002

Land class	1986 to 2001	2002 to 2007
Core protected areas	0.26%	0.79%
FSC certified concessions in multiple use zone	0.01%	0.04%
Remainder of multiple use zone	0.31%	0.86%
Buffer zone	1.91%	2.20%
Entire MBR	0.52%	0.88%

Source: Hughell and Butterfield 2008:10

PERCENTAGE OF AREA BURNED IN EACH LAND USE ZONE BY YEAR

Land Use Zone	1998	2003	2005	2007
Core protected areas	23.6%	26.0%	29.6%	10.4%
FSC/RA certified concessions in multiple use zone	6.3%	1.8%	0.1%	0.1%
Remainder of multiple use zone	21.9%	21.3%	12.9%	5.0%
Buffer zone	23.9%	23.5%	19.6%	10.3%
Overall MBR (%)	19.5%	19.1%	18.0%	7.2%
Overall MBR (ha)	404,632	398,280	375,149	149,424

Source: Hughell and Butterfield 2008:1–2

Community Dividends: Jobs, Income, Infrastructure

The success of Guatemala's community forestry enterprises is reflected in growing income and employment among the desperately poor villages scattered through the remote northern forests and lowlands. By 2003, the 12 community enterprises were generating an estimated US$5 million per year in timber sales, while forestry operations generated an estimated 51,309 person-days of work, worth US$359,490 in wages (Nittler and Tschinkel 2005:21). By September 2007, approximately 7,300 people were employed either seasonally or year-round by the enterprises and FORESCOM (Carrera 2008).

Typically, half the wood harvested is highly prized mahogany, sold mostly to local timber companies that export

it to the United States. Another valuable species, Santa Maria, is sold for export to Mexico, while other native timber such as Spanish cedar finds ready local markets (Nittler and Tschinkel 2005:17–18).

Enterprise members enjoy distinct advantages over their neighbors. They earn an estimated average of US$1,140 during the two to three months when full time work is available for harvesting and processing within the concessions (Chemonics 2003: 6). The rest of the year they typically take other jobs, such as working on farms or ranches, although some members work year-round on the concessions, processing timber and harvesting and processing non-timber products.

Annual household incomes outside concessions can be as low as US$1,200 a year, the same amount that the average employed concession member earns in two to three months (Chemonics 2003:6). Not only do enterprises typically pay a higher day rate than the regional prevailing wage, but some also pay members an annual dividend (Chemonics and IRG 2000:A-IV-14).

As their income and business acumen has grown, some enterprises have also branched out into ecotourism, independent of donor support, providing additional jobs for local people. Arbol Verde, for example, built a small hotel, while Uaxactun, the gateway to Mayan temple country, has developed tour guide programs and a handicrafts center (Stoian and Rodas 2006b:6; Chemonics 2006:18–19).

Improving Quality of Life

While not all enterprises have fulfilled their own regulations on benefit-sharing with the wider community, most have invested in much-needed local infrastructure and services. In the early years, for example, Unión Maya Itzá purchased two buses and a truck for community use; Carmelita built a bridge, San Miguel installed a potable water system, and La Pasadita built a dispensary (Chemonics and IRG 2000:A-IV-14–15).

More recently, several enterprises have provided social services that are transforming poor families' quality of life and young people's prospects. For example, the Conservation and Management Organization that manages the Uaxactun concession operates an emergency fund that the town's poorest families can draw on for medical care. It also pays several high school teachers salaries and funds computer classes for 22 students in the provincial capital. "We invest in education because we want the next generation to be well-trained and capable of defending our interests," says the organization's board secretary, Floridalma Ax (Rainforest Alliance 2007c:2).

CARMELITA: A CONCESSION SUCCESS STORY

The remote forest town of Carmelita, nestled among Mayan ruins in the central Petén, was among the first to receive a concession contract from CONAP, in 1996. With assistance from U.S. non-profit Conservation International and the Wildlife Conservation Society and later with support from Chemonics and the Rainforest Alliance, it has made productive use of its 53,798 ha of forest (Nittler 2008; Stoian and Rodas 2006a:2). The 127 members of the cooperative enterprise (56 percent male and 44 percent female) that manages the concession have set aside 20,000 ha for timber production and 33,798 ha for harvesting non-timber forest products, primarily xate ornamental palms and chicle gum (Stoian and Rodas 2006a:6). In recent years, the community has offered guided ecotours on foot and horseback into neighboring El Mirador park, which is rich in archeological sites (Stoian and Rodas 2006a:7).

Despite felling timber on less than 1 percent of their land, enterprise members have significantly increased their income by selling certified mahogany and NTFPs and by investing in a community sawmill and carpentry shop. Sawn wood from first-class mahogany fetched US$1,781 per cubic meter in 2006, up from US$742 per cubic meter in 2000 (Molnar et al. 2007:171–172). Since 2003, individual enterprise members have also reaped an impressive average annual income from sales of xate and chicle of around US$2,300 (Chemonics 2003:7).

The community forestry enterprise is the largest local employer, providing seasonal logging and wild plant harvesting work for about 90 people and 30 permanent jobs in sawmills. More than a third of earnings are ploughed back into community development and improved forestry technology and management (Stoian and Rodas 2006a:13).

DAYS OF WAGES PROVIDED BY CARMELITA CONCESSION, 2005

Activity	Non-Members	Members	Total
Timber extraction	250	2,000	2,250
Wood processing	1,000	3,000	4,000
Xate collection	- - -	400	400
Chicle collection	- - -	200	200
Tourism	50	100	150
Total	**1,300**	**5,700**	**7,000**

Source: Stoian and Rodas 2006: 13

The future is not without hazards, as Carmelita's members sometimes have to fend off encroaching settlers, cattle ranchers from the south, and illegal loggers from the north. But the enterprise has strengthened its prospects by expanding markets and pooling resources with other EFCs by joining both FORESCOM and a non-timber forest products marketing alliance (Stoian and Rodas 2006a:5). "Our parents protected this forest for our benefit and it is our responsibility to protect it for future generations," says the enterprise's 23-year-old president Carlos Crasborn (Rainforest Alliance 2007b:2; Pool et al. 2002:94).

Adding Value: Processing and Wood Products

In the early years, EFC overreliance on donor subsidies and on high-earning but finite supplies of mahogany raised the specter of bankruptcy and subsequent community disillusionment. The NGO intermediaries therefore steered the fledgling enterprises toward capturing greater value from their resource, both by selling more species and by processing timber themselves. By 2003, eight communities owned portable sawmills, two had invested in carpentry equipment, and 55 percent of the 50,000 work days generated across community forests were spent sawmilling, compared with 29 percent spent harvesting (Nittler and Tschinkel 2005:16, 22; Chemonics 2003:7).

Since 2005, the collective forestry services company, FORESCOM, has taken its member enterprises a further step up the economic ladder by expanding markets and developing new products. Building on a marketing strategy developed by Chemonics, FORESCOM has successfully established national and US markets for three lesser-known wood species—pucte, Santa Maria, and danto (Chemonics 2006:24; Nittler and Tschinkel 2005:17–18). It also won government funding to build an industrial processing plant that began operating in 2007, enabling enterprises to directly manufacture finished products for the lucrative international market in certified wood. With assistance from the Rainforest Alliance, FORESCOM secured orders in 2007 for more than 1.5 million board feet of certified wood, worth US$3 million, including milled lumber, floorboards, and decking (USAID 2005). The plant has already allowed more members of FORESCOM to take advantage of sales contracts for products like decking and flooring with specialty companies in the United States, the Netherlands, and the United Kingdom (Molnar et al. 2007:172–173; Rainforest Alliance 2007a:1).

A Secondary Harvest: Non-Timber Forest Products

The community enterprises have also garnered extra income and diversified their business by harvesting and selling non-timber forest products (NTFPs). Collecting these products, which include chicle tree sap, xate palms, and allspice, for sale to exporters has been lucrative in the Petén for decades, yielding significant income for thousands of families (Chemonics 2006:5;

Chemonics and IRG 2000:A-V-2). Historically, NTFP collection has been an individual venture, resulting in little awareness of harvest sustainability and limited marketing power for the producers (IRG 2006:1). A few years after the concessions were awarded, however, NGOs began encouraging sustainable and collective harvesting of these products as a supplement to timber cutting (Pool et al. 2002:15). CONAP was subsequently charged with regulating NTFPs' harvesting and transport (IRG 2006:1-2; Chemonics and IRG 2000:A-V-4).

The new focus on NTFPs has paid off for the concession communities. With the assistance of the Rainforest Alliance, more enterprises have improved the management and professional harvesting of wild plants and are exploiting their commercial potential. They are dealing directly with overseas buyers, cutting out the export middlemen, boosting profits, and building relationships with customers (Rainforest Alliance 2007c:2).

In 2007, Carmelita, Uaxactun, and five other concessions created a joint marketing committee for xate palms to coordinate supply and export routes. With the Rainforest Alliance acting as intermediary, these enterprises are selling between 400 and 600 packages of xate a week to a single buyer, Continental Floral Greens in Houston. From January to September 2007 they grossed US$147,948 in US exports (Carrera 2008). Other new markets include the Adventist Churches of Minnesota, which bought 122,000 palms sourced from the Maya Biosphere Reserve over 12 months in 2006–2007 (Rainforest Alliance 2000a:2). For Palm Sunday 2008, these churches purchased 250,000 palms with a 5 cent premium on each palm (Carrera 2008).

To meet the demands of eco-conscious customers, the Rainforest Alliance has helped these communities set sustainable harvesting guidelines for collectors and improve supply and delivery by building two central collection and sorting facilities. With technical assistance, three enterprises—Carmelita, Uaxactun, and San Andres—are on target to achieve FSC certification in 2008 for sustainable xate plantations on 170,000 ha of concession land, the first such management standard in the world (Rainforest Alliance 2007b:2).

Xate palms

Securing the Future: A Challenging Road Ahead

Both for nature and for people, Guatemala's community forestry enterprises have proved a clear success. As early as 2000, the government's decision to hand over tenure rights and management responsibilities to communities with a direct economic interest in forest protection had paid off. "[They] have exceeded expectations…are dramatically increasing the incomes of concessionaires and have reduced the incidence of forest fires, illegal logging and settlements," reported the authors of a 2000 review of the Maya Biosphere Project for USAID (Chemonics and IRG 2000:III-5).

While the concessions have encountered problems and required millions of dollars in support, they have continued to do far better at protecting forest and biodiversity than CONAP has done in the neighboring national parks. Studies predict that at current rates of deforestation, the Maya Biosphere Reserve will lose 38 percent of its 1986 forest cover by 2050. As a result, the certified concessions are likely to play an increasingly important role in the future in the reserve (Hughell and Butterfield 2008:2).

The commitment of self-interested communities combined with the support of government agencies, NGOs, international donors, and, more recently, overseas buyers has fostered this success story. Yet 14 years after the first concession was granted, four EFCs are in trouble and the long-term future of the remainder, while promising, is not assured (Nittler 2008). The reasons for this uncertainty stem from mistakes made when concessions were first allocated and from failures to address wider policy issues, such as uncontrolled immigration and agricultural encroachment that threaten their future stability.

