

POVERTY, LIVELIHOODS, AND ECOSYSTEMS

Enhancing Sustainable Livelihoods in Puttalam Lagoon, Sri Lanka

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Introduction

Sri Lanka's coastal zone is vital to the country's social, economic, and environmental development. Much of the 1,620-kilometer (km) coastline was devastated by the tsunami in December 2004, although the area of this case study—Puttalam Lagoon on the northwest coast—suffered few impacts. Sri Lanka's coast comprises estuaries, peninsulas, beaches, and offshore islands. It supports 90% of the fisheries, most of the tourism and other industries, agriculture, and human settlements. The coral reefs, mangrove forests, estuaries, lagoons, wetlands, and sanctuaries in the coastal zone have some of the country's richest biodiversity. The coastal fisheries accounted for 66% of Sri Lanka's fish production in 1995, which totaled 235,750 tons. Coastal and marine fisheries contribute more than half of the population's animal protein consumption. Thus, while the coastal zone is extremely valuable to Sri Lanka's economy, it is also highly fragile and vulnerable to many dynamic processes, including natural and human forces. The recent tsunami was the most extreme example.

The coastal region is made up of 74 divisional secretariats (DS), each with a coastal boundary. These divisions lie within 14 of Sri Lanka's 25 administrative districts and cover about 23% of the country's land area. For historical reasons, the population is concentrated in the coastal region, particularly along the southern, western, and northwestern coasts. About 4.6 million people, representing 25% of the population, live in the coastal region.

Sri Lanka's diverse coastal resources sustain a range of economic activities, chiefly marine and brackish water fisheries. In 2000, the fishery sector contributed about 2.7% of the gross national product at the current factor cost price, providing an important source of foreign exchange. Marine fisheries accounted for an estimated 91% of the fish production in Sri Lanka in 2003, with coastal fisheries contributing 64% of this share. The fishery sector—including coastal aquaculture, which consists mainly of shrimp farms in North Western Province—employs about 150,000 people and provides sustenance to at least 1 million.

Coastal resources have provided economic and subsistence value to coastal communities since time immemorial. Coral reefs contain many resources of export value, such as ornamental fish, lobsters, etc. Estuaries and lagoons, mangroves, sea grass beds, and salt marshes also function as vital breeding and nursery grounds for numerous species of fish, crustaceans, and mollusks, many of which have commercial value. The coastal communities traditionally use coastal vegetation for many purposes, such as food and beverages, timber for houses and boat construction, firewood, materials for manufacturing fishing accessories, etc.

Most of Sri Lanka's coastal habitats have suffered from degradation, in some cases at an unprecedented rate, reducing the availability of resources. Human population growth in Sri Lanka's coastal zone over the last 2 decades has increased the disruption of coastal processes tremendously. Natural causes and human activities have degraded the coral reefs of many important sites. Mining of coral for the lime industry is a principal cause of the destruction of coral reefs. Destructive fishing techniques often damage the sea grass beds in lagoons and around the coral reefs. Pollution from the inflow of sewage, untreated

industrial effluents, urban waste, and chemical compounds from shrimp farms increasingly harm lagoons and estuaries and their biodiversity. The conversion of these areas to other uses—such as shrimp culture, lowland agriculture, and house construction—has caused extensive damage to the naturally fragmented mangrove swamps. Salt marshes in specific areas of the country, which use to perform many vital ecological functions, have diminished considerably in the district of Puttalam, where they have been converted to shrimp farms.

Background

The Regional Technical Assistance for Coastal and Marine Resources Management and Poverty Reduction in South Asia, sponsored by the Asian Development Bank (ADB), aimed to promote regional cooperation among four Asian countries—India, Maldives, Pakistan, and Sri Lanka—in strengthening the management of environmentally sensitive coastal and marine resources using integrated coastal zone management approaches. As part of the regional technical assistance, a poverty and environment nexus study attempted to analyze the inherent links between poverty and environmental degradation, and their impact on socioeconomic groups.³

The study intended to address the main causal mechanisms at work in poverty and environmental degradation. Having determined the causal mechanisms exacerbating poverty, the study attempted to determine—from the quantitatively driven empirical analysis—the groups (gender, ethnic, or economic) that were hit hardest by environmental degradation. The fishing communities, in general, lack decent housing and basic social infrastructure. Seasonal variations of household income, primarily from fishing in coastal and lagoon areas, compound their economic problems.

The study focused on the nine *grama niladaris* (smallest administrative unit headed by a village headman) around Puttalam Lagoon on the north-western coast of Sri Lanka. Sample communities were drawn from these four villages.

Gangewadiya. Gangewadiya, originally a fish-landing site (*vadiya*), is now an established fishing

village within the grama niladaris of Aluth Eluwankulama. Bordering the right bank of Kala Oya Estuary, the isolated village is connected to the main road to the cement factory by a 5-km stretch of gravel road. Gangewadiya, established some 30 years ago as a seasonal vadiya with temporary huts, now has more permanent dwellings for the fisherfolk and their families. The number of housing units has increased appreciably over the last 10 years. In 1990, according to the resource profile, the village had only 39 fishery housing units (listed as “fisheries quarters” in the profile). It now has about 55. Although the houses in Gangewadiya are semipermanent, the study found that more than 25 families possess a second, more permanent house in Eluwankulama.

Serakkuliya. The grama niladaris of Serakkuliya consists of several villages—Serakkuliya, Sinnagowilluwa, Mahwilluwa, and Perriyanagar. Serakkuliya village is about 12 km north of the Wanathawilluwa DS Office, close to the lagoon. Serakkuliya has 266 housing units and a population of 1,197, the majority of which is Sinhala (881). Muslims (167) and Tamils (149), most of whom are engaged in lagoon fishery, account for the rest of the population.

Most households receive a state welfare payment (*samurdhi*) of Sri Lanka rupees (SLRs) 350–600 (US\$1 = SLRs100) per month. Over the last 10 years, fishing has expanded rapidly with a corresponding increase in the number of mechanized boats from 50 to 150. Limited space for anchoring, poor storage and landing facilities, and poor marketing arrangements create problems in Serakkuliya.

Karative (North). Geographically, Karative (North) is within a dense mangrove area bordering the lagoon, and has a large stretch of salt marshes. Its long coastline comprises three fishing villages: Serakkuliya, Odekare, and Palamkare. With a population of about 3,200, Karative (North) is inhabited by a Tamil-speaking Muslim community. Reportedly, the Muslim population has congregated in this village since ancient times, giving Karative a high population density (200 persons per square kilometer [km²]). Of the 609 households, 509 are Muslims and the rest are Sinhala. About 60% of the families receive the *samurdhi*.

³The aim of the poverty and environment nexus study basically is to understand the causal links between poverty and environmental degradation. Causal links between poverty and environment rarely are discussed at length in available literature. While widespread poverty clearly is due to social and economic deprivation, solid evidence to substantiate that poverty alone can cause environmental degradation is lacking. However, it can be argued reasonably that poverty contributes to resource degradation.

The salt marshes provided employment and income to about 60 families until recently. For most household members, fishing is the primary source of income. In Karative (North), for example, about 50–60% of the communities fish as their primary means of livelihood. Approximately 75–100 fishing families own outboard motorboats, and an additional 50 families own more conventional fishing gear, such as a small wooden boat (*theppama*) with cast nets. About 20% of the households also cultivate rice in the adjoining Eluwankulama area.

Pubudugama. Pubudugama is within the Samagipura grama niladaris in the south of Wanathawilluwa DS. It is a traditional fishing village with a population of about 260 (70 families), all of whom receive samurdhi. About 95% of the villagers fish. The St. Sebastian Fishery Cooperative Society—one of the few functional fishery cooperative societies in the country—draws its members from Pubudugama and Karadipual. The people in this village seem to enjoy a better socioeconomic standard of living than those in the other three study locations. However, unclear land titles, poor accessibility to drinking water, and the encroachment of prawn farms into mangroves are major environmental, social, and economic issues.

What it means to be poor

HOUSING

In a village economy, the types of houses, their amenities, and the ownership of some selected durables generally reflect the living standards of community members. Further, the extent of the livable floor

area, type of floor, materials used for the walls and roof, number of rooms, and the availability of amenities (e.g., water, latrines, and electricity) indicate the wealth and social status of the average rural household. In a fishing community, however, housing generally is not a satisfactory indicator of poverty because substandard housing is common in the coastal belt due to the lack of ownership of the land on which houses are built. In addition, semipermanent construction is often deliberate since houses are vulnerable to natural calamities, such as gales, high tides (sea erosion), etc. Families commonly own a better-quality house elsewhere, while occupying a substandard house on the beachfront. This is particularly true in Gangewadiya, where almost all the houses in the villages appear substandard. At least half these families own a second house in the nearby Eluwankulama village.

Housing continues to be a high priority in most fishery development projects in Sri Lanka due to the generally poor standard of housing in fishing communities. “Visara” and “Diyawara” are two of the large-scale housing programs recently implemented under the state-sponsored fishery extension programs. However, some people have complained that the criteria for selecting the beneficiaries of such housing projects were not transparent. In the study area, none of the villages had benefited from fishing community housing programs in the recent past.

The study also found that 40% of the houses in all four villages had a floor area of less than 18.6 square meters (m²) (Table 1). Most were one-unit houses. Since the average family has four to five members, these houses were overcrowded and far below the national standards. The conditions in

Table 1: Housing in the Pilot Villages

Floor area (m ²)	Gangewadiya	Karative	Serakkuliya	Pubudugama	% of houses in each floor-area category
	Houses (no.)				
9.3–18.6	12	5	6	8	40
18.7–27.9	3	4	6	6	24
28.0–37.2	2	2	4	2	13
37.3–46.5	–	2	–	3	6
46.6–55.7	2	1	–	2	6
55.8 and above		3	4	1	11

– = 0; m² = square meters; no. = number; % = percent.

Source: Household survey, International Union for Conservation of Nature (IUCN).

Gangewadiya and Karative were especially poor, with most houses having a floor area well below the minimum of 18.6 m². Houses without a kitchen, toilet, and adequate ventilation holes were common in the study area. Only a few houses (11% of the sample) were relatively large, with a floor area of 55.7 m² or more. Only two or three houses had cemented floors and were built as permanent constructions with brick walls and galvanized sheet roofing.

HEALTH AND SANITATION

Environmental sanitation in the coastal belt communities generally needs to be improved in terms of toilets and sanitation practices. This is true in the case of all four villages studied. Of the 80 houses surveyed, only 19 were found to have toilets (pit toilets). The five public toilets found in Gangewadiya were constructed under the Fisheries Development Program of the Fisheries Ministry of the North-western Provincial Council. Some nongovernment organizations (NGOs) and several special projects sponsored by the church have supported the construction of latrines, especially in Karative and Serakkuliya. However, there remains a great need for more toilets and proper sewage disposal in the four study areas.

WATER

The paucity of potable water continues to pose significant social, health, and economic problems for the households of the study area. Women, in particular, face severe hardships, as they spend long hours collecting water from distant places. The lack of adequate water severely handicapped their daily cleaning and cooking activities. Kala Oya is the main source of freshwater for villagers in Gangewadiya. Each day, the

villagers trek 2–3 km inland along the river to collect drinking water. Most of the villagers of Serakkuliya do not have access to freshwater, although they buy water from outside suppliers. Several suppliers transport *bowser* (tanks) full of water to these villages, which allows villagers to collect two to three 35-gallon cans per day. Dug wells are the main source of water in Karative. Instant wells are dug in the sandy soil, and the water is drawn using an *ookkuwa*, a spoon-type of equipment. In Pubudugama, where tube wells are also common, villagers obtain sufficient water from their own wells.