As described earlier, the borders of some early concessions were hastily drawn without close attention to the makeup of the forests and without input from forestry professionals. Several have since proved too small and devoid of high-value timber species that could provide a viable income from sustainable

timber operations, and they have struggled to make a profit (Nittler and Tschinkel 2005).

Under these circumstances, community commitment to sustainable forestry management has been lacking, with predictable consequences. Corruption has flourished in a number of the smaller concessions, including San Miguel (7,039 ha), La Pasadita (18,817 ha), La Colorada (22,067 ha), and Cruce a La Colorada (20,469 ha). In these concessions, powerful local figures illegally sell parcels of concession land to settlers and encourage farmers to encroach into forest earmarked for sustainable harvest (Nittler 2008; Carrera 2008). In 2004, SmartWood suspended the FSC certification status of San Miguel and La Pasadita, further harming their business outlook and producing a stalemate that has yet to be resolved (Chemonics and IRG 2000:A-IV-24; Carrera 2007).

Poor organization and governance have also continued to hold back some enterprises from thriving as independent small businesses. In 2005, for example, observers noted that the continued insistence by many enterprises on a yearly turnover of board members entrenched "a guaranteed recipe for perpetual incompetence" (Nittler and Tschinkel 2005:8). In the past three years, however, these problems have lessened significantly as EFCs have been required to professionalize their management under conditions specified by the SmartWood sustainable certification inspections. At least one manager with proven forestry experience must be hired, for example, and EFC governing boards are required to retain at least one or two members for more than one term of office to ensure continuity of experience (Carrera 2007). Long-term planning has also improved EFCs' business performance. With help from Chemonics, seven enterprises have produced comprehensive five-year plans enabling them to forecast timber supply, improve sales forecasts, and avoid poor investment decisions (Chemonics 2006:26).

In its 2006 completion report, Chemonics International focused on the growing economic and social resilience of the concession communities, describing how villagers had developed into effective entrepreneurs: "Unlike the mindset in 2001, today most [enterprise] members understand the importance of managing their organizations for profit. Board members and managers are more aware of production costs, they have built in administrative and production controls, and are better prepared to negotiate more profitable forest-harvesting contracts" (Chemonics 2006:38). By December 2007, according to José Roman Carrera, regional manager for the Rainforest Alliance's sustainable forestry division, eight enterprises were profitable, operationally self-sufficient, and well placed to prosper once USAID funding to develop new products and markets ceases in August 2009 (Carrera 2007).

LEARNING FROM GUATEMALA'S COMMUNITY FOREST ENTERPRISES

Care must be taken at start-up. In the understandable rush to establish concessions in the early 1990s, little thought was given to the implications of long-term forest stewardship. Territories were carved out with little consideration of what was appropriate and necessary to provide economic opportunities and incentives. The first few concessions were too small, unable to support profitable enterprises under sustainable management. Today, those concessions are rife with corruption, and the forests are degraded by illegal logging and clearing for agriculture.

There is a difference between stewardship and enterprise. Initial skill training for the concession managers focused on forest management. Only after government agencies and NGOs both saw that the expected economic impact was not materializing—and that sustainable practices were suffering as a result—did it become clear that communities also needed skills to manage the business side of the concession: sales, marketing, and certification. This oversight set back the development of profitable community concessions by several years.

Government has an ongoing role that must be exercised. One of the goals of the government's establishment of the Maya Reserve was the preservation of one of the last great swaths of virgin forest in Central America. The track record of the certified concessions shows considerable improvement in the health of the areas under their control. But the National Parks in the reserve itself, ostensibly off-limits to all extractive uses, are losing acreage at an alarming pace because of poaching and illegal farming. The lack of any enforcement undercuts the government's goals and may ultimately jeopardize the achievements of the concessions.

Long-term commitment is needed. This applies in every case. The first concession contract was signed in 1994. Nine years later, NGOs and aid agencies were putting the finishing touches on FORESCOM, the organization formed by nine of the concession communities to provide marketing services and training for concession members and to coordinate sustainable certification of their timber. Twelve years after the first concession, a phaseout plan for USAID is in place, now that nine concessions are well established and profitable.

There is strength in numbers. The forest concessions in Guatemala were thrust from the start into an international market; that is the nature of the high-value timber they were able to harvest. These concessions could never, individually, hope to have all the contacts and skills necessary to successfully navigate that trade. Their willingness to fund the creation of FORESCOM has paid significant dividends. In addition to the services mentioned already, FORESCOM markets the combined harvests of the members to command better prices and encourages the production of additional products. Delegating certain critical management decisions to FORESCOM is one key factor that has made eight of the Petén concessions self-sufficient and profitable today.

Carrera warned, however, that this encouraging prospect depended on the absence of "adverse external developments," particularly the threat of uncontrolled immigration and agricultural encroachment spilling over into community forests (Carrera 2007). Due to rising birth rates and economic migration from the south, illegal settlements and forest clearance by farmers continue to plague the Maya Biosphere Reserve's supposedly protected national parks. By 2006, for example, about 40 percent of Laguna del Tigre National Park along the reserve's western border had been destroyed by illegal logging and wildfires (compared with only 4 percent in the neighboring Uaxactun concession) (Rainforest Alliance 2007c:2).

One problem is that communities in the buffer zone alongside the national parks have not been given the alternative livelihood opportunities enjoyed by the concession communities and therefore lack any incentive to respect park rules. Another is the weakness of CONAP, which remains chronically short of staff and resources and which lacks political support from other government agencies (Chemonics 2006:45). "The government supports the development of the forestry enterprises," says Carrera, "but to protect the concessions it needs to assign enough resources to enforce the protected area laws throughout the Maya Biosphere Reserve" (Carrera 2008).

Scaling Up Community Forest Enterprises

Organizational Scale-Up

The creation of second-tier agencies has been critical in putting Guatemala's community enterprises on a viable business footing. In the early years, ACOFOP lobbied for more and larger concessions to be allocated and it provided fragmented communities with a collective voice (Chemonics 2003:10). Since 2003, the forest products company FORESCOM has enabled nine enterprises to add value to their basic product, timber, and to expand markets (Chemonics 2006:27).

By providing technical assistance in meeting SmartWood's sustainable timber certification conditions, FORESCOM has allowed enterprises to cut compliance costs by up to 80 percent and to end reliance on donor subsidies (Chemonics 2006:13–14; Nittler and Tschinkel 2005:16). With assistance from the internationally networked Rainforest Alliance, the company has also successfully identified national and overseas markets, particularly for lesser-known wood species that FORESCOM sells on its members' behalf. By representing the combined output of nine concessions (with the other three due to join by 2009), FORESCOM is winning big contracts beyond the reach of individual enterprises, such as an annual contract to supply 1 million board feet of timber a year to a Guatemalan building company.

Much of the demand from the US and Europe is for processed wood and finished products. In 2006, FORESCOM received a US$260,000 grant from the Guatemalan government to build a factory that manufactures flooring, decking, and furniture components from lesser-known species. In 2008, the company will also help enterprises set up dry kilning facilities in their communities to refine the processing of high-value mahogany and cedar, further boosting profits (Carrera 2007).

FORESCOM has also built strong working relationships with customers, such as the national timber company Baren Commercial, and strategic alliances with local, national, and international organizations and agencies such as the municipalities of San Benito and Flores in the Petén, the National Forest Institute, the Union Association of Exporters (now a FORESCOM member), and the International Tropical Timber Organization (Chemonics 2006:29; Rainforest Alliance 2007b:1). Individual enterprises have also established strong relationships with specialist US buyers, such as Gibson Guitars and Continental Forest Greens, who are willing to pay premium prices—and often in advance—for, respectively, certified timber and xate (Rainforest Alliance 2007b:3).

Political Scale-Up

Despite the EFCs' well-publicized success, Guatemala's government has rebuffed USAID proposals that the concession approach be extended to core zones of the Maya Biosphere Reserve still being destroyed by illegal development and forest fires (Tschinkel 2007). Its commitment to the existing community concessions, however, is not in doubt. CONAP's 2005–2014 management strategy for the MBR, which includes consolidating the concessions in the multiple use zone, was approved at Cabinet level (Chemonics 2006:33), giving communities at least medium-term security. The national parks agency and the National Forest Institute have also widely adopted and institutionalized the extraction and management practices used in the concessions (Tschinkel 2008).

Since 2006, government agencies have also joined CONAP and the USAID-funded NGOs in helping EFCs achieve profitability and independence. The National Forest Institute is helping refine villagers' technical forestry skills. Two other agencies—PRONACOM (the National Competitiveness Program) and the Technical Training and Productivity Institute—are teaching enterprise members "learning by doing" skills and tools for running a small business, including the supply of finished products to international markets (Rainforest Alliance 2007b:2; Carrera 2008).

These agencies are expected to retain their links with the enterprises after international donors withdraw, deepening the government's investment in the EFCs' future (Carrera 2007). "The importance of the government of Guatemala's political and financial support for the development of the community forestry concession system…and continued enterprise development cannot be overstated," says Greg Minnick, Managing Director of the Rainforest Alliance TREES (Training, Extension, Enterprise and Sourcing) Program (Minnick 2008).

Claiming Carbon Credits: A New Policy Tool

The Guatemalan government has also recognized the earning potential represented by preserving the Maya Biosphere Reserve's natural forest cover.

With funding from PRONACOM, USAID, the Inter-American Development Bank, and two private companies, CONAP and the Rainforest Alliance are supporting a pioneering scheme to develop carbon credit markets for the community concessions on the basis of avoided deforestation (Rainforest Alliance 2007b:3). "It is a new concept, the first of its kind in Central America, because we are not working with plantations, but with natural primary tropical forest under certification," says José Roman Carrera (Carrera 2007). The pilot Maya Biosphere Carbon Project has already attracted interest from three buyers, and a quantification and verification process is due to be completed in 2008. The Rainforest Alliance projects that the enterprises will be able to sell 24.9 million tons of avoided carbon dioxide emissions over the next 10 years, creating an impressive new revenue stream in the form of environmental services payments (Rainforest Alliance 2007b:3).

The government's interest reflects the recognition that, as donors withdraw, payments such as these may represent the best guarantee for the reserve's long-term survival, reinforcing local communities' stake in its conservation. According to Carrera, the new income will be partly invested in the four failing community concessions, helping them to develop non-timber forest product industries and sustainable agriculture in areas already stripped of forest. "It's the only way we can preserve biodiversity," he says, "by adding environmental services to other sustainable forms of income and extracting maximum value from the forests" (Carrera 2007).

Replicating the Petén's Success

USAID is funding the first attempt to certify community and family-owned forest plots outside the Petén, by expanding the activities implemented by the Rainforest Alliance to two other regions. Since September 2006, as part of the Forestry Enterprises in Guatemala Program, the NGO has worked in Las Verapaces, to the south of the Petén, and in the Western Highlands area affected by Hurricane Stan, helping communities implement sustainable management practices and expand markets for local mixed forest products. Already, several existing community forestry organizations have reached commercial timber and wooden gift markets for the first time by promoting their timber as "pre-certified" (Rainforest Alliance 2007b:1).

Across Latin America

Neighboring countries with biologically diverse tropical forests are also taking advantage of the skills and lessons learned by the Petén's pioneering enterprises. Following a decade of training, the sophisticated technical capacity of community foresters is so evident that they have been hired as consultants and trainers in sustainable forest management programs in Nicaragua, Panama, and Peru (Chemonics 2006:41). The comprehensive 25-year sustainable management plans developed by the enterprises and intermediaries have also produced "technical models worthy of emulation" by forest managers across tropical regions, according to observers (Nittler and Tschinkel 2005:15). The Rainforest Alliance, for example, is already replicating the concession forest management model in Honduras, helping to build community enterprise skills and access to certified timber markets for 11 villages that manage 100,000 ha within the threatened and wildlife-rich Rio Platano Biosphere Reserve (Rainforest Alliance 2006:1).

Guatemala's community enterprises have taken a long time to become established. In the process, they have become increasingly resilient and better prepared for new external and internal challenges. Their success in keeping deforestation at bay, raising local incomes and quality of life, and developing into established businesses is encouraging and offers prospects and lessons for replication in other tropical regions. Management responsibility for 25 percent of the developing world's forests now lies in the hands of local communities—a figure expected to double by 2015 (Molnar et al. 2007:19; Carrera 2008). This makes identifying and scaling up such local management models, which meet the needs of both people and nature, a compelling and necessary task.

TURNING BACK THE DESERT

How Farmers Have Transformed Niger's Landscapes and Livelihoods

NIGER IS AN UNLIKELY SETTING FOR AN ENVIRONMENTAL SUCCESS STORY OF MAJOR proportions. The West African state ranks 174th out of 177 countries in the 2007–08 Human Development Index prepared by the United Nations Development Programme, based on indicators of health, education, and economic well-being. Sixty percent of Niger's people live on less than US$1 per day (UNDP 2007). Four fifths of its territory falls within the Sahara desert and cannot support food crops. Yet population pressures are intense, with rural women bearing an average of 7.1 children (INS and Macro International Inc. 2007:xxv). Niger's farmland and people—nomadic tribes apart—are concentrated in a southern strip of wind-swept savanna that falls within the Sahelian climatic zone. Rural communities struggle to grow crops in sandy, nutrient poor soils against a backdrop of chronically low and erratic rainfall, an ecological challenge that climate change will only intensify (IPCC 2007:444, 447–48).

Yet Niger is also the scene of an unprecedented, farmer-led "re-greening" movement that has reversed desertification and brought increased crop production, income, food security, and self-reliance to impoverished rural producers. Vast expanses of savanna devoid of vegetation in the early 1980s are now densely studded by trees, shrubs, and crops. The scale of the change is truly astonishing, affecting about 5 million ha of land—about the size of Costa Rica—which amounts to almost half of the cultivated land in Niger (Tappan 2007). By 2007, between a quarter and half of all the country's farmers were involved, and estimates suggest that at least 4.5 million people were reaping the benefits (Reij 2008).

The ecological impacts have been dramatic and include reduced erosion and increased soil fertility (Tougiani et al. 2008:10). Crop harvests have risen in many areas, enabling rural households to enjoy better diets, improved nutrition, higher incomes, and increased capacity to cope with periods of drought (Tougiani et al. 2008:16). In some villages, the *soudure*—the annual "hungry period" when food supplies are nearly exhausted—has been shortened or even eliminated (Larwanou et al. 2006:1). Large areas of countryside that a few years ago faced constant shortages of fuelwood and fodder now produce surpluses for sale in nearby markets (Tougiani et al. 2008:13).

Many rural producers have doubled or tripled their incomes through the sale of wood, seed pods, and edible leaves (Winterbottom 2008).

The re-greening movement has had especially important impacts for some of the poorest members of Nigerien society—women and young men (Larwanou et al. 2006:1–2). The burden on women associated with the gathering of wood for household fuel has been reduced substantially (Boubacar et al. 2005:23). So has the annual exodus of young men seeking urban jobs in Niger and neighboring countries, thanks to new opportunities to earn income in an expanded and diversified rural economy (Larwanou et al. 2006:1–2). With farmers producing more fuelwood to supply urban areas, Niger's shrinking natural forests have also been spared further destruction (Winterbottom 2008).

There have been two key vehicles for this remarkable transformation. First is the adoption of simple, low-cost techniques for managing the natural regeneration of trees and shrubs, known as farmer-managed natural regeneration, or FMNR. In concert with forest management, many communities are also using simple soil and water conservation programs to drive the greening transformation. Both efforts have been encouraged and assisted by intermediaries including NGOs, donor governments, and international aid agencies. While this case study emphasizes the FMNR process, much of Niger's greening success can also be attributed to the simultaneous soil and conservation work. FMNR evolved in the mid-1980s as a response to the problems associated with traditional farming in Niger, in which farmers "cleaned" their land of all vegetation and crop residues before planting crops (Polgreen 2007:2). The past two decades of experimentation and innovation with FMNR in sustainably harvesting native vegetation have resulted in widespread acceptance that tree cover brings both income and subsistence benefits. The government of Niger has played an enabling role, enacting key land tenure and tree growth reforms, having learned from the failures of earlier destructive policies (McGahuey 2008).

In an ecologically vulnerable region expected to experience more frequent drought as a result of climate change, Niger's tree regeneration movement, say natural resource management experts, offers a proven path to greater environmental and economic resilience and increased food security for the inhabitants of Africa's drylands (Harris 2007; IPCC 2007:444, 447–48). Given the explosive rate of population growth in the region, FMNR alone will not enable Niger—or other Sahelian countries—to stay ahead of the food and livelihood needs of their people (McGahuey 2008). Indeed, even though FMNR is used widely today, 50 percent of Niger's children remain undernourished (INS and Macro International Inc. 2007:xxix). But it is one important tool to increase productivity for land-poor farmers and has already proved its capacity to provide them with diverse and sustainable rural livelihoods and economies.

KEY ACHIEVEMENTS OF NIGER'S RE-GREENING MOVEMENT

Building Environmental Capital

- An increase of 10- to 20-fold in tree and shrub cover on about 5 million ha of land, with approximately 200 million trees protected and managed (McGahuey and Winterbottom 2007:7; Tappan 2007; Reij 2008).
- At least 250,000 ha of degraded land reclaimed for crop production (McGahuey and Winterbottom 2007:7).
- Soil fertility improved as higher tree densities act as windbreaks to counter erosion, provide enriching mulch, and fix nitrogen in root systems (Reij 2006:iii).
- In some areas, the return of wild fauna, including hares, wild guinea fowls, squirrels, and jackals (Boubacar et al. 2005:16).
- Return of diverse local tree species that had all but disappeared from many areas and of beneficial insect and bird predators that reduce crop pests (Boubacar et al. 2005:13; Rinaudo 2005a:14).

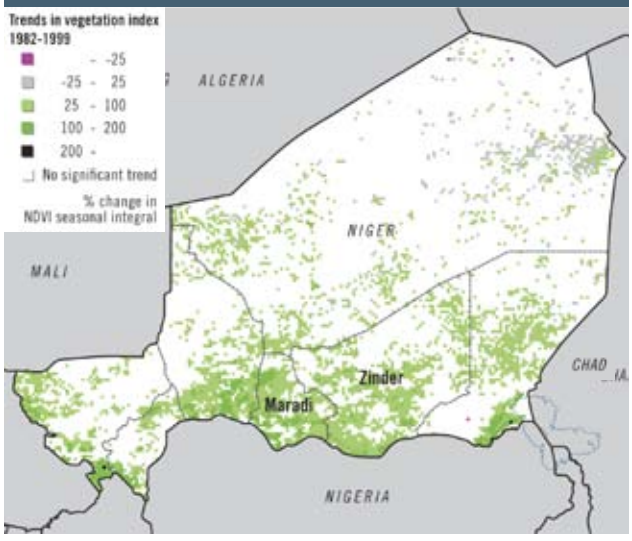
Building Economic Capital

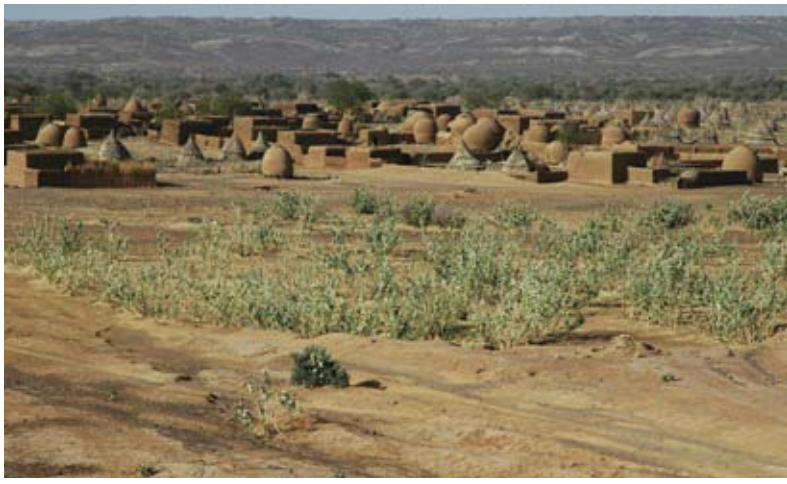
- Expanded cultivation of cereals and vegetables, with harvests doubling in some areas (Tougiani et al. 2008:16; Boubacar et al. 2005:25).
- Pods and leaves provide critical dry-season fodder supplies for livestock (Tougiani et al. 2008:16).
- New food export markets created, primarily to Nigeria (Reij 2006:ii).
- Rural incomes rose in three regions practicing farmer-managed natural regeneration (FMNR) (McGahuey and Winterbottom 2007:3).
- Creation of specialized local markets in buying, rehabilitating, and reselling degraded lands, with land values rising by 75–140 percent in some areas (Abdoulaye and Ibro 2006:44).
- Empowerment of hundreds of thousands of poor farmers, enabling them to pursue new enterprises and improve livelihoods (McGahuey 2008).

Building Social Capital

- Some 25–50 percent of all rural producers have adopted improved natural resource management techniques (estimate based on Tappan 2007).
- Food, fuelwood, and income provided by trees have increased food security (Reij 2006:iii).
- Nutrition and diets have improved through the availability of edible tree leaves and fruits as well as produce grown on rehabilitated plots (Larwanou et al. 2006:22).
- Improved access to land and income generation for women, widows, and the landless poor (McGahuey and Winterbottom 2007:13).
- Average time spent by women collecting firewood has fallen from 2.5 hours to half an hour (Reij 2006:iii).
- Increased self-reliance among villages; improved social status of women involved in FMNR (Reij 2006:iii; Diarra 2006:27).
- Reduced urban exodus of young men in search of work and creation of new small businesses related to forest products (BBC 2006).

TRENDS IN VEGETATION INDEX, 1982–1999





From Famine to Food: The Revegetation of Niger

The farmer-led transformation of Niger's countryside over the past quarter-century stemmed from an ecological and humanitarian crisis that threatened the lives and livelihoods of millions of people and undermined the country's ability to sustain itself.

Through the early 1900s, land use in Niger was characterized by sparse rural populations cultivating small fields amidst surrounding bush. Families were smaller, yields were sufficient, and there were ample supplies of timber from natural woodlands. Fields were left fallow, and trees and shrubs were regenerated to provide extra wood before being cleared for planting (Winterbottom 2008).