Drinking water provided by the Government through water supply projects is still a luxury, despite the implementation of ADB-funded community water supply projects in the district. Thus, water is a precious commodity for the majority of poor fishing households. Alternatives, such as the construction of rainwater harvesting tanks and distribution of water through the water bowser with the DS office, were suggested as possible improvements. The divisional secretary explained that the DS is responsible for the distribution of water to all the affected villages, especially during the dry season. However, this could not be undertaken due to the lack of funds to repair the mobile water tank lying in the yard of the DS office.

LAND

Rural communities tend to have multiple livelihood strategies because seasonal weather patterns and other external factors often affect their income sources. Access to land resources (for agriculture and fishery) is the key to ensuring and protecting livelihoods, especially during lean periods. Land provides rural families with the opportunity to earn a subsis-

Table 2: Housing Amenities in the Study Villages

	Gangewadiya	Karative	Serakkuliya	Pubudugama	Sample average (%)
Houses (no.) with toilets	Nil *	6	9	4	24
Houses (no.) with electricity	Nil	Nil	Nil	Nil	0
Permanent houses (no.) **	4	12	10	20	57
Semipermanent houses (no.) ***	19	5	7	3	43

no. = number; % = percent.

* Four public toilets are available.

** Wattle and daub (plastered) or brick walls with cadjan, sheets, or tiles as roofing materials.

*** Wattle and daub or cadjan for walls and cadjan as roofing materials.

tence income. Land ownership, however, is equally important as it provides collateral when borrowing money from formal and informal lending institutions.

The people in the four study villages faced severe social problems caused by poor land quality, as well as the lack of clear titles and deeds, even for the small landholdings they occupy. Generally, the individual landholdings in all study areas—except Pubudugama—were 253–1,012 m² (Table 3). In terms of land quality, the small allotments provided little support to people’s livelihoods. In almost all cases, the soil is sandy, infertile, and highly saline, which prevents productive crops from being grown in home gardens. The lands also are not suitable for raising livestock. The cultivation of anything in the areas adjacent to the beach, especially at Serakkuliya and Gangewadiya, is very difficult. For a better view of approaching vessels along the beach strip, much of the topsoil in these areas has been removed, leaving a salty underlayer. Soils farther away from the beach are better, allowing a good selection of perennials and annuals, including fruits and vegetables, to grow.

The majority of villagers with lands on the borders of the lagoon did not have legal title, despite occupying these lands for 2–3 decades. Some houses were constructed on government land. However, the provincial administration did not initiate action to transfer land ownership to the villagers, even though several land allotment programs had taken place within the division. Land ledger permits issued to community members many years ago were not renewed. The occupants claim ownership on the grounds that they have occupied the land for a time. The divisional secretary did not believe this problem could be handled at the DS level due to staff shortage.

Often, people construct substandard housing when they are deprived of the proper land titles and deeds. Proper titles and deeds can serve as collateral for credit when dealing with formal lending institutions, especially for house construction. The divisional secretary said that additional staff (even temporary staff) in the DS office could help expedite the conveyance of lands.

INDEBTEDNESS

Savings can be a strong indicator of the economic stability of a household. Savings are particularly important in fishing households, who invest capital at least once a year to replace fishing gear, such as nets. On the average, each fishing family needs SLR15,000–30,000 a year to replace nets and repair boats. The study found little evidence that poor fishing communities, in general, have formal bank accounts. In fact, funds normally are borrowed from moneylenders to replace nets destroyed by motorboats or damaged by crabs. Savings are generated through collective saving mechanisms. Since the fishery organizations or cooperative societies are not functioning, formal sources of funds are not available. As a result, capital needs are met through informal credit and livestock sales. However, a well-functioning informal credit mechanism is operating within the society, led by organized fish buyers.

Households do not consider indebtedness a pressing economic issue. Poor fishing communities often operate on a barter system in which fish catches are negotiated based on short- and long-term financial needs. Most importantly, they depend heavily on informal credit to purchase the necessary fishing gear. Fisherfolk also rely on net and boat vendors providing long-term credit for the purchase of fishing gear. Sometimes, intermediaries (moneylenders)

Table 3: Size of Landholdings in the Study Villages

Village	0.4–0.8 ha	0.2–0.4 ha	0.1–0.2 ha	506–1,012 m ²	253–506 m ²	< 253 m ²
Gangewadiya	–	–	4	2	9	8
Karative	–	–	8	6	3	–
Serakkuliya	–	1	–	13	6	–
Pubudugama	14	2	3	–	3	–

– = 0; ha = hectare; m² = square meter.

lend money, in the form of cash or checks (drawn to a third party), for the purchase of equipment and other daily needs. This informal credit mechanism also provides the intermediaries with regular buyback systems. Nevertheless, the owners of most of the motorized boats (outboards) in Karative and Serakkuliya are aware that the marketing of fish catches is tied unavoidably to the credit provided for purchasing boats and nets. Obviously, the terms of trade in such arrangements become extremely unfavorable for the boat owners or fisherfolk, who are expected to sell their catches to intermediaries (who determine the price). While this relationship is informal, it allows the intermediary to maintain a monopoly over the collection, storage, and marketing of fish.

UNEMPLOYMENT, UNDEREMPLOYMENT, AND EDUCATION

Unemployment and underemployment remain pertinent social issues in all four sample study sites. Most of the youths engaged in fishing expressed dissatisfaction and frustration, and emphasized that the lack of other livelihood options was the only reason they fished. Some young boys (17–23 years old) who have just finished their secondary education join their elders in fishing. Women and children often help in ancillary activities, such as net clearing. Social issues will be aggravated in years ahead as the young generation receives a decent education and develops greater aspirations. Clearly, the next generation will be better educated, and social unrest among the educated youth is likely if sufficient alternatives to fishing are not available.

Warnakulasuriya Sunil Gamini of Gangewadiya is a 38-year-old fisher and father of three children. His 12-year-old daughter and 14-year-old son are still attending school. His 17-year-old son dropped out after completing secondary education and joined his father in fishing in the estuary using a theppama. Sunil says the fishing effort has not increased just because his son joined him. His only intention is to keep his son occupied. If his son can find an alternative income-earning source, he will not allow his son to join him in fishing as a livelihood. “You cannot take much from the lagoon,” he says.

FISHERY-RELATED LIVELIHOODS

Fishing in the estuary has been the main livelihood for the majority of the fishing community in the four study areas. With the increase in the number of boats, competition for the lagoon’s aquatic resources has been growing over the years. Reports indicate that fish stocks have declined due to excessive fishing by an expanding fleet. The lack of alternative livelihood opportunities, an increase in the use of bottom set nets⁴ and push nets, and the inability of average fisherfolk to invest in efficient fishing gear have kept incomes at subsistence levels.

Prawn fishing and crab collecting, although highly seasonal activities, have been the most lucrative enterprises for those using nonmechanized methods. During the prawn season, the poor can achieve sizable catches in the lagoon, but this period lasts a maximum of 3–4 months per year. The income level from crab collecting could be increased two- or three-fold if the community used appropriate methods to fatten the crabs. However, such programs have not been introduced in the recent past, so fisherfolk depend on common fish species. Table 4 presents the most common fishing techniques practiced by poor and affluent fisherfolk in the lagoon, and the impact of these techniques on the resource base.

OWNERSHIP OF FISHING GEAR

The type of gear fisherfolk own reflects their ability to sustain a sound livelihood which, in turn, can minimize the vulnerability of their livelihoods during difficult times. Those engaged in fishing as a primary livelihood need several types of fishing gear to cope successfully with income fluctuations during the fishing seasons. Those who possess mechanized boats and nets of different sizes can exploit other fishing areas during difficult or slack times and are considered to be affluent. Besides, they can exploit fishery resources in the lagoon and the sea more efficiently than their counterparts who use conventional fishing gear.

The inability of most fisherfolk in and around Puttalam Lagoon to purchase highly efficient fishing gear has limited their access to fisheries. Those engaged primarily in lagoon fishing have limited access to sea fishing because their fishing gear is more obsolete and not seaworthy. The primary fishing gear required for lagoon fishing was found to be a theppama, or a fiberglass *oruwa* (small boat), plus a set of all-purpose nets.

⁴Bottom set nets are used by fisherfolk who cast their nets on solid structures, such as coral, sandstones, etc. The Fisheries Act bans such fishing practice because it damages these solid structures.

Table 4: Fishing Techniques Prevalent in the Lagoon

Type of fishing	Segment of fisherfolk involved	Fishing equipment used	Extent of resource degradation
Catching prawns	Women and men	Collection pot	No evidence of resource degradation
Cast netting	Men	Cast net and collection pot	No evidence of resource degradation
Push netting	Women and men	Push net and collection pot	Resource degradation due to scraping of the lagoon bed
<i>Sangili</i> (pull) netting (more synonymous with drag netting)	Men	Sangili net, <i>theppama</i> , and collection pot (<i>madiya</i>)	Resource degradation due to by-catches and scraping of the lagoon bed
Trammel netting	Men	Theppama and nets	No resource degradation
Fish shoaling	Men	Motorized boats	Resource degradation due to by-catch

Source: Household Survey, IUCN.

Most fisherfolk in the four study areas only owned trammel and cast nets that cannot be used in coastal fishing. Nearly 64% of fisherfolk surveyed in the four villages owned a theppama that is suitable for lagoon fishing. Few people owned motorized or mechanized boats. Table 5 presents data on the types of fishing gear owned by fisherfolk in the study areas.

DEFINING THE POOR

Based on the given socioeconomic indicators, the number of poor as a proportion of the population in the four sample study sites was identified using the following criteria:

- national poverty line to qualify for samurdhi allowances (monthly household income below SLR1,000);
- lack of housing (living in someone else's property);

- condition of housing (semipermanent housing with wattle and daub walls, no cement floor, less than 27.87 m² of floor area);
- community perception;
- fishing in the ode (fishing area adjoining the lagoon) with substandard fishing gear or without fishing gear (fishing by hand, push nets, old theppama unsuitable for lagoon);
- lack of productive assets, such as own nets, theppama, or any other permanent fishing gear (e.g., those who hire fishing gear, do net clearing, or share fishing gear and the harvest with another fisher);
- number of dependents and sick persons in the family; and
- limited alternatives (no homestead to raise livestock).

Table 5: Fishing Gear Owned by Fishers in the Four Study Areas

Type of fishing gear	Gangewadiya		Serakkuliya		Karative		Pubudugama	
	No.	As % of the sample	No.	As % of the sample	No.	As % of the sample	No.	As % of the sample
Mechanized boat	Nil	Nil	2	9	3	17	1	4
Theppama or oruwa	18	67	4	17	3	17	10	45
Trammel or cast nets	22	88	11	48	6	35	16	72
Push nets	Nil	Nil	10	43	9	52	1	4

no. = number; % = percent.

Table 6: Number of Poor Households in the Study Areas

Village	Households (no.)	Population	% of poor in the population
Karative (North)	609	3,200	60
Serakkuliya	266	1,197	70
Gangewadiya	55	225	50
Pubudugama	70	260	95

no. = number; % = percent.

Accordingly, the number of poor people in Karative (North) was found to be significant in relation to the village’s relatively large number of households (Table 6). Of the 609 families, nearly 60% were categorized as “very poor” based on the above criteria.