Land clearing and tree-felling became more common in the 1930s, as the French colonial government pushed Nigerien farmers to grow export crops and implemented policies that provided disincentives for farmers to care for their land. Such disincentives included a new land law that established the national government as the owner of all trees and required Nigeriens to purchase permits to use them (Brough and Kimenyi 2002).

Perversely, the positive outcomes of the effective French health care system, namely higher life expectancy and lower infant mortality, also increased strain on natural resources (Brough and Kimenyi 2002). So by the time the post-colonial government took power in 1960, Niger's resources were already stretched thin. Throughout the 1960s and 1970s, this pressure multiplied with the policies of the new government, rapid population growth, and a series of devastating droughts.

Niger's postcolonial government extended its predecessor's policy of state ownership over all forest resources. Hoping for better enforcement of the forestry law, it made the Forestry Service into a paramilitary institution (USAID et al. 2002:42). Its

THE GREENING OF NIGER: KEY DATES

- **1935:** French law asserts that all natural resources in Niger, including trees, belong to the state
- **1960:** Independence from France; new government maintains natural resource rules and begins stricter enforcement with paramilitary Forest Service
- **1969 -1973:** 4-year drought cripples country
- **1975:** Multiple donors and NGOs enter Niger to improve food security and combat desertification, including CARE International's Majjia Valley Project
- **1983:** Serving in Mission (SIM) begins implementing Farmer-Managed Natural Regeneration (FMNR) as part of its Maradi Integrated Development Project (MIDP)
- **1984 -1985:** MIDP teams with World Food Program's Food for Work Program in 95 villages in Maradi in response to drought
- **1985:** Government creates Plan to Combat Desertification
- **1987:** Transitional government's Rural Code Secretariat coordinates with international aid groups to revise Rural Code and natural resource governance regulations
- **1993:** New Rural Code signed, transferring tree ownership to property owners
- **1996:** Coup d'état results in suspended donor assistance
- **1998:** Legislation to implement Rural Code at village level enacted
- **2004:** Rural Code enforcement begins at village level
- **2005:** Food shortages due to drought, locust infestation, and population pressures; farmers practicing FMNR and soil and water conservation techniques fare better than those that do not
- **2007:** Satellite images show that over 5 million ha of Niger has new vegetation thanks to regeneration efforts of previous twenty years

officers forbade any felling, harvesting, or selling of trees without government permits (Dan Baria 1999:1, 2). Offenders, including farmers lopping branches from bush trees on their own land, were fined or even imprisoned (Rinaudo 2005a:5). This discouraged people from investing efforts in producing, managing, and selling forest products.

At the same time, government agricultural extension services focused on planting crops in rows, animal plowing, and other measures that also discouraged trees in fields (Rinaudo 2005a:5). The government invested heavily in centrally managed reforestation projects, funded with donor support, which often involved plowing under natural vegetation (McGahuey and Winterbottom 2007:21).

This stripping of Niger's natural tree cover was exacerbated by rapid population growth. By 1975 much of the remaining natural woodland had been converted to farm fields to feed rapidly growing rural communities. But by clearing native trees and shrubs, farmers exposed their fields to the fierce Sahara winds, resulting in plummeting soil fertility and harvests. The loss of tree cover also triggered a rural fuelwood crisis. Poor households were forced to burn animal dung or crop residues instead of using them for compost, reinforcing the downward spiral in soil quality and crop yields (Rinaudo 2007; Winterbottom 2008).

In 1969, Niger's growing stresses developed into a humanitarian disaster with the start of an extreme 4-year drought that triggered famine across the Sahel, afflicting 50 million people (Dan Baria 1999:1). The scale of human suffering attracted global media coverage and drew international aid agencies into Niger. Within a few years these donors, including the United States Agency for International Development (USAID), the World Bank, CARE International, the Canadian International Development Agency, Italian Cooperation, the International Fund for Agricultural Development (IFAD), and the German government agency GTZ, had expanded relief efforts to include development projects aimed at restoring rural productivity (Hamissou 2001:34–35).

In the 1970s and early 1980s, these efforts focused on training foresters and establishing exotic tree nurseries and fuelwood plantations. This approach was both intensive and expensive—plantations typically cost US$1,000 per ha to seed and maintain (McGahuey and Winterbottom 2007:4). Local people were rarely consulted before projects began, and the government often appropriated land that farmers and herders had used (Rinaudo 2005a:4). Over 12 years, some 60 million trees were planted in Niger, less than half of which survived (Tougiani et al. 2008:5).

One exception to an otherwise ill-fated program was the Majjia Valley Project, developed by CARE International in 1975, funded by USAID, and implemented by the Nigerien Forest Service and U.S. Peace Corps volunteers (USAID et al. 2002:42;Wentling 2008a). Farms in the tree-denuded river valley had been plagued by high winds that destroyed seeds in Niger's June-to-October growing season. By planting alternating rows of neem *(Azadirachta indica)*—an exotic nursery-grown species—and native *Acacia nilotica* saplings across the valley to act as windbreaks, the project improved soil retention and fertility, lessened the need for repeated sowing, and reduced damage to newly planted crops (Steinberg 1988:1).

Within a few years, overall yields of millet in fields between windbreak rows increased by 15 percent. While this roughly equaled the loss of production due to trees taking up former

crop space, the harvesting of tree branches, leaves, and twigs used for wood fuel, thatching, and livestock fodder rose by 68 percent (Steinberg 1988:1). In a break with previous top-down approaches, the project gave communities responsibility for maintaining the windbreaks, and village committees were established to create and enforce rules governing tree pruning (Steinberg 1988:3; Tougiani et al. 2008:10).

The Search for Sustainable Solutions: Tree Regeneration Takes Root

In its emphasis on improving native soils, harvesting branches, and sharing responsibility with communities, the Majjia Valley Project laid the groundwork for the FMNR revolution. Its capital- and labor-intensive plantation-based approach, however, was not very scaleable, as only a small fraction of Niger's cropland lies within river valleys; the majority is in drier upland areas (Steinberg 1988:2).

By the early 1980s, development agencies operating in Niger began to recognize that simple, low-cost farming techniques held the greatest promise for improving rural livelihoods. At the same time, studies sponsored by USAID's Forest and Land Use Planning project produced compelling evidence that native species were better adapted to local conditions than exotic imports, such as eucalyptus and neem, that were initially used in development projects (Gallegos et al. 1987:86). Not only could the long tap roots of native trees reach low water tables, but they quickly regenerated after lopping (Amoukou 2006:26; Rinaudo 2005a:6). These native trees provided multiple products for resource-poor households, including fuelwood, livestock fodder, and edible leaves and seedpods (Rinaudo 2005a:6).

Armed with this evidence, projects funded by development agencies increasingly shifted from exotic plantations to promoting natural forest management.

The Pioneers: Serving In Mission

One of the key people behind the movement toward natural forest management was Tony Rinaudo, a Christian missionary with a strong background in natural resource issues who spent the 1970s and 1980s working with Serving in Mission (SIM, formerly Society of International Ministries). In 1958, SIM had established a farm school in Maradi, partnering with the Evangelical Church of Niger to assist small-scale farmers in the region (Evans 2005). In response to the drought of the early 1970s, SIM, like other aid organizations at the time, turned its focus in Maradi to tree planting. But by the early 1980s, Rinaudo and some of his colleagues saw that the greening improvements from these efforts were limited, given the amount of time and money invested.

It was then that Rinaudo began to seek out a different solution to desertification (Rinaudo 2005a:6). In 1983 he realized that the fields cleared by project farmers were not barren, as they appeared, but contained "underground forests" of native tree and shrub stumps that could be successfully regenerated at a fraction of the cost of growing nursery tree stock (Rinaudo 2005a:2). As a result, he helped SIM launch the Maradi Integrated Development Project (MIDP), featuring a new approach to reforestation (Rinaudo 2005a:2).

Farmer-managed natural regeneration, as MIDP's approach came to be called, involved supporting the regeneration of trees and their sustainable management to produce continuous supplies of fuelwood as well as non-timber products such as edible seeds and leaves. MIDP's effort entailed very few "rules," instead emphasizing farmer experimentation and choice. Farmers chose how many tree stumps to let resprout in their

WHAT IS FARMER-MANAGED NATURAL REGENERATION?

Farmer-managed natural regeneration (FMNR) in the savannas of southern Niger adapts centuries-old methods of woodland management to produce continuous harvests of trees for fuel, building materials, and food and fodder without the need for frequent, costly replanting. Trees are trimmed and pruned to maximize harvests while promoting optimal growing conditions (such as access to water and sunlight). The new feature, pioneered by farmers in Niger and the intermediary organizations that assisted them, was to use these techniques in agricultural cropland and to manage trees as part of a farm enterprise.

For decades, Nigerien farmers had cleared their fields of vegetation, leaving what turned out to be an "underground forest" of living stumps and roots. FMNR is based on the regeneration of native trees and shrubs from these mature root systems, which promote surprisingly fast regrowth. Four key steps are involved:

- Selecting the stumps to regenerate based on the usefulness of the species.
- Selecting stems to prune and protect on each stump—usually the tallest and straightest. Intermediaries promoted five stems per stump as the ideal, but each farmer decides for himself or herself, based on farming objectives and household needs.
- Removing unwanted stems and side branches.
- Removing new stems and regularly pruning surplus side branches (as often as once a day). The longer a stem is left to grow, the higher its value in local wood markets.

The original FMNR model, pioneered by Serving In Mission, promoted harvesting one of the original five stems every year, with a newly resprouting stem chosen as a replacement. However, some farmers regrow many more stems per stump, allowing more than 200 stumps per ha to regenerate. This method quickly creates a young woodland. Typical species regenerated in the region include Ziziphus and Combretum, Guera senegalensis, Bauhinia reticulata, and Piliostigma reticulatum, which provide wood, nutritious fruits, edible leaves, and livestock fodder.

Source: Rinaudo 2005a:6–11

fields, how many resprouted stems to grow and harvest, and what to do with the wood (Rinaudo 2005a:8). MIDP workers lived in the project villages and led by example, practicing FMNR on their own farmland. They won recruits by holding village meetings and approaching farmers known to favor planting trees (Rinaudo 2007, 2008).

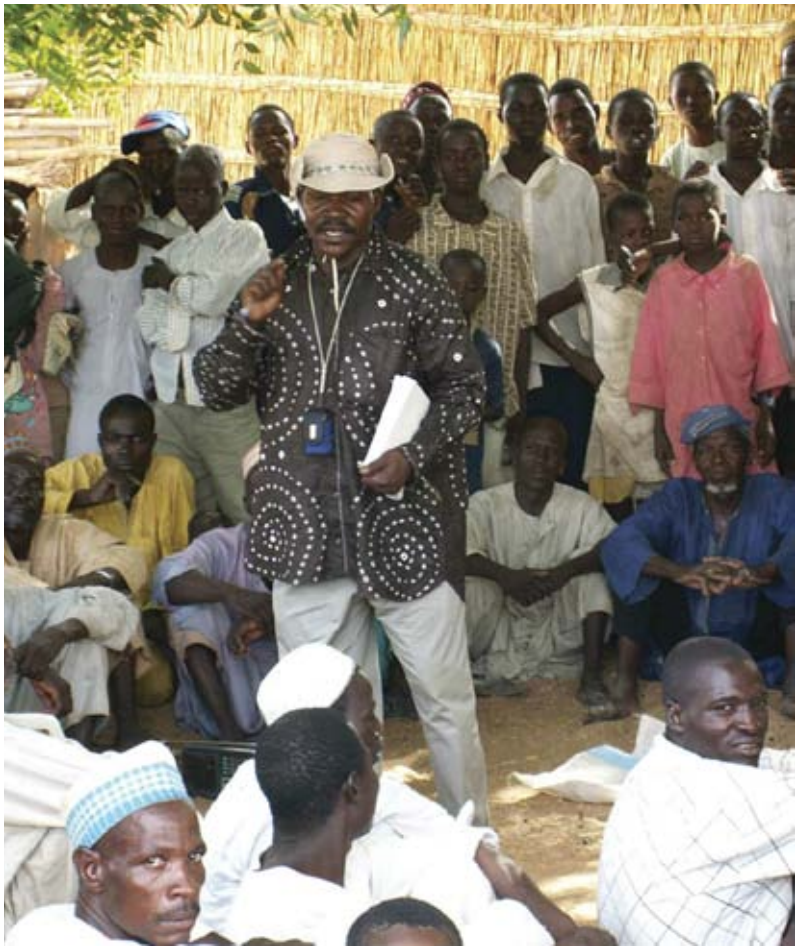
The FMNR approach asked farmers to abandon lifelong practices. Unsurprisingly, few of them were daring enough to take such a risk (Rinaudo 2005a:9). In the first year, only 12 farmers cultivating a total of 12 ha responded to recruitment efforts, from among thousands of local farmers in the district of Guidan Roumdji (the name of this arrondissement was changed to Groumdjii in 2002). They were mocked by other farmers, and some of their young trees were deliberately damaged or chopped down and stolen for fuelwood (Rinaudo 2007).

According to Rinaudo, the first farmers were motivated by a variety of factors. "In 1983, the thought of leaving trees in crop fields was seen as ludicrous by farmers brought up with the belief that cleared fields were essential for good crop yields. Some of the 12 guys were early adopters and innovators and were used to being different.... Some may have hoped that the project would provide loans for oxen, fertilizer and seed as SIM had done in the past. Some were visionary and were already planting trees, so the idea that FMNR would be simpler and faster appealed to them" (Rinaudo 2007).

Despite the peer pressure, all 12 farmers persevered and benefited from a small fuelwood yield in the first year (Rinaudo 2007). Their crop productivity also increased, as MIDP workers had predicted. The following year, the Sahel was hit with another major drought and subsequent famine, a cycle repeated in 1988. MIDP staff seized the opportunity to expand its tree regeneration efforts by incorporating FMNR in a Food for Work program in 95 villages in three of Maradi's six districts—Guidan-Roumdjii and Madarounfa along the southwest border with Nigeria and Dakoro district in the northwest (Rinaudo 2008). In return for food, farmers were required to regenerate native vegetation on their land. Rinaudo estimates that between 80,000 and 100,000 people were exposed to FMNR in 1984 and 1988, providing "the critical mass of people required for adoption of an innovative approach" (Rinaudo 2007).

Most farmers took part only reluctantly, however, motivated solely by their desire for food aid. Although crops flourished among their field trees, many chopped the trees down after the program ended. About two thirds of the half-million newly regenerated trees were lost, with only a third of farmers continuing with the program (Rinaudo 2005a:9). "Despite regular program messages about the value of trees, most people practiced FMNR only in order to obtain grain," says Rinaudo (Rinaudo 2007).

Nevertheless, MIDP's leaders had seen the benefits of FMNR and were optimistic that it had the potential to help farmers across Niger and beyond. They therefore continued their efforts, working with the thousands of farmers who did



keep their trees to refine regeneration practices. Early progress was slow, obstructed not only by deep-rooted cultural beliefs but also by Niger's forestry laws, which stipulated that trees were state property (Rinaudo 2005a:5, 9). As farmers were liable to be fined for cutting branches in their fields, they lacked incentives to regenerate native bush, and many would slash and burn regrowing stumps (Rinaudo 2005a:1). While government budget cuts in the 1980s began to limit the ability of forestry agents to enforce the laws, the Forestry Service continued to station agents at road blocks to confiscate cut wood, preventing the development of a legitimate commercial market for farm-grown fuel (Rinaudo 2007).

In the late 1980s, however, this problem abated after MIDP intervened with the head of the Maradi Forestry Department, who agreed to suspend enforcement of the tree cutting regulations (Rinaudo 2007). For the first time, this gave farmers the incentive and confidence to protect trees on their land by providing both informal tenure rights and the prospect of new income from timber products. By fostering the perception that farmers "owned" the trees in their fields—although official reform of tree ownership was not implemented until 2004—this cooperation between NGO and local government enabled FMNR to take hold (Rinuado 2008).

PERCENT OF POPULATION IN THREE NIGER PROJECT VILLAGES ADOPTING COMPLEMENTARY TREE REGENERATION AND SOIL AND WATER CONSERVATION TECHNIQUES

NRM Technique	Dan Saga, Maradi region (IFAD project)	Control, non-project village (Dourgou in Maradi region)	Kolloma Baba, Tahoua region (GTZ project)	Batodi, Tahoua region (IFAD project)
Protection of natural regeneration of trees	100	6	86	100
Tassa	--	--	91	97
Demi-lunes	--	--	20	46
Stone lines	--	--	97	91

Source: Adapted from Abdoulaye and Ibro 2006:37.

Farmers Spread the Word

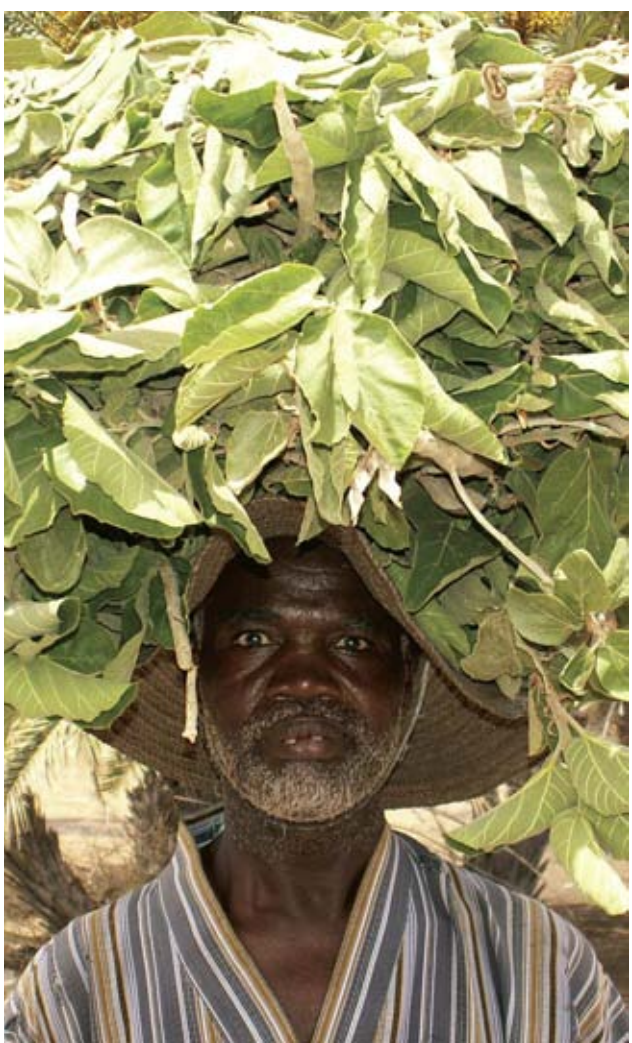
Within a few years, farmers throughout the region began to experiment with regeneration. As thousands of households quickly made impressive gains in crop yields and incomes, the practice spread from farmer to farmer and from district to district, driven by self-interest without project intervention. As regenerating trees requires no financial outlays for materials or equipment by poor, risk-averse farmers, FMNR was well adapted to such spontaneous self-scaling (Rinaudo 2005a:17–18).

Farmers became the best spokespersons for woodland regeneration. But the movement was also facilitated by external intermediary support, with donor agencies funding village implementation projects, farmer study tours, and farmer-to-farmer exchanges. By the mid-1990s, FMNR had become standard practice within the MIDP operational area in Maradi. Project staff had also trained farmers and NGO field workers in five of Niger's six other regions, including neighboring Tahoua and Zinder and more distant Tillabéri, Dosso and Diffa (Rinaudo 2008). Other rural development projects adopted and promoted FMNR methods in their programs, including some funded by the German government and the World Bank and implemented by organizations that included IFAD and CARE International (Larwanou et al. 2006; Boubacar 2006:16; USAID et al. 2002:42).

Following a military coup d'état in Niger in 1996, most of this donor assistance was suspended (USAID et al. 2002:42). Yet woodland regeneration continued to spread rapidly, underlining the key role played by farmers themselves in self-scaling (Winterbottom 2008). In 2004—the year in which government reforms formally awarded tree ownership to rural landowners—observers estimated the number of regenerated trees in Maradi's Aguié district alone at about 4 million (Reij 2004:1). By 2006, farmers in the densely populated parts of Zinder had almost universally adopted FMNR on about 1 million ha—without any major donor intervention (Larwanou et al. 2006:12–13, 17).

This remarkable trend, attributed by observers to the high economic value of Zinder's dominant gao and baobab trees, underlines the profound shift that farmer-led regeneration has brought about in national consciousness (Larwanou et al. 2006:12, 14). The gao tree has always been highly valued in Niger—under Hausa tradition, for instance, anyone cutting the sultan's gao trees was subject to physical punishment (Larwanou et al. 2006:14). But with Niger's recent decentralization of natural resource management and the legalization of tree-cutting, the gaos' value can now be translated into economic benefits for the rural farmers that tend them.

While no comprehensive national inventory has been conducted, aerial and ground surveys and anecdotal evidence suggest that by 2006, trees had reappeared on about 5 million ha, nearly half of all cultivated land in Niger (Tappan 2007). In Maradi and Zinder, which account for over half of Niger's cereal production and where 40 percent of its people live, the practice of FMNR is now common (Wentling 2008b: 7; Rinaudo 2005a:5, 9).



Demi-lunes

Tassa

Adding Value: Reclaiming Water and Land

Since the late 1970s, donor efforts to stave off future famines have also included the introduction of simple soil and water conservation techniques to rehabilitate barren land (Reij 2008). As the practice of tree regeneration spread across southern Niger, intermediaries and farmers adopted some of these practices to further boost crop production. Widely adopted methods included rock lining (placing rocks lines along the contour of sloping land to reduce runoff), improved versions of traditional planting pits or tassa, and demi-lunes (crescent-shaped trenches dug along the contour of sloping land to improve water infiltration into soil) (Abdoulaye and Ibro 2006:19).

These techniques enabled cultivation of secondary vegetable crops, which in turn helped rural families improve their diets in a country where half the children suffer from malnutrition (Boubacar et al. 2005:21). For example, improved soils and higher water tables have enabled villages in Tahoua region to grow onions, tomatoes, sweet potatoes, cow peas, watermelon, and asparagus for home use and sale in local markets (Guéro and Dan Lamso 2006:31).