Fishing livelihood challenges

SOCIAL CONFLICTS DUE TO OPEN ACCESS

In and around the lagoon, social conflicts occur among fishing communities over open access fishery resources. The study found that during high tides, many fisherfolk from all areas of Puttalam encroach upon the lagoon, resulting in community conflicts that sometimes lead to criminal activities. In some instances, the police reported, escalating conflicts led to homicides over fishing territories. The fishing communities often are ineffective or highly polarized on political grounds. Thus, they are unable to resist the more organized activities of migrant fisherfolk from the Kalpitiya area. This situation is particularly tense during peak prawn-harvesting periods. Open access to fishery resources has been an accepted practice. However, the pressure that has mounted during the past years over limited fishery resources in the lagoon and the inability of ordinary lagoon fisherfolk to migrate to other open access areas (due to inefficient fishing gear) had led to uncontrollable community upheavals.

Some of the fishery cooperatives are unable to protect the social needs of their membership. The fishery cooperative societies in Serakkuliya and Karative are divided on political lines. Local political authorities often wield power and influence in decisions regarding who receives fishery extension services, including nets and boats at subsidized prices, loans, and houses.

Case of the saltern

The provincial administration leased the 20-acre saltern in Karative to 60 households for salt harvesting. These households earned about Sri Lanka rupee (SLR) 3,000–5,000 a month from the salt they harvested, enabling them to secure a fixed source of income at least 9 months of the year.

At the time of the study, the saltern was abandoned. No one was using it due to a social conflict that arose when the local political authorities interfered in the process. The political authorities were interested in changing the leasehold prematurely as the local political power changed. The conflict ended up in litigation. As a result, the saltern was abandoned, depriving the people of much-needed income.

TYPE OF FISHING GEAR AND PRACTICES

The use of harmful fishing gear and fishing practices is increasing in any fishery society where law enforcement and awareness about the adverse impacts of such practices remain minimal. The use of dynamite is one of the most devastating marine fishing techniques. In lagoons, fish shoaling and the use of detrimental nets were common—even though these fishing techniques are illegal.

A fisher stated in the survey that he has been one of the 40 push net holders in the lagoon for the last 10 years. He said no alternative was available: “I have no other source of income. I am living on rent in this small hut. I have a family with two children. Nobody provides me with a loan to buy good fishing gear. Others know that I use the push net. I also know that this is harmful. But I do not think that others will report this to the fishery inspector because they know my plight.”

Fishing with push nets is considered detrimental to the resource base and frowned upon by the communities as an illegal activity. Nevertheless, a sizeable number of families depend on the use of push nets and chain nets, since these do not require a large upfront investment and any poor fisherfolk can afford them. Consequently, even though the use of such equipment is banned, the sympathy for those who use it is widespread because of the level of poverty of the users.⁵ However, while this technique allows the household to earn a subsistence income, damage to the resource base is considerable.

Several families that do not possess a mechanized boat or a push net make their living by borrowing nets from friends and relatives. Some of the poor families clear trammel nets. Clearing nets is especially common among women and children, primarily to fish for consumption.

Few of the poor households (the sample only included households engaged in fishing) own decent, multiple-use fishing craft. Almost all those living in Gangewadiya have at least a cast net, and the majority owns a theppama, a plastic boat, or an oruwa. Significantly, fisherfolk in Gangewadiya and Pubudugama did not own push nets or chain nets, unlike their counterparts in Karative and Serakkuliya.

FISHERY EXTENSION SERVICES

Extension services constitute a strong safety net for rural villagers, especially those with marginal household income. Some of the primary extension services that have been provided through the state institutions are assistance in obtaining fishing permits, insurance for their craft, subsidized craft and gear, market links, training, relief during the off-season in the form of dry rations, housing, and sanitation. In addition, a veterinary surgeon and agricultural instructor provide extension services to strengthen alternative livelihood options in coastal communities.

Some 18–20 years ago, the fishing communities of the sample sites received subsidized fishing craft and gear. However, the distribution of these services apparently has been extremely politicized. The local political leadership influenced fishery cooperative societies in identifying who should receive the benefits. As a result, the fishery inspector reported that no training in fisheries had been delivered during the last few years. The Department of Fisheries, through its extension

arm in the area, has sponsored the training of artisans, but no one from the four study villages has benefited from this. Each of the fishing communities in the four villages belongs to a fishery cooperative society. However, these cooperative societies seem to play a passive and reactive role, and are mostly ineffective in terms of convening regular meetings.

Although boat owners are required to obtain permits and insurance cover for their craft, the fishery inspector has been unable to encourage boat owners to comply with these rules. The lack of official transport, funds, and staff had hampered site visits by the fishery inspector. Moreover, extension services provided by other government and nongovernment institutions have not been readily accessible to these village communities despite the presence of many functional NGOs in the area. Except for World Vision and Rural Development Foundation, NGOs do not provide any community services in Gangewadiya because it is far from the main cluster of villages. World Vision, which runs a large development program in Wanathawilluwa, has provided credit services, preschool services, and water and sanitation facilities to some villages, including Karative and Serakkuliya.

FISH MARKETING

The most important marketing channel available to the fisherfolk has been the organized buyers from their own villages, or those who visit from the nearby

Table 7: Prices of Shellfish at the Fish Landing Centers of the Study Sites

Grade or variety	Price per kg (in SLR)
Prawns	
No.10 (50 g or more)	700
No.15 (20–50 g)	500
No. 20 (15–20 g)	250
Mixed (less than 15 g)	170
Crabs	
Jumbo (more than 500 g)	560
Large (350–500 g)	360
Medium (300–350 g)	240
Low quality	100
g = gram; kg = kilogram; no. = number; SLRs = Sri Lanka rupees. Source: Socioeconomic study by the IUCN.	

⁵Push nets are made locally with a minimal investment of SLR500 (\$6). A triangular-shaped push net requires only three strong poles, which are fitted with a net. The user pushes the net deep into the fish breeding areas, entangling fish, fingerlings, sea grass, etc. The operation of push nets is extremely strenuous for the user, and unconfirmed statements have indicated it is detrimental to health.

Kalpitiya area. In Gangewadiya, four or five regular buyers—intermediaries working on behalf of larger companies—visit the village every day. They specialize in purchasing different types of sea fish. Only one or two buyers purchase prawns; others look for crabs and other types of sea fish.

Records maintained by fish buyers show that prawns are bought at prices ranging from SLR200–250 per kilogram (kg) depending on the size. Although Grades No. 10 and 15 fetch higher prices, prawns of these sizes have not been purchased for some time, especially from those using cast nets, push nets, or similar methods.

The amount of fish bought over 4 days, randomly selected from the notebook maintained by a prawn buyer visiting Gangewadiya, showed that each of the 20 fisherfolk sold only 100–500 grams (g) of prawns, while another 17 sold 600–900 g each. Only 10 fisherfolk sold more than 1 kg, and only two sold more than 1.5–2.0 kg each (Table 8).

None of the study villages had a formal marketing place, such as a fair or fish landing auction center. The most serious deficiency is the lack of common cold storage facilities, which forces fisherfolk to dispose of their catch as soon as possible. The buyers stock the fish in boxes and hand them over to transporters. Another key issue that boat owners face is the lack of proper anchorage facilities for their boats. The buyers often determine the price and varieties of fish they are going to purchase. Poor road infrastructure and transport facilities also hamper marketing. Gangewadiya is far from the main road, and renovating the gravel road leading to the main road was one of the key demands made by the community. However, this has to be assessed in terms of the expected economic benefits.

Role of natural resources in the livelihoods of the poor

The lagoon’s resources have been the primary source of livelihood for many people living around it. Poverty and organized fishing have created increasingly severe pressure on the exploitation of resources. For the youth awaiting better employment, fishing in the lagoon has been a stopgap. Those who have no formal source of subsistence income find inefficient fishing gear and resort to fishing. As this occurs throughout the year, lagoon resources do not have time to regenerate properly. The lagoon is also a source of supplementary income for women and

Table 8: Prawns Sold by Fisherfolk in the Study Villages during the Season

Volume of catch per fisherfolk	Fisherfolk (no.)
100–500 g	20
600–900 g	17
1.0–1.5 kg	10
1.5–2.0 kg	2

g = gram; kg = kilogram; no. = number.
Source: Household survey by the author.

children, but for the average poor person it offers a coping mechanism at all times.

The primary resources of the lagoon environment are aquatic animals, sea grass beds, and mangroves. Fish yields reportedly have decreased from 4,800 metric tons (t) to 3,800 t over the last 10 years. Sea grass beds have been destroyed, and fish habitats are no longer sustainable. Shrimps, the most profitable species, are harvested with little care for their habitats. The clearing of mangroves largely accounts for the low productivity, although conflicts over fishing rights also have undermined the productivity of shrimp harvests in the lagoon.

Other key resource management issues arising from the different resource-use practices are presented below.

EXPLOITATION OF JUVENILE PRAWNS IN THE ESTUARY

For many fisherfolk, especially the poorest of the poor, fishing is a coping mechanism throughout the year, irrespective of whether it is the fishing season or not. This practice hinders resource regeneration. Scientific studies have established that juvenile prawns migrate from the estuary to the lagoon and then offshore to complete their maturation. However, the fisherfolk in Gangewadiya harvest most of the prawns from the estuary’s shallow waters in their juvenile stage—before they migrate to the lagoon and offshore waters, and reach an economically valuable stage. As such, the economic loss to the fishing effort in the lagoon could be high. Indeed, according to estimates, 100 kg of juvenile prawns caught in their breeding grounds would have yielded 400 kg had they been allowed to migrate into the lagoon and mature. The downstream fishing communities, which depend economically on lagoon fishery, complain that the previously abundant stocks of large prawns in the lagoon are dwindling fast.

DAMAGE TO FISHERY RESOURCES

Studies highlight that destructive fishing practices, both by the rich and the poor, play a major role in resource degradation in the lagoon. The better-off fisherfolk have organized destructive fishing practices, such as shoaling and using monofilament nets. Poor fishing communities also adopt ecologically harmful fishing methods based on their investment capacity. Two of the undesirable fishing techniques—yet the most frequently practiced by the poor—are push nets (known locally as *thallu del*) and chain nets (known as *sangili*). Women and children often use these types of nets because they require minimal fishing skills. A small net fitted to a wooden frame and dragged on the lagoon bed and bunds, in knee-deep shallow areas, can generate a substantial catch of small fish and prawns to satisfy daily subsistence needs. This practice was used first during high tide, when little or no fishing usually occurs. However, it is now used throughout the year due to poverty, especially among refugee families. Although this method has been made illegal, the fisheries authorities do not strictly enforce the ban because of the extreme poverty of the users. Still, the use of push nets destroys natural fish breeding habitats. Furthermore, due to the small size of the net, small fish, prawns, and crabs can become entangled in the nets. Fisherfolk who use push nets usually discard the dead fish and other waste materials (including sea grass) after collecting the larger prawns and fish.

DESTRUCTION OF MANGROVES

Large-scale prawn farm operators destroy substantial segments of mangrove when they clear them to establish prawn farms, especially in Pubudugama. Other communities are aware that mangroves are prawn breeding grounds and have taken steps to preserve mangroves. The communities gather products from the mangroves for their own use, such as wood for fuel and house construction. Amarasinghe (1988) reported that 55% of the households around Puttalam estuary collected firewood from the mangroves in 1987. With the influx of refugees into the area, this figure has increased. In 1986, an estimated 12,000 kg of bark were extracted annually from the Dutch Bay. Other products harvested in the mangroves include timber for making tools, wildlife for meat, fish for subsistence, honey, and some edible and medicinal plants. Households from Gangewadiya, as well as people from the adjoining village of Elluwankulama, exploit the mangrove's resources.

THE NEED FOR LONG-TERM INVESTMENT PLANNING

An appropriate long-term development program, adopting integrated coastal zone management planning approaches, is essential to address some of the above issues. The essential elements in such a development program will include

- the declaration of the Puttalam Lagoon and its environs as a special area for coastal zone management;
- further analysis of the sustainable extraction levels of lagoon resources;
- habitat enhancement and ecosystem rehabilitation, including mangrove restoration;
- improved community awareness and education, leading to beneficial community action;
- promotion of alternative livelihoods that can bring beneficial returns to the local communities and the ecosystem in general;
- extension of financial services, including strengthening of the revolving loan fund;
- restoration of essential infrastructure and facilities to support fish storage, marketing, and processing;
- establishment of private sector links in the management of natural resources;
- strengthened institutional arrangements at the national and local levels, especially at the DS level, with adequate human resources to handle environmental and land issues;
- empowerment of the fishing communities through strong fishery cooperative societies, and depoliticization of the existing ones;
- women-targeted vocational and fishery-related interventions; and
- more supportive legal and policy advocacy for pro-poor integrated coastal zone management.

In addition, poor communities

- should be able to generate sufficient assets by mobilizing savings and gaining access to formal credit. Credit schemes should accommodate the poor fisherfolk who are unable to provide collateral. Subsidies should be made available to fishing communities whose practices are attributed to natural resource degradation.
- should have access to an equitable share of natural resources. Regulatory mechanisms should be introduced to discourage organized fisherfolk from encroaching upon the fishing territories of the poor.

- could benefit from additional income generation options with diversified skills. Special training modules could be introduced into the curricula of technical training institutes to enable poor coastal communities to acquire artisan skills.
- should benefit from the social infrastructure. The policies aimed at providing housing to the various categories within society should be extended to communities living along lagoons.

Conclusion

This analysis demonstrates that the income levels and livelihood strategies of poor households have an impact on the natural resource base, leading in due course to food insecurity. This cause-and-effect model (Figure 3) was developed based on the findings of the survey in the four study areas. Further, it shows that there is a spiral effect between poverty and the environment, taking into consideration the causes leading to poverty and the effects that ultimately lead to resource degradation.

Under conditions of absolute poverty, the poor have few options in terms of livelihoods, food security, and social well-being. In turn, this harms the environment due to the extensive pressure exerted on the natural resource base. Although the poor are aware of the consequences of unsustainable harvesting practices, investment capacity generally determines the techniques used for harvesting natural resources. Poverty is absolute when the poor are not creditworthy, do not have marginal savings, and are unable to compete with other resource users. Poverty tends to intensify when the poor are marginalized from mainstream development, are politically polarized, and are socially excluded.

Households at subsistence income levels are vulnerable to the slightest changes in environmental and socioeconomic conditions. The more vulnerable they become, the more destructive and harmful are their livelihood strategies. When livelihood strategies are inefficient, they tend to damage the resource base. Therefore, any attempt to reduce poverty can contribute to the sustainable use of natural resources.

Diversifying livelihood strategies can reduce poverty. More options have to be made available to eliminate livelihoods based on a single source. Poverty reduction programs, therefore, should be aimed at strengthening pro-poor policies, ensuring that the poor are not solely responsible for arresting resource

degradation. The entire society, poor and rich, should work individually and collectively toward achieving such a goal.

Poverty–Environment Links in the Wetlands of Sanjiang Plain, People’s Republic of China

Ma Zhong, Wu Jian, and Leo Horn

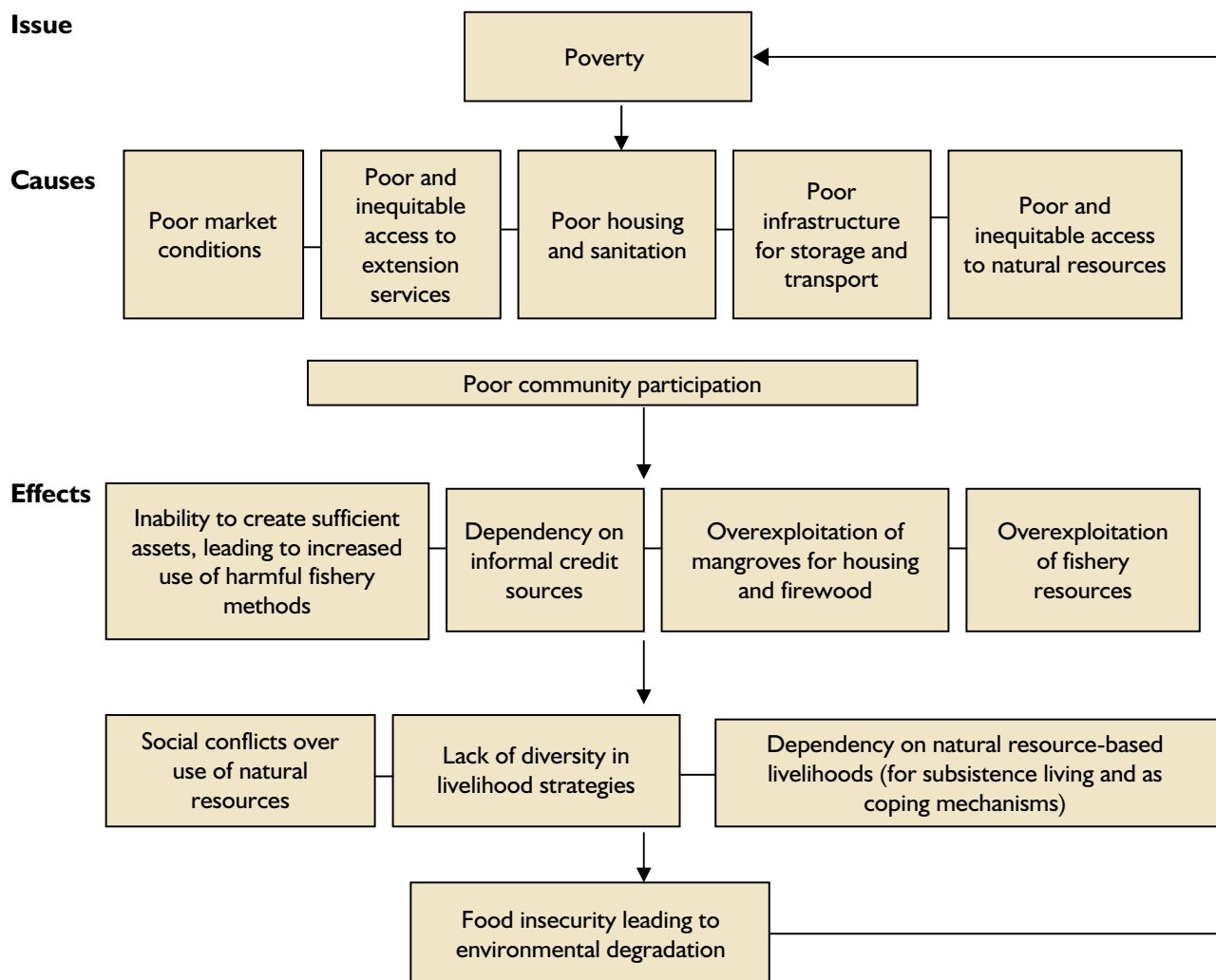
Introduction

The combination of a relatively rich environment—with abundant natural resources and biodiversity—and low population density would seem to provide the baseline conditions for economic development and poverty reduction. The Sanjiang Plain wetlands in the People’s Republic of China (PRC), however, present a peculiar case of poverty persisting against the backdrop of this type of double-blessed baseline. Alarming, the scope for the poor to transform their rich natural endowments into a developmental advantage is narrowing. Despite the national and global importance of the wetlands’ ecological functions, policy decisions and institutional failures (government and market) continue to degrade the local environment.

The PRC and international community have mobilized significant public resources in support of environmental protection and poverty reduction objectives in the Sanjiang area. However, these efforts have had little impact. Environmental degradation is continuing, and large pockets of poverty remain. Why has a virtuous cycle involving the environment, economic development, and poverty reduction failed to take root? Instead, why has a vicious cycle been set in motion, whereby environmental degradation erodes the basis for sustained poverty reduction, and poverty, in turn, reinforces and accelerates environmental degradation?

This case study attempts to provide some preliminary answers to these questions. The first section provides a brief overview of the geographical, ecological, and socioeconomic features of the Sanjiang Plain that are pertinent to our analysis. This is followed by a description of poverty–environment links in the region. A third section seeks to uncover the root causes of environmental degradation and persistent poverty by examining the drivers of change at the interface between environmental quality, economic development, and poverty. Conclusions from the analysis are then summarized. A final section recommends measures for the Government

Figure 3: Cause-and-Effect Model for Environmental Degradation



and international development organizations. These are intended to contribute to a better understanding of how to avoid unnecessary trade-offs, and to build on complementarities between environmental protection and poverty reduction goals in public programs and policies.

General features of the Sanjiang Plain⁶

The Sanjiang Plain is a vast, low-lying alluvial floodplain in the northeastern segment of Heilongjiang Province. It sits at the confluence of three rivers: the Heilong (Amur), the Wusuli (Ussuri), and the Songhua (Map 1). The plain covers approximately

108,900 km², and is home to the largest wetland area in East Asia (more than 1.97 million hectares [ha]). Nearly 9 million people, about half of them farmers, live in the area. The plain is divided into 18 rural counties (including three national-level, poverty-line counties) and 7 cities (urban counties). At 20 persons/km², the population density is the lowest in the province.

Although the region is ecologically rich and strategically important, its economic position is relatively weak—especially when compared to other eastern provinces in the PRC, where per capita gross domestic product (GDP) is approximately four times higher at

⁶The term Sanjiang Plain refers to a general topographic region, not a political unit, and definitions vary. This study adheres to the definition used by the ADB Sanjiang Wetlands Protection Project. The statistics used throughout are computed accordingly.

more than \$4,000. This is apparent in the structure of economic activity, which will continue to be dominated by the primary sector for the foreseeable future, as well as in other economic indicators. While local government revenues have increased over the last decade—from yuan (CNY)18.3 billion (US\$1=CNY8) in 1995 to CNY46 billion in 2002—the fiscal deficit also has expanded (from CNY0.83 billion to CNY10.5 billion). As a result, the local government remains heavily dependent on fiscal transfers from the center. The plain's average annual per capita GDP is CNY5,551 (\$680). In some of the rural counties, it is as low as CNY3,321 (\$410).⁷ In terms of income, the average per capita annual income in rural areas of the plain is as low as CNY1,900 (\$240). All these numbers are markedly lower than the provincial average (CNY8,562 and CNY2,148, respectively). Based on the Government's poverty line of CNY1,000, the poverty incidence is relatively high at approximately 10%, compared with the 3.4% national average. In some poor villages, the incidence is as high as 57% (ADB, 2004b).

Four main factors contribute to poverty in the area. First, the production structure, which is dominated by farming, is vulnerable to the dual risks of marketing and natural disasters. Returns from farming are low and unpredictable, and the opportunities for off-farm labor are limited. Second, environmental shocks, such as droughts, waterlogging, flooding, early frost, and soil erosion, occur frequently. These are an important cause of cyclical poverty. Third, illness and school tuition costs also can seriously constrain available income. Finally, the lack of education and skills leads to low income and low agricultural yields (ADB, 2004b).

The plain is home to several ethnic minorities. The Hezhe—with only 4,000 to 5,000 people—is the smallest ethnic minority in the PRC. The Hezhe people maintain their own language, culture, and lifestyle and, traditionally, have made a living primarily from fishing. Because of overfishing, however, the Hezhe gradually have changed their traditional lifestyle. As Hezhe women normally have less access to education and information, they are the most vulnerable within this group. Ethnic minorities, who make up less than 9% of the population, account for an estimated 40% of the remaining poor in the PRC.