Soil and water conservation methods have proved particularly important in districts with low water tables and severe shortages of cultivable soil. One of the most dramatic success stories is Batodi village in the Illéla district of Tahoua, where the International Fund for Agricultural Development promoted use of improved tassa and demi-lunes (Boubacar et al. 2005:8). According to villagers, the local water table had sunk to 18 meters below ground by the early 1990s (Boubacar et al. 2005:15). Nothing would grow in the barren land around the village, and women typically spent several hours a day fetching water. By 2005, with almost every villager using tassa and demi-lunes, water tables had risen to three meters below the surface and yields of millet and sorghum, Niger's primary food crops, had increased significantly (Guéro and Dan Lamso 2006:31). Batodi's many women farmers now cultivate dry-season vegetable gardens, irrigated by wells, for household use and sale (Guéro and Dan Lamso 2006:31). Onions are especially high value, with one producer (a male farmer) earning 250,000 CFA francs (US$500) for a crop grown on a quarter of a hectare (Abdoulaye and Ibro 2006:19).

Adoption of these soil and conservation techniques has led to the restoration of land once considered useless. In Tahoua region, for example, entrepreneurial farmers started a new market by buying degraded land to rehabilitate and resell (Reij 2008). Land prices around Batodi doubled between 1990 and 1994 as a result, while in a second village, Roukouzoum, rehabilitated land was resold after two years for triple the original price (Boubacar et al. 2005:10–11, 20). A market in specialized labor has also developed in the region, with self-trained land restorers hired by other farmers to dig tassa and demi-lunes (Boubacar et al. 2005:27). While farmers most able to capitalize on increased land values tend to be the better-off ones, land reclamation has also provided a route for very poor families to relieve hunger and increase income (Boubacar et al. 2005:20–21).

Creating Resilient Landscapes, Livelihoods

The simple and cost-effective practice of farmer-managed natural regeneration has provided an impressively wide range of benefits for Niger's impoverished rural communities. Over the last 20 years or so, about 200 million trees have been protected

and managed by farmers and at least 250,000 ha of degraded land has been restored to crop production (Reij 2008; McGahuey and Winterbottom 2007:7). A 2005 survey for USAID recorded tree or shrub stems ranging from 20 to 150 per ha across three regions, a dramatic 10- to 20-fold increase since 1975 (McGahuey and Winterbottom 2007:6–8). This change in the rural landscape has enabled hundreds of thousands of households living on US$2 or less a day to diversify livelihoods and increase income, thus increasing their economic resilience. It has also played a critical role in addressing the chronic hunger of families accustomed to living with unpredictable harvests.

FMNR has also had an enormously empowering effect, demonstrating to hundreds of thousands of people that they were not helpless hostages to poverty and a capricious climate. "[Its success] helped establish a positive mindset about farmers' capacity to take charge of critical farm management decisions," explains USAID natural resources management adviser Mike McGahuey. "It showed that progress against poverty and desertification was strongest when the rural poor worked on their own behalf to achieve their own objectives" (McGahuey 2008).

Money Trees

Fuelwood and Fodder Income

The most immediate benefit for most families practicing FMNR is the availability of fuelwood from pruned tree branches. From the first year, communities are able to harvest light firewood and from the second year to cut branches to sell in local markets for much-needed extra income. According to conservative SIM estimates, farmers regenerating 40 stumps on a 1-ha field could earn an additional 70,000 CFA francs (about US$140) per year—half the average annual income of a poor farming household.

By 2004, researchers had recorded steep increases in fuelwood and fodder production in FMNR communities, with majorities of villagers gaining income from one or other product. Earlier studies indicate that in 100 Maradi villages alone, about US$600,000 worth of wood was sold between 1985 and 1997 (SIM 1999, as cited by Rinuado 2005a:14). And survey results from across villages with land rehabilitation projects demonstrate that residents perceive a marked decrease in poverty around them as a result of the projects (Abdoulaye and Ibro 2006:40).

Crop Income

Revegetation also improves the traditionally poor fertility of Niger's soils, which in turn boosts crop production. Bush trees dotted across fields help hold soil in place, reducing wind and water erosion (Guéro and Dan Lamso 2006:15). Native trees and shrubs draw up nutrients and distribute them in the topsoil at the same time that falling leaves and trimmings are used as mulch (Rinaudo 2005a:12). Livestock and birds attracted to tree shade and branches leave droppings that fertilize the soil (Rinaudo 2005a:12). Moreover, the growing season on land with trees is longer because farmers only have to sow once, compared with twice or more on fields unprotected from the elements (Rinaudo 2005a:4; Reij 2008). Such benefits are magnified when farmers act collectively, as blanket FMNR villages in Maradi and Zinder regions have discovered. Vegetation in one field affects nearby land by serving as a windbreak and promoting improved water infiltration and soil retention (Winterbottom 2007).

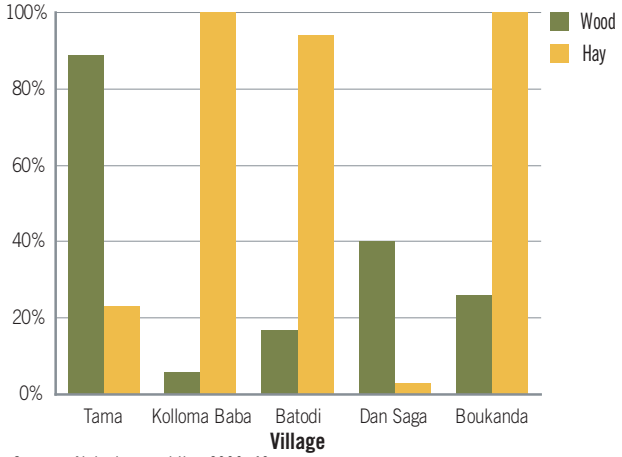
All these FMNR benefits, combined with the soil and water interventions, have resulted in increases in sorghum yields of between 20 and 85 percent and in millet yields of between 15 and 50 percent in intervention villages (Amoukou 2006:25). Other studies suggest that millet yields have even consistently doubled in some FMNR-practicing communities (Tougiani et al. 2008:16). This has enabled households both to store more food against the threat of shortages in the dry season and, occasionally, to sell surplus crops in local markets or for export to neighboring Nigeria (Reij 2006:ii).

SAMPLE WOOD INCOME BENEFITS FOR FARMERS

Area: 1 hectare		
No. Trees protected: 40/hectare		
No. stems protected per tree: 5 stems/stump		
Year 1	40 stems x 0.10 cents	US$ 4
Year 2	40 stems x 0.70 cents	US$ 28
Year 3	40 stems x US$1.50	US$ 60
Year 4	40 stems x US$ 3.50	US$ 140
Year 5	40 stems x US$ 3.50	US$ 140
Year 6	40 stems x US$ 3.50	US$ 140
Total		**US$ 512**

Source: Rinaudo 2005b.

PERCENT OF RURAL HOUSEHOLDS EARNING INCOME FROM WOOD AND HAY IN 2005



Source: Abdoulaye and Ibro 2006: 43

Storing millet

Nationally, figures from the Niger agriculture ministry show cereal production rising steadily in parallel with the spread of FMNR. In 1980, Niger produced 1,770,700 metric tons of cereals, rising to 2,093,300 mt in 1995 and 2,319,800 mt in 2000. By 2006, when at least a quarter of cultivated land was converted, production reached an impressive 4,055,984 mt (Wentling 2008b:1). These statistics suggest that the farmer-led re-greening movement is having a clear impact on the country's ability to feed itself and improve the rural economy.

Non-Timber Tree Products

Farmers' trees have also yielded direct non-timber benefits in the form of fodder for livestock and edible leaves and seedpods to set aside for times of hunger (Rinaudo 2005a:3). Anecdotal evidence suggests that diet has also improved for many FMNR practitioners as they have a greater diversity of food sources. Some villagers in the Aguié district of Maradi, for example, harvest the leaves of a common scrubland tree, *Maerua crassifolia,* which are rich in vitamin A (Reij 2008). Maradi-based farmers have also used the proceeds of FMNR to embark on new income-generating activities, such as beekeeping (Burns 2008).

While most non-timber tree products are consumed by farming families, some districts have generated significant income from their sale. This is especially true in Zinder province, where FMNR has revived cultivation of the baobab tree. Each baobab can bring in an average of US$20 a year in economic benefits just from the sale of its edible leaves (Larwanou et al. 2006:18). With some farms boasting an average of 50 baobab trees per ha, that can amount to US$1,000 per ha a year—nearly three times the total annual income of much of the population (calculation based on Larwanou et al. 2006:18; Winterbottom 2007).

Providing Food Security, Protecting Against Famine

The return of trees to Niger's densely populated southern plains and dunes has also increased food security for local rural economies at a time when the country is adding 440,000 new mouths to feed every year (Wentling 2008b:2). Since the cereals millet and sorghum make up over 90 percent of the typical villager's diet, it was critical that in 2006 the country was able to produce 283 kg of cereal per capita, almost identical to the 285 kg produced in 1980 despite a near-doubling of the population over 25 years (Wentling 2008b:3, 1).

"In the late 1970s donors thought it would be impossible for Niger to produce enough food to feed a population of 10 million," says Mark Wentling, USAID's country program manager for Niger. "In the past three years, Niger has produced more cereals than ever. Much of this increase can be attributed to higher crop yields achieved through the practice of FMNR… which has been critical to enable Niger…to feed its population of 14 million" (Wentling 2008a).

Over the last 45 years, Niger has been plagued by an average of one bad harvest every eight years, following a growing season of low rainfall (Wentling 2008b:4). Farmers practicing FMNR, who are able to stockpile some grains during good years and to harvest trees for food and income, are better insulated against these deadly cyclical droughts, which are predicted to increase as a result of climate change (Reij 2006:2; IPCC 2007:444, 447–48).

When the most recent drought and accompanying food shortages hit the regions of Maradi, Tahoua, Tillabéri, and Zinder in 2004–05, FMNR villages fared much better than those stripped of vegetation. An estimated 15 children a week died of hunger in Maradi during the summer of 2005 (BBC 2005). Yet

villages in Aguié District, where inhabitants could harvest regenerated trees for food, fodder, and firewood to sell in exchange for grain *(see box)* did not rely on famine relief and avoided a single death (Tougiani et al. 2008:13). The contrast between the famine's impacts on FMNR farmers and on their neighbors who did not practice FMNR is a stark reminder of the persistence required to scale up even visibly beneficial and simple changes to entrenched customs. Indeed, despite all its successes, at least half of Niger's farmers still do not use FMNR (Tappan 2007).

Women Reap Dividends

Women are perhaps the biggest winners in Niger's tree regeneration revolution. Traditionally excluded from resource management decisions (despite being skilled in farming and animal husbandry), they have profited from the simple reality that FMNR favors women producers (Tougiani et al. 2008:12). Getting the best results from revegetation requires year-round,

DAN SAGA: PEOPLE POWER TRANSFORMS LOCAL ECONOMY

The Maradi village of Dan Saga and its neighbors are the focus of a concerted effort to build social capacity while promoting natural resource management in Niger. Beset by chronic food shortages due to a lack of land to sustain its rapidly growing population, Dan Saga was chosen as a priority site by the Aguié District Rural Development Project, an initiative launched in 1992 by the International Fund for Agricultural Development (Boubacar 2006:17). The project provided rural credit to several dozen villages and actively promoted farmer-led tree regeneration. Initially it did so using top-down demonstration and instruction to farmers. But these early efforts were undermined by conflicts among villagers, as some people were stealing wood from trees grown by others (Boubacar 2006:17–19).

In 2001, project managers switched focus to empowering communities through capacity-building. Under the renamed Desert Community Initiative, village management committees for natural regeneration were elected by all community members. In a major break with tradition, these included women farmers and herders—two normally marginalized groups—as well as male landowners. The committees laid down strict rules to regulate the exploitation of trees, organized villagers to guard fields against intruders, and imposed fines on those who broke community-approved regulations (Reij 2004; Tougiani et al. 2008:12).

Resource management decisions and action plans were made at monthly village assemblies, held before local elders and the chief, at which committee members fed back information to the community. New bylaws, agreed to by the local administrative authority, embedded these arrangements, while elected committee members were equipped with a uniform and badge, emphasizing their authority. Aguié's departmental government, forestry department, and land tenure commission also approved the new institutional arrangements (Tougiani et al. 2008:10–14).

Their investment thus protected, many more farmers began nurturing bush trees, adopting pruning and trimming techniques that allowed fast vertical growth without hindering the growth of millet in the soil below (Toumieux 2005). By 2007, a total of 53 FMNR community committees had been established, covering 170 villages and encompassing the entire Aguié district (Tougiani et al. 2008:11). Each village made payments toward policing tree regeneration activities. The income raised, together with fines collected, was placed in a village fund and used to support development activities and tree nurseries on common land. This transparent process both enhanced social unity and reinforced public support for tree regeneration (Tougiani et al. 2008:12–13).

By 2007, destructive tree cutting practices had "practically ceased in the whole of Aguié," and 130,000 ha across the district boasted regenerating trees (Tougiani et al. 2008:14). In Dan Saga, this included every household and more than 5,600 ha of land, transforming the local economy (Abdoulaye and Ibro 2006:15). Fields that had previously lain barren contained on average 150 bush trees per ha, compared with only 52 per ha in a nearby non-project village (Abdoulaye and Ibro 2006:36). Villagers reported that FMNR can double their yields (Diarra 2006:18), and some
40 percent of village producers were selling surplus wood, seedpods from gao trees, and fruits and gum Arabic from Acacia seyal trees (Abdoulaye and Ibro 2006:43). Annual per capita income from wood sales alone ranged between US$46 and US$92 (Tougiani et al. 2008: 13).

Food security and resilience to drought—critical issues for a village on the edge of the Sahara—have also improved markedly (Tougiani et al. 2008:2). In 2005, when a deadly combination of locusts and drought struck the region, Dan Saga required no food aid (Toumieux 2005).

even daily, attention to pruning trees. As most men still migrate to urban centers throughout West Africa during the dry season to secure additional cash income, the increasingly valued task of tree husbandry often falls to women (Wentling 2008a).

Women and their families derive a host of material benefits from this role. Using their own wood for cooking eliminates a daily cost of 200 CFA francs (US 40 cents) for purchased firewood (USAID et al. 2005:18). Surplus wood can earn up to 400 CFA francs (US 80 cents) per bundle in local markets during the dry season; in Zinder, a sack of nutritious, edible baobab leaves can sell for as much as 3,000 CFA francs (US$6), three times the average daily wage for laborers (Larwanou et al. 2006:18). Women farmers use FMNR income to meet household needs, including purchasing food and paying school fees. Many have also diversified their households' livelihoods: some by taking advantage of better soil fertility and water retention to cultivate cash crops such as onions, tomatoes, sesame, and hibiscus; others by using their new earnings to invest in sheep and goats, which live off of tree seedpods (BBC 2006; Reij 2006:iii).

Anecdotal evidence highlights how the status of women has been transformed by their involvement in FMNR. A 2006 field study of FMNR villages across Zinder region found that livestock owners—ranked high on the social ladder—commonly included women (Larwanou et al. 2006:21). In Kolloma Baba village in Tahoua, formerly vulnerable and marginalized widows and divorcees employ male laborers to work their farms (Boubacar et al. 2005:10, 16). During the 2005 food crisis, female FMNR farmers also used their food reserves to assist others, elevating their position in the community (Diarra 2006:12). Women farmers' enhanced status is also clearly demonstrated in FMNR communities that boast village natural resource management committees, where they participate equally with men in decision-making (Tougiani et al. 2008:12).

KOLLOMA BABA: WOMEN REVIVE LAND, IMPROVE THEIR STATUS

"These lands are now like our husbands," say the women of Kolloma Baba, describing the thriving plots of millet and sorghum, cow peas, groundnut, and okra around them, the result of years of hard labor (Abdoulaye and Ibro 2006:40, 42). Once barren, boulder-covered, and devoid of vegetation, these patches of reclaimed desert have lifted the women, mostly divorcees and widows, out of grinding poverty and transformed their social status. Today, not only do they harvest enough food for their families; they earn income from selling surplus crops, hay, and tree seedpods, and their land has significantly increased in value (Boubacar et al. 2005:17, 20; Diarra 2006:21).

The women's fortunes were transformed with the help of the Tahoua Rural Development Project, funded by the German government agency GTZ. In the late 1980s, with the agreement of the village chief and local government officials, about 250 widows and divorced women received the rights to abandoned, degraded land in Kolloma Baba, a village where farm productivity had plunged by up to 90 percent (PDRT 1997 as cited by Guéro and Dan Lamso 2006:5; Abdoulaye and Ibro 2006:40). In return the women pledged to restore the land by investing their labor in soil and water conservation techniques (Guéro and Dan Lamso 2006:29; Winterbottom 2008).

After clearing the land of rock, each woman received a plot of about 60 square meters (BBC 2006). In addition to sowing traditional millet and sorghum, many took the initiative to diversify into cow peas, groundnut, and okra (Abdoulaye and Ibro 2006:32). In the early years, female farmers worked through the Kolloma Baba Women's Association, established by the project, with members helping each other to develop their land (BBC 2006). More recently, they have hired male labor, proof of their considerable economic capacity (Boubacar et al. 2005:18, 29). By 2006, they had restored 2,000 ha of degraded land and were selling excess crops, lifting themselves a step out of poverty and increasing their social status. A village committee, principally made up of women, deals with protection of regenerated trees across the community (Saadou and Larwanou 2006:15–16, 18).

Although their land has increased several times in value, and despite persistent pressure from male farmers, the women have vowed not to sell. Says association member Fatima Illiassou: "Thanks to our crops, we can eat. We can buy clothes for our children. We won't go through all that suffering to give men the fruits of our labor" (BBC 2006).

Re-greening a Country: Key Players and Partners

With millions of trees now carpeting land that was mostly barren only one to two decades ago, Niger's farmers have produced one of the most visibly successful examples of natural resource management in the world today. Although it took several years to take off, Niger's farmers have abandoned a core practice of clearing fields and have embraced the protection and sustainable management of native vegetation.

Why did they do so? One clear reason, say observers, was the impact of the environmental and economic crisis of the late 1970s and early 1980s, combined with Niger's booming population. With more mouths to feed every year, rural communities could see that traditional clearing and farming methods were no longer meeting their needs (Wentling 2008a). The obvious success of early FMNR projects, implemented at little or no cost to farmers, was also a powerful spur to their neighbors. But it is unlikely the movement would have reached such a scale or overcome the barriers to farmer adoption without the input of two key players: Niger's central government and international intermediary organizations.

Role of Government: From Policemen to Allies

One of the biggest hurdles to widespread adoption of FMNR was the state ownership of Niger's trees. Villagers were well aware of the law because the oppressive Forestry Service vigorously enforced it for over 20 years, well into the 1980s, making farmers hesitant to manage trees. However, de facto shifts in the forest and land tenure system began in the late 1980s as part of the government's transition to democracy (USAID et al. 2002:42; Wentling 2008a).

These de facto shifts were driven by a confluence of forces. Macro issues included the fallout from the 1984 drought and Niger's 1987 transition to a democratic government. There were also a range of smaller efforts taking place simultaneously that had an impact on the thinking of the government. One of the most important of these was a USAID project that partnered Niger's Forest Service with rural residents to manage a formerly "off-limits" national park using FMNR and soil and water conservation techniques.

The Forest and Land Use Planning project convinced the Forest Service that such practices were effective and could actually create revenue for the state, as the partnership was based around a sustainable wood harvesting cooperative that divided revenues between the Forest Service and local people (Gallegos et al. 1987:51–52). MIDP and CARE projects were also helping the government realize the goals of its 1985 Plan to Combat Desertification, thereby solidifying the effectiveness of FMNR and these localized conservation techniques in the minds of government officials (Gallegos et al. 1987:24).

In 1987, the transitional government created a Permanent Rural Code Secretariat to begin the process of revising the Rural Code, a body of law that applied to much of Niger and that included the provision establishing government ownership of trees. MIDP, USAID, and others worked with the new Inter-Ministerial Committee on Natural Resources, charged by the government to develop a new Code (Gallegos et al. 1987:25).

The organizations were largely successful in their efforts, though formal legal changes took longer than hoped due to government instability. The Code that was signed in 1993 recognized both customary and formal land use rights and laid the groundwork for transferring tree ownership to property owners (McGahuey 2008). Legislation to implement the new code at the village level was passed in 1998 and came into force in 2004 (Wentling 2008a). For many farmers, having this sense of security about managing trees without fear of legal repercussions tipped the balance of self-interest in favor of embracing FMNR's simple, cheap, and effective practices.

Prompted and assisted by foreign donors, the new government did not limit its reforms to the Rural Code. In pursuit of economic development and improved management of the country's beleaguered natural resources, it also overhauled the country's Forest Code, decentralization laws, Forest Service, and forest fiscal policy (USAID et al. 2002:42). The collective impact was to create an economic and social environment in which sustainable land management practices, such as FMNR and soil and water conservation, could and did explode across the country. "Under the old system, the spontaneous spread of FMNR would not have likely occurred," says Mike McGahuey. "FMNR demonstrated that the most effective role of government was to reduce barriers and strengthen farmers' incentives to engage in and benefit from environmentally and socially sustainable agricultural practices" (McGahuey 2008).

Role of Intermediaries: Agents of Change

In an effective partnership, international donors and NGOs have had a twofold impact on the spread of Niger's tree regeneration movement: promoting new land management practices among Niger's farmers and facilitating the government reforms that enabled community experiments to reach national scale.

The U.S. and German governments and the World Bank acted as significant catalysts by providing intellectual input, funding, land management expertise, and pressure for policy reform. In the 1980s USAID, GTZ, the French and Dutch governments, IFAD, and the World Bank helped provide the economic rationale for farmer-led tree regeneration by funding research on the superior benefits of native vegetation, including potential markets for forest products (Winterbottom 2008).