The Sanjiang Plain is ecologically significant regionally, nationally, and globally. The plain has three Ramsar wetlands and eight national nature reserves. The wetlands perform crucial ecological functions—maintaining the hydrological balance, regulating water flows, mitigating floods, and purifying water and air. As biodiversity hotspots, they also have global significance. The Sanjiang wetlands are the most important breeding grounds and migration routes of migratory waterfowl in northeastern Asia and provide habitats for numerous wildlife species. These wetlands host 37 vertebrate wildlife species ranked by the International Union for Conservation of Nature (IUCN) as globally threatened; of these, 20 species are wetland birds. For some of these wetland birds, the plain represents a significant portion of their remaining habitat on a global level (ADB, 2004b).

In addition to its ecological significance, the plain plays a critical strategic role nationally. The high quality of the plain's soil is an important feature of its rich ecological profile. However, the PRC faces formidable resource constraints in its efforts to feed a fifth of the world's population with only 7% of the world's farmland. Moreover, available per capita water resources represent just one quarter of the world average. National food security, therefore, is always of paramount concern. The soils of the Sanjiang Plain are fertile and high in organic matter.⁸ Further, the plain receives abundant rainfall, with an average of 550 millimeters of annual precipitation, about 70% of which falls during the growing season (from April to October). These conditions lead to high agricultural productivity, which has earned the Sanjiang Plain the designation as a national base for grain production. Consequently, the central and provincial governments, as well as bilateral and multilateral funding agencies, have invested in agricultural development in the Sanjiang Plain over the last 4 decades. The cropland area increased from 820,000 ha in 1949 to 4.02 million ha by 1997. About 2.46 million ha of original wetlands have been converted for monoculture agriculture.

Economic activity in the region continues to be driven primarily by agriculture, which is dominated by corn, rice, and soybean production on large-scale mechanized state farms. Forest and lumber industries are also significant. As of 2003, the proportion of primary, secondary, and tertiary industries was

⁷This is the figure for Raohe County.

⁸Sanjiang Plain soils are mainly wet black clays, and the plain is the only black-soil region in the People's Republic of China (PRC). Black soil is characterized by high concentrations of organic matter and nutrients, which leads to high ecological and agricultural productivity.

42%, 26%, and 32%, respectively. The environmental impact of these economic activities is evident: the plain has suffered extensive deforestation and wetland loss. Over the last century, wetlands have receded by about 80%. Forest cover, meanwhile, represents only 11% of the total land area, compared with an estimated 71% in 1896 (ADB, 2004b). In recent years, the provincial government has adjusted its primary industry structure, encouraging farmers to shift to animal husbandry. It also has reversed its forestry policy to encourage the planting, rather than felling, of trees in line with central policy directives, such as the Sloping Land Conversion Program and Natural Forest Protection Program.⁹ While these appear to be positive steps, they have not been effective, as discussed below.

Nature of poverty–environment links

To start identifying, characterizing, and understanding poverty–environment links in the PRC, it is necessary to break away from conventional definitions and measurements. These tend to be too narrow to capture the complex interactions that can exist between the poor and their environment.

As in many other countries, environmental protection in the PRC conventionally is understood to designate a narrow pollution control mandate, whereas natural resource management is considered a sectoral issue of resource development. Broadly speaking, the division of administrative responsibilities for environmental protection and natural resource management reflects this distinction. Only recently—with the 1998 expansion of the State Environmental Protection Administration’s (SEPA) mandate to include “green” issues—the notion of ecological conservation was recognized fully as firmly in the public domain and incorporated into the environmental protection agenda. These conceptual distinctions are motivated by concerns of public administration. In practice, pollution control, natural resource management, and ecological conservation evidently overlap. Therefore, this analysis proposes moving beyond these artificial separations. The term “environment” will refer to a concept that includes

ecological quality and natural resources; “environmental quality” refers to the condition of the natural environment in a broad sense.

In a similar vein, this analysis expands on conventional categorizations in assessing poverty. Government statistics on poverty are based on income measures, i.e., the poor are defined as those living on an annual income below a set poverty line.¹⁰ Income is undoubtedly a key indicator, and usually a reasonable proxy for nonincome indicators of well-being. However, it provides no information about the intensity of poverty, which environmental conditions and human–environment interplay can be instrumental in determining.

In this regard, the poverty situation in the Sanjiang Plain is atypical. The majority of the poor in the PRC are concentrated in remote western and upland areas, where the natural environment is very fragile. Poverty in these areas is characterized by heavy dependence on a narrow asset base (often a single resource) and insecure access to environmental resources, such as clean water and productive land. This is the type of poverty that is evident in the two other PRC case studies of this publication. In the Sanjiang Plain, on the other hand, the poor rely on the environment to meet a range of basic needs, including food, clothing, energy, building materials, etc. In money-metric terms, therefore, the purchasing power of a given level of income is relatively high in Sanjiang. A range of basic environmental services are available for free in this region, whereas the poor in most remote upland areas of western PRC have to pay (often dearly) for these. Thus, poverty in Sanjiang is mostly of a relative form. The environment, rather than being a constraining factor, has the potential to be the foundation of a resource-based development path. For example, black bee apiculture sustains the livelihoods of the poor in Raohe County. In this small rural county, an estimated 4,500 people depend directly on black bee apiculture for their livelihoods. Black bees generate a staggering 27.9% of the value of agricultural output in the county.

Despite the particular character of the poverty–environment interplay in Sanjiang, some common features should be noted. In the Sanjiang Plain, as in

⁹The Sloping Land Conversion Programme is a state program with environmental and socioeconomic aims. It allows for the provision of direct financial incentives (subsidies) to rural households to reforest cultivated land with a slope of 25 degrees or more. A key component of the Natural Forest Protection Program is the logging ban on the 30.38 million ha of natural forest area in the upper reaches of the Yangtze River, as well as the upper and middle reaches of the Yellow River. Of relevance to this case study, the program has a component on the reduction of logging in state-owned forest farms in the northeast, Inner Mongolia, and Xinjiang.

¹⁰As of 2004, the Government’s poverty line was defined at an income level of CNY924 (\$120) per year.

the remote western areas, livelihoods depend heavily on the environment. Moreover, poverty is characterized by vulnerability to environmental shocks and stresses in both cases. Just as environmental conditions provide livelihood opportunities, environmental deterioration will seriously limit the regions' future development potential and erode an important portion of the poor's livelihood base.

The poverty–environment–growth interface has important tensions and trade-offs. The high productivity of the wetland, and its multiple functions and uses, generates many potential conflicts over land use. The wetland can be preserved to play its ecological function (e.g., flood control, bird habitat, water purification, local climate regulator), or used as farmland after drainage. Forests can be harvested for their timber, or preserved for ecological purposes, environmentally friendly uses (e.g., black bee apiculture), or harvesting of nontimber forest products (NTFPs). Given the national strategic importance of the area, and perhaps also as a legacy of central planning, decisions relating to land use are often determined by the national government.

The dual character of the Sanjiang Plain—as a place of ecological significance and a strategic hub for grain production (as the PRC's breadbasket)—creates tension. The most obvious conflict is over water resources. Wetlands depend on adequate water supply from river systems and groundwater to maintain their saturated soils and wetland habitat characteristics. However, water tables have been lowered to allow for the development of agriculture.

In the past, these tensions between preservation and exploitation have tended to be settled in favor of economic development. The economic development path over the last 4 decades has depended heavily on overexploitation and degradation of environmental resources. Only in the 1990s did wetland conservation become an explicit policy goal. The PRC has ratified international conventions (Ramsar, 1992; Convention on Biological Diversity, 1993), and issued official decrees to reinforce the protection of wetland ecosystems. In 1996, the Ministry of Agriculture submitted a report to the State Council (the highest executive body of the Government), stressing the importance of coordinating wetland conservation and agricultural development. Despite these positive signs, however, the pattern of economic growth in the region continues to be at odds with preservation goals—and environmental deterioration persists. Water continues to be diverted from wetlands for economic uses. Further,

water quality is deteriorating as a result of pollution from untreated urban wastewater, industrial effluent (mainly paper mills, electricity plants, coal mining, breweries, etc.), and agricultural nonpoint sources, endangering biodiversity. The provincial government has implemented measures to slow the development of farming, promoting animal husbandry instead. However, this only creates a different set of environmental problems. Moreover, while the provincial government has encouraged planting rather than felling of trees, overall compliance is very low.

Of equal concern, economic development of the Sanjiang Plain has failed to generate significant benefits for the local poor, even while it is undermining the environment upon which they rely so heavily for their livelihoods. The economic development of the region was viewed from the vantage point of national interest. As a result, and the bulk of economic activity—particularly agriculture and forestry—was aimed at developing and exploiting local resources for the benefit of national economic growth and food security. However, the distribution of benefits was not considered carefully. In effect, economic activity transfers the benefits (or economic rents) from exploitation of the rich local environment out of the region, without adequate compensation to the local residents. These transfers represent significant losses in development potential for the region.

Poverty, in turn, translates into increased environmental stress when locals by necessity must revert to unsustainable uses of their environmental resources. This is evident, for example, in illegal logging, extraction of groundwater, etc. More alarmingly, provincial poverty reduction plans and programs conflict directly with environmental protection goals when the former promote income-generating activities, such as the development of animal husbandry, that are unsustainable because of adverse environmental impacts.

Conversely, environmental protection policies and programs typically fail to take into account the needs and incentives of the poor. As a result, they have caused the poverty situation to worsen sometimes, and often have come undone because of incentive incompatibilities leading to low compliance rates. For example, the Natural Forest Protection Program (known as the “logging ban”) deprived local residents of access to an important resource and created widespread underemployment in the sizeable state-owned forestry industry. Another example is the Sloping Land Conversion Policy, which is mentioned in the other

PRC case studies of this volume. This policy caused much uncertainty over land ownership and land-use rights, and failed to compensate farmers adequately for their ecological conservation efforts.

Centrally determined policies have prioritized economic development over ecological conservation. The pattern of economic activity that has been fostered is detrimental to the local environment and disadvantageous to the local poor, who are excluded from sharing in the benefits generated by this growth. A vicious cycle is set in motion, whereby environmental degradation erodes the foundation for sustained poverty reduction, and poverty, in turn, drives locals to reinforce and accelerate this process through coping mechanisms that harm the environment. Policy measures aimed at addressing these problems in isolation are often mutually defeating—and self-defeating in the long run. In the end, they increase tensions at the poverty–environment interface rather than easing them. Although the situation of the poor in Sanjiang Plain is not desperate today, the environmental degradation presages a long-term downward trend in the well-being of the poor.

Such trade-offs and conflicts are unnecessary and can be avoided. Environmental protection, economic development, and poverty reduction goals have promising complementarities that offer great potential for sustainable resource utilization and development. These are based on the development of “green” industries (e.g., organic farming, ecotourism, agroforestry, black bee apiculture, etc.) and sustainable natural resource management (e.g., sustainable fisheries, cultivation of herbal medicines, NTFPs, etc.). While these are options with real potential, moving away from the current pattern of economic activity toward environmentally sustainable economic development that is inclusive and pro-poor will require understanding how to overcome the deep-rooted barriers to change.

Root causes of poverty–environment trade-offs

The foregoing discussion suggests that the economic development drive—motivated by central policy concerns—and myopic government programs and policies provide the main explanation for the vicious cycle of poverty–environmental degradation. But what explains these failings? The aforementioned trade-offs take root in systemic weaknesses and institutional failures that run deep, as discussed below.

One of the biggest public policy challenges the PRC faces is overcoming institutional fragmentation and related coordination failures. Historically, the challenges of administering a vast empire with a large and diverse population required the development of an extensive, rigid, and well-disciplined government bureaucracy. The vertical channels of action and information function impressively well in executing central plans. Between agencies, however, the organization is poor and communication lacking—let alone policy coordination. Earlier, this study hinted that institutional coordination failures take root in the narrow definition and unclear division of mandates between government agencies. The mandates for poverty reduction and economic development, like those for environmental protection and natural resources management, are separate. As a result, policy making and planning do not integrate poverty reduction, environmental protection, and economic development objectives, even where obvious complementarities exist.

Institutional fragmentation is particularly severe for wetland protection and management. Although SEPA has a clear mandate for ecological conservation, sector ministries (notably those in charge of water resources and forestry) increasingly are taking on responsibility for conservation. Different agencies at different levels of government control the Sanjiang Plain, including the state-owned Farm Bureau, the state-owned Forestry Bureau, the Forestry Department, and the Agricultural Commission. Some of these administrative units operate under the provincial government; some are at lower levels of government. Without adequate cooperation, these complex institutional arrangements are bound to create conflicts.

Almost universally, environmental policy concerns fail to carry sufficient weight in economic planning and policy processes. The PRC is no exception. An embedded pecking order is demonstrated by the relative resources various agencies command. Although environmental protection has become a clear policy priority for the Government, the resources for SEPA are grossly inadequate to carry out its responsibilities. Moreover, SEPA did not have ministry-level status until 1998. Therefore, environmental concerns fail to be integrated systematically into national macroeconomic policies and planning.

The mismatch between responsibility and means for environmental conservation at the center is mirrored at lower levels of government. Local environment protection bureaus often lack the resources to perform

their crucial monitoring and enforcement functions. As a result, the threat of sanctions and penalties for violating environmental regulations or standards are not regarded seriously. For instance, the incentives for illegal logging in the Sanjiang Plain are strong.

Moreover, a rigid hierarchy governs center-local government relationships, and local governments are often given little room for maneuver. For example, land-use patterns in the Sanjiang Plain were determined to a great extent by decisions taken at the center, with little regard for the development of the region. The local government in Sanjiang Plain—like most other underdeveloped regions of the PRC—depends on financial transfers from the center that are unstable and unpredictable. This reinforces the short-term character of local government planning and spending, and the focus on economic growth. Moreover, the system of transfers does not reduce disparities and ensure a fair and efficient distribution of benefits from environmental resources. The complex system of equalization and special purpose transfers from central and provincial governments is poorly coordinated and tends to have a perverse effect, benefiting rich areas with high rates of economic activity over poor areas. As a result, poor provinces often lack financial support from the central government for key environmental protection functions.

In addition, the countrywide system of nature reserve management has deep flaws. First, the PRC's nature reserve category system fails to distinguish between different management responsibilities and objectives. Under the current system, all nature reserves in the PRC are classified as strict nature reserves (i.e., IUCN Category I), even though scientific assessments require only 7.3% of all protected areas to be so strictly protected. As a result, available funds per unit area are limited.¹¹ And those limited funds are not used effectively. Nature reserve management authorities typically lack the financial capacity to effectively carry out scientific research, monitoring, recruiting, and training. Further, they are unable to put in place schemes to involve neighboring communities in nature reserve protection. Instead, infrastructure construction, staff salaries, and office expenses typically dominate expenditures. In fact, central funding for national-level nature

reserves is restricted to infrastructure construction, while biodiversity protection and scientific research programs receive no central funding. Moreover, the amount of spending on conservation-related activities as a proportion of total expenditure is decreasing (Department of Wildlife and Plant Conservation, State Forestry Administration, 2003).

Second, a uniform nature reserve management system does not exist. Owing to history and pragmatism, the nature reserve management system in the PRC is horizontally separated by sector and vertically classified by level. Interrelationships between ecosystem elements are divided artificially by sector boundaries, administrative regions, and administrative levels. For example, an integrated forest ecosystem belongs to the local forestry bureau and the forest industry. When a small river divides a wetland, one section is designated as a national-level nature reserve and the other as a provincial-level nature reserve. These divisions do not fit the requirements for effective ecosystem management. The sector-separated and level-classified management system determines the management duties and responsibilities for the reserves. As a result, the fund allocation pattern is fragmented and incomprehensible.

Third, land property rights are not defined clearly. The 7th and 12th articles of the Measures for Nature Reserve Land Management¹² state: “the land of nature reserves is either owned by the State or the collectivity... Right of land use and ownership will not change because of the establishment of nature reserves”; and “the need for taking collectivity-owned land or state-owned land for establishment and expansion of nature reserves, core zones or buffer zones should refer to relevant regulations in the Law of Land Management.”¹³ In reality, however, many reserves have not processed the regulations for taking state-owned or collectivity-owned land as a result of fund shortage or sectoral restrictions. Consequently, nature reserve management authorities often cannot avoid conflicts with other sectors or local residents due to unclear land (including natural resources) property rights. At the same time, unclear land property rights make identifying cost and benefit stakeholders problematic when protecting nature reserves.

¹¹The PRC is investing little in its protected areas compared to neighboring countries, such as India, Thailand, and Viet Nam.

¹²Enacted by the 24th council meeting of the State Council on 2 September 1994, promulgated by Decree No.167 of the State Council, enforced from 1 December 1994.

¹³The revised Law of Land Management was enacted on 1 January 1999.

The context of transition from an administered to a market economy creates an additional set of problems and challenges. A hallmark of transition is the prevalence of market failures, which are important drivers of environmental degradation and persistent poverty. Market-oriented reforms (e.g., price liberalization) have been a driving force behind economic growth. However, market forces alone cannot be counted on to perform certain regulatory functions, particularly regarding environmental protection and poverty reduction. Environmental market failures arguably are the most important root cause of excessive pollution and overuse of scarce natural resources, resulting in environmental degradation. Some numbers illustrate this point: the subsidization of chemical fertilizers in the PRC has translated into 30–40% efficiency in fertilizer use. In other words, the PRC wastes as much fertilizer annually as the United States uses. The findings for pesticides are similar. Market forces also increase pressures on the environment by attributing monetary value to environmental goods, thereby encouraging the overharvesting of local resources to supply distant markets. Finally, an unsupervised market creates conditions for private sector actors to mine local resources for short-term gains.

While these challenges are formidable, the current context of rapid change also offers many opportunities, which is cause for optimism. Environmental issues and poverty reduction are receiving increased public attention and are commanding a high profile in public policy debates. The demand for environmental improvement is growing outside SEPA. This is reflected, in particular, in the upgrade of SEPA to ministerial status in 1998. Over the last decade, policy makers' approach to reform has changed tangibly, reflecting a better understanding of, and increased reliance on, markets and incentive-based instruments. Specifically, the move toward a market-based socialist economy, as well as the impetus to streamline and rationalize state expenditures, lends political momentum to the reform of subsidy policies. A strong legislative framework is in place to support the attainment of environmental objectives. The many new laws and regulations (e.g., Water Act, Environmental Impact Assessment Law, etc.) clearly signal the importance of environmental protection, and help close some important loopholes. The dramatic growth in government revenues over the last decade—on average two to three times higher than the rate of economic growth—creates unique opportunities for fiscal reforms to correct environmental mar-

ket failures. It also offers the chance to improve public spending on environmental protection and poverty reduction. The World Trade Organization accession creates its own important environmental opportunities. For example, the logic of comparative advantage demands that the PRC shift from resource-intensive to labor-intensive agricultural production, which will benefit the environment.

Finally, the importance of poverty–environment links, as well as improving environmental quality to reduce poverty, has received increasing political recognition. The Government has made poverty reduction and environmental protection policy priorities. In addition, many government programs, such as the Great Western Development Program and the New Rural Poverty Reduction and Development Plan, have positioned environmental protection and poverty reduction as parallel policy objectives.

Conclusions and recommendations

This case study has shown how policy decisions motivated by national concerns and dominated by the economic development drive and pervasive institutional failures (including market failures) created a mutually reinforcing cycle of poverty and environmental degradation. The messages emerging from this study focus on two key areas—sustainable resource management and reconciling environmental improvement with economic development.

Sustainable natural resource management encompasses poverty reduction and environmental protection goals. An integrated approach to public interventions on environment and poverty will increase the effectiveness and efficiency of public spending on both. In addition, it will be important to balance the distribution of costs and benefits among the various interest groups, regions, and generations.

Reconciling environmental improvement with economic development requires (i) working upstream to integrate environmental policies into national macroeconomic policies (e.g., finance, tax, and banking); (ii) working downstream to integrate environmental objectives and best practices into social and economic development policies at regional and subnational levels; and (iii) improving interagency cooperation and coordination. Specifically, this entails

- **Enhancing participation of environmental authorities in economic and sectoral policy.** Environmental authorities need to be empowered to participate in economic and sectoral decision

making from an early stage. In particular, SEPA should build the capacity to engage in pricing, taxation, and expenditure policy. They should be involved more systemically with public hearings. To participate meaningfully in these policy processes, environmental authorities need to build a strong scientific base. Further, they must be able to command reliable data and information (e.g., on emissions, damage costs, etc.), and the relevant expertise to interpret and use this data. Therefore, the enhancement of monitoring capabilities is crucial. This also requires building capacity for economic analysis within SEPA.

- **Dealing with change and economic transition.** The interface of poverty, environmental protection, and economic development is complex, context-specific, and constantly in flux. Therefore, a long-term view and analysis of trends and dynamics is important. Equally important as dealing with existing poverty–environment trade-offs is improving our understanding of how to forestall a poverty–environment vicious circle. This is especially true during rapid change, such as the current transition in the PRC, where the Government plays an important role in supervising this transition. Moreover, public interventions to build the capacity of the poor to participate favorably in market institutions (particularly in labor and product markets) are needed.
- **Matching means with mandates.** The rules governing the division of responsibility for environmental expenditures between levels of government need to be clarified. Not only should funds match mandates in the aggregate, these funds also should be channeled to where they will be used best for the purposes defined. Central finance should be used to address environmental problems that have a clear national dimension, or where the public welfare costs or benefits span several jurisdictions (e.g., river basins). Central fiscal support is also justified on distributional grounds (see below).
- **Establishing stable, predictable, and long-term fiscal arrangements.** Environmental protection and poverty reduction should be seen as long-term strategies. Stability and predictability of fiscal flows to support such programs and policies is essential to enable local governments to plan over the long term. Government budgeting, as well as accounting practices and procedures, needs to be improved to ensure efficient alloca-

tion of budgetary resources and stable, predictable financing for environmental protection and poverty reduction.

- **Determining fiscal transfer payments for environmental protection in accordance with distributional justice principles.** The current system of intergovernmental fiscal transfers is regressive. As a result, poor provinces often lack the financial support from the central government to undertake key environmental protection functions. Where a region or district is particularly well-endowed with natural resources, those resources must be accorded their full social value when extracted and transferred elsewhere—even within the same country. In the longer run, this study recommends that the principle of ecological compensation be extended to regions. This would ensure that interregional rent transfers are compensated fully through the intergovernmental fiscal transfer system. Further research into this matter is recommended.
- **Strengthening the scientific basis for environmental valuation.** To correct market failures, the ability to estimate the value of the environment’s assets must be strengthened, and instruments that capture these values must be introduced. This hinges on the availability of environmental data. Further, the development of a comprehensive environmental information management system is a major requirement to ensure authoritative release of environmental information. Therefore, nationwide ecosystem and pollution monitoring systems need to be developed.
- **Creating equal opportunities and ensuring rights for farmers.** Support systems and supportive institutions (e.g., education, information, training, professional advice, etc.) are crucial to ensuring that the poor have access to markets, information, and appropriate technology. This would enable them to make the best use of their resources. Farmers need clear rights to ensure that those who lose their land are fairly compensated.
- **Subjecting public policies and programs to poverty and environmental assessments.** Large public spending programs need to be scrutinized for their impacts on the environment and on the poor. This study, therefore, recommends that independent analytical and

advisory capacity for conducting environmental and social impact assessments be developed. In addition, clear criteria to evaluate the efficiency and effectiveness of public investments and to ascertain its need must be developed.