While supporting soil conservation and tree management programs, these donors also engaged the government of Niger in a policy dialogue on sustainable natural resource management, stressing the need for community rights, laws providing secure resource tenure, and reform of both the forestry code and the

role of forestry agents (USAID et al. 2002:42). Their advice was adopted in the wholesale reforms of the 1990s described earlier.

USAID's involvement went well beyond advice, however. In the mid-1990s, the agency was deeply involved in helping Niger's new democratic government formulate, implement, and popularize its natural resource management reforms, through a US$28-million agricultural development grant program. This funded, for example, technical support for formulation of the Rural Code and the establishment of the Permanent Secretariat to administer the legislation. The agency also funded all-important efforts to publicize the code to millions of dispersed farmers and herders. This included translating the text into the eight major languages spoken in Niger and communicating the changes via radio and television (USAID et al. 2002:148).

While donors played their part at the macro level, in the field it was the committed and long-term presence of NGOs and specialized agencies such as Serving In Mission, IFAD, and Care International that enabled FMNR to take root. By 2008, SIM had worked with farmers in Maradi for over two decades, while the major IFAD projects in Aguié district had begun 13 years earlier. "After the food-for-work program ended in 1988, the only tools at hand were persuasion and persistence," recalled Rinaudo. "Having staff in the village and giving the same message over and over." In the early years, he added, the catalyzing influence of individual MIDP figures and supportive Maradi forestry staff played a major role in fostering recognition and acceptance of the new farming practices. Without the efforts of such intermediaries, FMNR might not have reached the critical mass that resulted in its scale-up over much of rural Niger (Rinaudo 2008).

A Road Map for Greening Africa's Drylands?

The simple process of regenerating native trees, coupled with progressive policy and institutional reforms, has proved an impressively strong mechanism for leveraging transformational development in Niger. The scope of its impact on one of the world's poorest societies includes poverty reduction, economic growth, agricultural and rural development, and improved governance and health.

Niger's overused farmland and barren savanna are visibly more fertile and resilient thanks to sustainable management practices. And instead of the dire food shortages predicted by aid agencies as Niger's population boomed, farmers adopting FMNR have displayed a new economic resilience that has impressed development experts. "Although challenges remain, the resiliency, innovations and adaptations of rural producers…in the face of environmental and economic stresses… provide encouraging prospects for progress," reported USAID officials in 2007 (McGahuey and Winterbottom 2007:26–27). And progress need not be limited to Niger. For other Sahelian countries facing the triple challenges of population growth, desertification, and climate change, FMNR also offers a cheap and effective model to improve farm productivity and reclaim precious land from the dunes (Rinaudo 2005a:9).

More Food for More People

Yet despite the extraordinary spread of FMNR and the significant benefits generated, population growth will continue to pose a major challenge to food security in Niger, especially against a backdrop of climate change.

In the past 20 years, Niger's population has doubled to 14 million people, and it maintains one of the highest birthrates in the world of about 7.1 children per woman (Wentling 2008b:1; INS and Macro International Inc. 2007:xxv). By 2015, the population will rise to 18.8 million and the area of cultivable land per capita will fall further—from 1.45 ha to 1.12 ha per person (Wentling 2008b:6, 7). Yet already, even in the best harvest years, at least 1 million land-poor Nigeriens need food aid due to localized droughts or pest infestations (Wentling 2008a:5). Similar demographic pressures face Niger's neighbors, including Burkina Faso, Mali, and Chad.

As a result, food production will become an increasing government and donor priority in the region, which makes higher agricultural productivity imperative. In this context, say development experts, FMNR has a major role to play in helping poor rural populations improve food security and ride out the present baby boom. "Niger appears to be a model in buying time," says Mike McGahuey. "FMNR has a track record of allowing people to (a) get more product and more diverse forms of product from the same amount of land and (b) maintain the productive capacity of that land even while more is being taken

from it. [Such] approaches… will be more and more important for Niger and for other countries" (McGahuey 2008).

With two thirds of Africa either desert or drylands, this potential has not been lost on donors, neighboring governments, and international NGOs. While the vast, spontaneous spread of re-greening in Niger is unique, tree regeneration and soil and water conservation projects have also been successfully implemented in other Sahelian countries, notably Burkina Faso, Mali, Senegal, the Gambia, and Guinea (Winterbottom 2008). Organisation for Economic Co-operation and Development donor countries, working with the Club du Sahel and the Permanent Interstate Committee for Drought Control in the Sahel, have implemented successful programs supporting decentralized natural resource management, land tenure, and forestry code reforms (Winterbottom 2008).

During the 1990s, USAID duplicated its policy reform assistance to Niger in other West African countries, including Mali, Senegal, and Guinea, where it helped governments reform forest codes. These reforms recognized farmers' rights to

LEARNING FROM NIGER'S RE-GREENING

Sometimes costly technology is less important than patience and persistence. The FMNR approach has succeeded in restoring and improving vast swaths of land in Niger using little more than the time and persistence of the staff of NGOs and aid agencies. No new technology was involved, and no special seeds or other agricultural inputs, simply the willingness of the NGOs to support the first adopters of the practice and to take advantage of every chance to demonstrate the impact of FMNR to other farmers. Even with unexpected setbacks, these organizations stayed close to the farmers and kept encouraging them. The result, over time, has been the significant improvement of more than half the cultivated land in Niger.

Tradition and fear are powerful forces that must be accommodated. The fact that most farmers who had allowed trees to grow on their land in exchange for food support later uprooted the trees, even after the benefits of that practice were apparent, demonstrates the difficulty of securing change in rural and traditional cultures. The NGOs and donors understood the strength of these traditions, and they overcame them with patience and perseverance.

Livelihood improvements can also improve community stability. In rural Sahelian communities, the dry season leaves families seeking alternative sources of income and food. It is something of a ritual for men to leave the village for several months at a time seeking paying work in larger towns and cities. Not only does this exodus increase the pressure on those left behind, it decreases social cohesion within communities and commonly results in the introduction of diseases such as HIV when the men return. One of the important benefits of the increased productivity from FMNR is that it can provide more in-village economic opportunities for men and women, reducing the need to leave to seek work, and so enhancing community resilience. This is a benefit that we have seen in several cases studies in WRR 2008 and 2005.

Simple methods of communication can yield significant benefits. The widespread adoption of FMNR practices in Niger was, to a very large extent, due to simple word-of-mouth…what today is called "viral communication." The program began with a few brave souls willing to break with tradition. It expanded as neighbors witnessed the visible agricultural and economic improvements created by these changes and as farmers conversed about the potential benefits of leaving trees in local and regional markets. Planned visits of farmers to FMNR communities resulted in a continued spread of the practice. Today, about 5 million ha have benefited; more than 250,000 ha of land that was once considered unusable is now producing crops, and a significant portion of the nation's farmers are involved.

Inclusion is important. As communities in Niger began to adopt FMNR and water conservation practices, decisions about the use of common lands and tree protection were necessary. The inclusion of all affected parties, not just land-owning farmers—women, nomadic herders—was critical for broad community acceptance of change and the effectiveness of the new rules.

manage trees and to redefine the role of forestry officers as extension agents, supporting community-based management (USAID et al. 2002:42, 137). As in Niger, USAID also provided assistance in Mali and Senegal to help implement newly enacted forest codes (USAID et al. 2002: 137).

Barriers remain, however, to achieving the level of scale-up for farmer-led natural resource management witnessed in Niger. "Unfortunately, key enabling conditions are not yet fully established in most countries across West Africa," says International Resource Group natural resources management (NRM) expert Bob Winterbottom, who worked through USAID as Natural Resources Management Advisor to Niger's Ministry of Environment from 1993 to 1996. "An important challenge for donors and governments will [be] to reinforce their efforts to reduce barriers to FMNR, such as high taxes on wood and other 'natural products' harvested and marketed by rural populations, and…onerous permit requirements that discourage investment in producing and marketing forest products" (Winterbottom 2008).

Equally important in creating the incentive to change among farmers is granting secure land and tree tenure—still lacking in some West African countries—and the transfer of rights and authority to local communities to control access to and use of natural resources. As Niger's experience has shown, when farmers are given the rights and tools to control their own economic destiny, both land and people benefit.

Creating Resilience to Climate Change

The Sahel has been identified as one of the areas most vulnerable to increased drought in a warming climate. While rains have been relatively good in recent years (except 2004), the long-term projections are for longer and more frequent droughts across the region as global temperatures rise (IPCC 2007:444, 447–48). In the absence of effective natural resource management approaches such as FMNR in Niger, this raises the threat of future famines approaching the devastating scale of the 1970s; it also promises to further the desertification of fragile lands in the Sahel. Yet development experts and intermediary organizations are hoping that region-wide expansion of FMNR and other proven land management programs will help the region increase its resilience in the face of changing climate (Winterbottom 2008).

Winterbottom notes: "The development community needs better models for poverty reduction and rural development that simultaneously assist these populations in adapting to climate change. The experience in Niger has demonstrated that incorporating FMNR and other NRM practices are key elements of such a model" (Winterbottom 2008). Gray Tappan, a geographer who measures the spread of FMNR across Niger, has seen these tangible effects throughout his travels: "[Adopting communities] have become much more resilient to drought in the last 20 years because of the increase in vegetation cover. Crops can fail, but the farmers, the herders, have something to fall back on. And that is the trees—the wood, the fruit" (Harris 2007).

One opportunity to extend these cost-effective resilience-building techniques to more communities would be to integrate them into the National Adaptation Programmes for Action (NAPAs) of the countries of the Sahel. The NAPAs are adaptation strategy plans written by developing-country governments under the United Nations Framework Convention on Climate Change (CNEDD 2006:3). FMNR can achieve many of the goals of Niger's current NAPA, but unlike the actions recommended in the present version, it would not require extensive external technical and financial assistance (CNEDD 2006:7–8).

Another opportunity to increase the resilience that comes with FMNR across the Sahel is a new international alliance of NGOs and research organizations that is developing a Sahel Re-Greening Initiative. The Initiative will mobilize donor funding to build on the grassroots successes of FMNR across the West African Sahel (Reij 2008).

Niger's current government appears more capable than earlier administrations of instituting the new Rural Code to allow for institutionalization of FMNR and other community conservation practices across Niger. The new government's Rural Code Secretariat, created in 2006, is also getting considerable support from donors (Wentling 2008a). It is hoped that the lessons of the drought in 2004, which left many individuals and communities that did not practice FMNR vulnerable, will help convince farmers who continue to clear their land indiscriminately of the benefits of better management.

But there are new challenges. Where tree regeneration is widely practiced, community and local governments need to act to resolve conflicts over access to natural resources and property rights to formerly abandoned land that has been restored (Winterbottom 2008). In particular, the rights of the more vulnerable—nomadic herders, the landless, and women—to equitably gain access to the benefits of FMNR need to be strengthened (Tougiani et al. 2008:12–15). The gains made by the current generation of women, for example, could be eroded unless Niger's inheritance laws are revised to enable land and livestock to pass from mother to daughter (BBC 2006).

Nevertheless, in its proven impacts and ready scaleability, FMNR and associated soil and water conservation practices provide a potentially transformative model for natural resource management in the drylands of Africa and beyond.

Successfully scaling up ecosystem enterprise requires a confluence of community-level and national-level actions.