- **Enhancing recognition of regional and local differences.** The ability of the Government and development agencies to recognize regional and local differences in policy implementation and instrument design can be crucial to the success and sustainability of centrally formulated policy, as the shortcomings of the Sloping Land Conversion Policy illustrated. Moreover, more flexibility is needed to allow for regional differences in fiscal resources and needs. In some cases, the failure to take into account institutional realities in the design phase—and to make good use of local knowledge and institutions—can distort development agencies' program and project goals during implementation.

Poverty and Natural Resource Degradation: Irrigation Tanks in South India

R. Balasubramanian and C. Chandrasekaran

Introduction

Tanks are one of the oldest sources of irrigation in South India. Tanks are particularly important in Tamil Nadu, where they provide irrigation for about one third of the rice-growing area, thus playing a crucial role in the state's food security. Tank irrigation systems are less capital-intensive and have wider geographical distribution than large irrigation projects. They are also eco-friendly, serving as flood moderators during heavy rainfall and as drought mitigating mechanisms during long dry spells (Vasimalai et al., 1996). Tanks recharge groundwater, a major source of drinking water for numerous rural and urban communities. Fish reared in tanks provide nutritious and affordable food for rural people besides being a source of income to fisherfolk. Thus, prosperity levels and the size of villages in many semiarid regions are directly proportional to the size and performance of irrigation tanks (Someshwar, 1999).

Despite these economic and ecological benefits, the performance of tanks has been in continuous

decline. The share of the area irrigated by tanks, compared to the total irrigated area in Tamil Nadu, has dwindled from about 1 million ha (about 40% of the total irrigated area in Tamil Nadu) in 1955 to about 0.6 million ha (less than 21%) in 2000. This decline reflects many problems besetting tank irrigation. The condition and performance of most of the tanks are poor due to inadequate operation and maintenance, disintegration of the traditional institutions responsible for managing tanks, heavy sedimentation, and private encroachments into feeder channels and water spread areas (Palanisami and Balasubramanian, 1998). Traditional institutions have come under tremendous pressure because of state and market interventions, political patronage, and political encouragement of encroachment (Nadkarni, 2000).

In response to resource degradation, people often develop collective and individual coping mechanisms (Scherr, 2000). In this context, collective coping strategies mainly take the form of efforts to revive and conserve the tanks. Individual coping strategies include permanent or temporary migration to seek nonagricultural opportunities, and the digging of private irrigation wells to make up for tank water shortages. Private coping strategies, such as migration and nonfarm employment, reduce investments in and labor for tank management (Bilsborrow, 1992; Reardon and Vosti, 1995). Meanwhile, private wells and nonfarm employment reduce the relative economic value of tanks in the village economy. Hence, the individual and collective coping strategies, together with user-group, resource, and household characteristics, determine the level of collective action applied to the conservation and management of tanks. Because the extent of collective action affects resource conditions and water availability, it has a direct bearing on agricultural productivity, poverty, health, and nutrition.

This case study is based on a larger study undertaken in the south Indian state of Tamil Nadu (Balasubramanian and Selvaraj, 2003), plus additional fieldwork to answer specific questions on the role of groundwater, dependence of farm and nonfarm households on tanks, and institutional challenges to the revival of tanks. This case study also analyzes the nexus between poverty, livelihood options, and tank management. Further, it challenges some of the existing notions regarding the factors leading to tank degradation, tank rehabilitation, and the handing over of tank management. The study also attempts to provide a modest agenda for future tank rehabilitation programs.

Poverty, dependence on tanks, and tank institutions

Being small, tanks lend themselves to decentralized management and are especially important to marginal and small-scale farmers who largely depend on them. The dependence of the poor was analyzed based on the village- and household-level data collected from 30 tanks in two administrative blocks of Ramanathapuram District. Sample households are classified according to two income categories: households living below the poverty line (poor households) and households living above the poverty line (non-poor households). The study used the Government of India's poverty line of Indian rupees (Rs)18,000 (\$360 based on the prevailing exchange rate during 2000) per capita per year.

Farm and landless households in poorer regions are much more dependent on tanks than their counterparts in nonpoor regions (Table 9). Poor regions depend more heavily on tanks for agricultural crop production and noncrop activities, including domestic water use, livestock husbandry, and fuelwood collection. More than 90% of poor farm households depend solely on tank water for irrigation, while only

two thirds of the nonpoor households depend solely on tanks for water. Although livestock ownership was comparatively lower in poor regions, livestock-based income's share of total household income, and the dependence of poor farming and landless households on tanks for grazing and watering livestock, has been much higher than for nonpoor households. A similar observation could be made of household dependence on tanks for domestic water and fuelwood.

In poorer villages, the greater dependence on tanks is one plausible reason for people investing more money and labor in tank maintenance, as well as the presence of stronger institutions for tank management. However, the declining dependability of tanks due to uncertainties in water availability leads to the diversification of livelihoods away from tank-fed agriculture, resulting in reduced dependence on tanks and weakening of the related institutions.

Tank management: Provision and appropriation

Tank management problems fall into two distinct categories: provision and appropriation. Provision problems are encountered in bringing sufficient water to

Table 9: Dependence on Tanks of Farming and Landless Households

Item	Poorer regions		Nonpoor regions	
	Farming households	Landless households	Farming households	Landless households
Dependence on tanks for irrigation water (% of households)	92	0	67	0
Average agricultural income from tank command (Rs/yr/household)	13,000	4,960	18,500	6,120
Share of agricultural income in tank command in total household income (%)	28.63	30.75	19.64	24.43
Average number of livestock units per household	7.9	5.6	9.2	3.4
Share of income from livestock to total household income (%)	13.30	21.57	9.60	12.92
Average number of days of livestock grazing in tank per yr	78	93	48	56
Average number of days of livestock watering in tanks per yr	67	102	52	71
Average number of days of using tanks for domestic purposes per yr	62	68	37	45
Fuelwood collected from tanks in relation to total household fuelwood consumption (%)	21.20	24.65	18.30	17.40

% = percent; Rs = Indian rupees; yr = year.
Source: Authors' field survey.

the tank, and making it available for use at the outlet. This involves multiple tasks, such as conserving the catchments, maintaining supply channels, removing and preventing encroachment into tank water spread areas, desilting, and maintaining and repairing bunds and sluices. Appropriation problems relate to the sharing of benefits from tanks, such as water for agricultural and nonagricultural purposes, fish, trees, and grasses that grow in tanks and silt from the tank bed. However, as this case study will demonstrate, provision and appropriation are closely related since inequitable appropriation results in reduced support for provision.

The institutional landscape in tank-irrigated areas of Tamil Nadu varies from very weak and informal water management mechanisms to strong formal institutions. The weak and informal institutions do almost nothing to improve the performance of tanks, except for formulating a few ad hoc rules for sharing water. Farmers enforce and monitor these rules, or appoint common irrigators temporarily. At the other extreme, strong formal institutions in some places clearly specify and enforce management rules, water diversion from the upstream supply channel, cleaning of field channels below the tank outlet, and revenue mobilization from tank usufructs and its utilization. A wide array of institutional arrangements can be found between these two extremes.

However, evidence suggests that tank management has been decreasing in recent years. In about 20% of the tanks surveyed for this study, farmers reported that they have stopped the time-tested practice of appointing *neerkattis* (common irrigators), who irrigate the fields and are in charge of protecting tank boundaries. This has happened even for some of the tanks that were modernized recently under externally assisted tank rehabilitation projects.

Factors behind tank management decline

A review of previous work on tanks (Palanisami and Balasubramanian, 1998; Palanisami and Easter, 1991; Janakarajan, 1993a and 1993b; Umasankari, 1991; Sakthivadivel et al., 2004) and this study's own fieldwork enabled the identification of various factors and processes that result in tank degradation. These are shown in Figure 4. Based on this information, an econometric analysis was conducted separately for the State of Tamil Nadu and for Ramanathapuram District to generate empirical evidence regarding the tank degradation process. The results show that the number

of private wells in tank commands, the ratio of rural to total population (a proxy for encroachment), and rainfall were statistically significant in affecting tank degradation (Balasubramanian and Selvaraj, 2003). Fluctuation in rainfall, government control over tank management activities, livelihood diversification through off-farm employment, size of user group, and the presence or otherwise of traditional institutional arrangements are some of the other factors affecting tank maintenance.

- **Rainfall fluctuation.** As noted by Williams (1997) in the context of rangelands, long periods of low rainfall and severe droughts have accelerated the process of resource degradation, as people diversify their livelihood strategies away from tank-fed agriculture and neglect tanks.
- **State intervention and state neglect.** State intervention in tank management initiated during the later part of British rule in India led to the loss of community rights over tank usufructs, breakdown in traditional management systems, and neglect of tanks. The extent of poor people's dependence on tanks as a prime factor promoting their participation in tank maintenance, and the income-generating potential of tank usufructs, rarely has been recognized. This is evident from the gross underinvestment in tank maintenance by the local and state governments (Dhan Foundation, 2004). The Government always has depended on external agencies for tank rehabilitation. Such attitudes also can be found at the village level. Just as the Government expects external aid for tank rehabilitation, villagers turn to outside actors, such as the government and nongovernment organizations (NGOs), for tank maintenance.
- **Off-farm employment.** Large-scale migration and off-farm employment have altered dramatically the relative economic importance of tank-fed agriculture in people's livelihoods, social values, and power structures in village societies. This has destabilized the traditional village institutions, including those responsible for tank management (Janakarajan, 1993b). In most parts of Tamil Nadu, agriculture is becoming a less-preferred livelihood occupation—even more so in tank-irrigated areas because of the growing risks in tank-fed agriculture. As shown in Table 9, tank-based income of farming and landless households represents less than one third of the total household income in

poor and nonpoor regions. In most tank-fed areas, especially those without access to groundwater, a single rice crop is grown, with low yields and high risks. Groundwater availability and smaller landholdings limit the scope for increasing cropping intensity, yields, and diversification; hence, tank-fed farm income is hardly sufficient. A number of farmers in a recently modernized tank cascade in Ramanathapuram District reported that the rice supplied to them under drought relief is cheaper than the rice produced on their farms. Thus, diversification into nonfarm activities becomes inevitable, leading to neglect and further degradation of tanks.

- **Group size.** The econometric analysis also showed that tank size—a proxy for group size—has a negative influence on collective action. This is probably because larger tanks serve more beneficiaries, in many cases more than one village. Increasing heterogeneity discourages cooperation. Large tanks are also more likely to be divided along political and caste lines.
- **Existing institutions.** The presence of common irrigators represents the vestiges of traditional institutional arrangements (or prior institutional experience), and plays a strong role in sustaining cooperation among tank farmers.

PROVISION PROBLEMS REGARDING WATER DELIVERY AND STORAGE

The provision problem refers to bringing sufficient water to the tank, and making it available for use at the outlet through the maintenance of tank structures, feeder channels, etc. Participation of households in tank maintenance is decided at village meetings. Collective tank maintenance work was observed in only 18 of the 30 tanks for which detailed information was gathered. In the remaining 12 tanks, such activities were not undertaken during the survey years 1999–2000 and 2000–2001. The main challenge is the encroachment on tank components, such as feeder channels, water spread area, and catchments. To understand this, three related questions must be answered. Why does encroachment occur? Why do people not stop it? Why do they not contribute to repairing the damage?

In poor and nonpoor regions, the main reason for low levels of tank maintenance is the perception that it is the duty of the Government to invest in tank conservation and maintenance. The cost of rehabilitation is the overwhelming reason in poorer regions,

while the multivillage nature of tank problems and lack of cooperation from well owners were reportedly the prime reasons for meager maintenance efforts in nonpoor regions.

Why does encroachment occur?

- **Industrial development and urbanization.** Politically powerful individuals and/or groups with links to the Government and/or bureaucratic power structure have encroached on tanks for agricultural or nonagricultural purposes. Pollution of tank water is common in many tanks located near cities and industrial areas, such as tannery-intensive villages in northern Tamil Nadu. Government departments have shown the way by encroaching on and misusing tanks for urban purposes (Dhan Foundation, 2004).

Why do people not stop encroachment?

- **Encroachment by those in other jurisdictions.** In more than 90% of cases, encroachment is an intervillage problem. Thus, it is not amenable to being solved by local people without active support from the Government and the bureaucracy. Furthermore, because most of the tanks are in cascades, the hydrological boundaries do not coincide with the civil and revenue administrative jurisdiction. As such, village panchayats and local bureaucracies cannot resolve the encroachments.
- **Particular challenge facing small tanks.** Other things remaining constant, encroachment is a more serious problem in small tanks. Farmers are not only fewer, which limits their lobbying power, their poor economic status makes them vulnerable to local political and economic pressures.

Why do people not contribute to repairing the damage?

- **High cost of maintenance.** Even in the 18 tanks where some collective tank maintenance was evident, the contribution was grossly inadequate compared to the extent of rehabilitation required.
- **Nonpoor regions face greater problems.** The institutional landscape also shows remarkable differences between poor and nonpoor regions—with poorer regions having comparatively stronger institutional arrangements than nonpoor regions. Consequently, even households with a high degree of dependence on nonfarm activi-

ties in poorer regions have made a more substantial contribution to tank management than their counterparts in nonpoor regions. Encroachments were generally greater in nonpoor than in poorer regions. The level of encroachment was not significant in Ramanathapuram, probably due to poor urban development and low levels of land productivity (Mosse, 1997a).

- **Lack of cooperation from private well owners.** Detailed discussions with the villagers indicated that participation in tank maintenance activities is not based on strategic interaction among the farmers. Rather, it is based on a consensus regarding what has to be done and how much has to be spent on tanks. In some tanks, where many private wells are found, voluntary participation by well owners is relatively low. In a few tanks, well owners do not participate in collective action, although they take water from tanks. Those who do not own wells do not object to this because of their dependence on well owners during periods of tank water scarcity.

APPROPRIATION PROBLEMS REGARDING THE SHARING OF TANK BENEFITS

Private wells have upset long-standing rules on tank water access. In effect, wells within tank commands are used to privatize common-pool tank water because of the physical interdependence between tank storage and well-water recharge.

Private wells, agricultural yields, and employment. Existing property institutions regarding land and groundwater, the policy environment, and the hydrological conditions in most tank areas are highly conducive to the digging of private wells by rich farmers. The emergence of a groundwater market has mitigated, to a large degree, small-scale farmers' lack of access to groundwater. Private wells and groundwater markets help considerably in saving crops under water stress during critical growth stages, given the uncertainty in tank water supply (Palanisami and Flinn, 1989; Palanisami and Easter, 1991; Janakarajan, 1993a; Palanisami and Balasubramanian, 1998). Crop cultivation using wells during the non-tank season is a source of employment for the landless labor households. A comparative analysis of crop production and labor employment under different levels of access to groundwater can identify the role of groundwater in tank commands (Table 2). Cropping intensity, crop

yields, and the extent of labor employment correlate positively with the number of wells in the tank command area.

Private wells and tank management. The number of private wells has a positive impact on tank performance up to a certain threshold, and then its impact on tank performance becomes negative. In other words, the tanks and wells have a complementary relationship up to a limited number of wells. Beyond that number, the relationship becomes competitive and leads to tank degradation, as seen in Tamil Nadu and Ramanathapuram. This is possibly because the emergence of private wells in limited numbers contributes to agriculture by providing supplementary irrigation when tank water is scarce (Palanisami and Easter, 1991), thereby sustaining the farmers' interest in tank-fed agriculture and collective action in maintaining the tanks. Indeed, wells are highly dependent on tanks for recharging. However, if the number of private wells exceeds a certain threshold, economic differentiation among farm households sharpens and the dependence on private groundwater takes precedence over the collective interest in maintaining common-pool irrigation tanks. When private wells reach a sufficiently large number, competitive groundwater markets emerge in the tank commands. This reduces dependence on tanks even further, including among non-well owners since they become water buyers. The bottom line is that the impact of private wells and nonfarm employment on the conservation and management of tanks is a finely balanced issue that needs to be addressed carefully.

Electricity subsidies and weak regulations. Subsidized electricity for groundwater pumping, and the absence of institutional mechanisms to regulate the digging of private wells, has encouraged multiplication of the latter. Raising electricity prices has met with strong resistance from farmers, as well as opposition politicians. Some states (including Tamil Nadu) that raised prices have switched back to subsidies. The Government of Tamil Nadu recently introduced a law to regulate the digging of private wells, although it has not been implemented and there is no reason to believe it will be in the near future. Weak implementation also is likely to undermine the Tamil Nadu Farmers' Management of Irrigation Systems Act, which was introduced recently to hand over irrigation management to farmers.

Figure 4: Links Between Resource Degradation, Poverty, and Livelihood Options

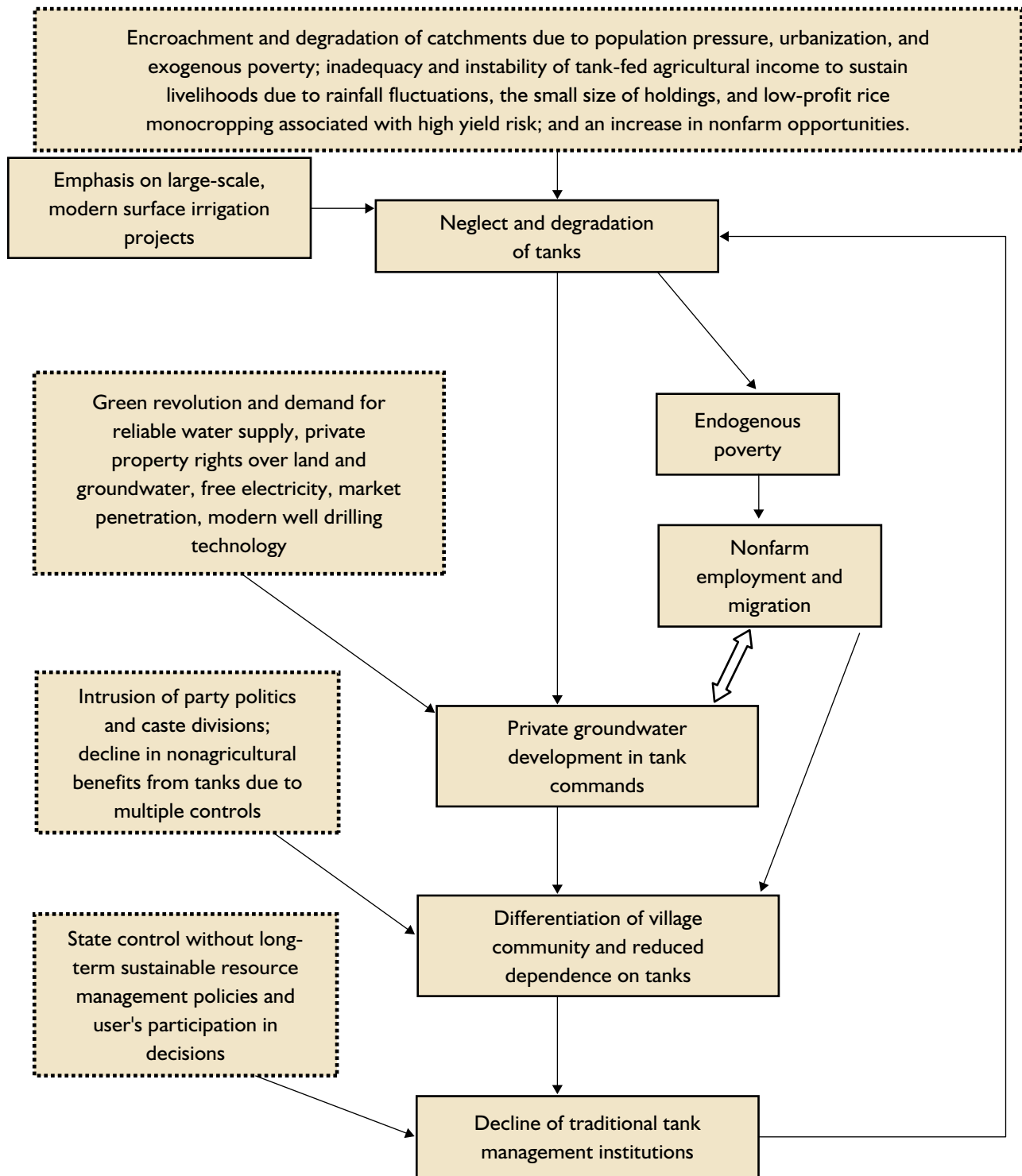


Table 10: Dependence on Tanks, Perception of Tank Problems, and Collective Action

Item	Share of tank-fed agriculture in total income of farm households in poor villages			Share of tank-fed agriculture in total income of farm households in nonpoor villages		
	< 33%	33–66%	>66%	< 33%	33–66%	>66%
Perception of tank problems	Poor water supply due to rainfall fluctuations and choking of supply channel	Poor water supply due to choking of supply channel and sedimentation in tanks	Sedimentation and poor condition of tank structures	Encroachment and poor water supply	Sedimentation and encroachment	Sedimentation and encroachment due to neglect of tanks
Ranking of reason for poor tank maintenance by village community	1. State's duty because tank rehabilitation and maintenance are costly	1. State's duty because tank rehabilitation is costly	1. State's duty because tank maintenance is a multivillage problem	1. State's duty because tank rehabilitation is a costly investment	1. Tank maintenance is a multivillage problem	1. Non-cooperation from well owners
	2. Nonfarm employment and reduced role of tanks in livelihoods	2. Low income and high risks in tank-fed agriculture	2. Increasing role of private wells	2. Tank management is a multivillage problem	2. Non-cooperation of well owners	2. Tank maintenance is a multivillage problem
Rice yield in tank command (kg/ha)	3,700	3,950	4,325	4,075	4,450	4,840
Wells (no.) per ha of command area	0.10	0.22	0.34	0.17	0.38	0.55
Percentage of migration and nonfarm employment among farm households	70.2	56.9	42.2	63.2	46.2	19.9
Institutional arrangements for tank and water management	Weak	Strong	Strong and systematic	Very weak	Weak	Weak
Contribution to tank management (Rs)	47.65	191.20	448.85	19.00	97.25	173.50
Encroachment (%)	10	15	23	36	27	14

ha = hectare; kg = kilogram; % = percent; Rs = Indian rupees.
Source: Authors' field survey.

Table 11: Private Wells, Nonfarm Employment, and Tank Performance

Item	Wells (no.)	Less than or equal to one well per 10 ha	Two to four wells per 10 ha	More than four wells per 10 ha
Average no. of wells per 10 ha	0	0.08	3.13	5.37
Percentage of remittance and nonagricultural income in relation to total household income	46.75	39.52	32.47	22.53
Percentage of households reporting migration and nonfarm activities in relation to total households	85.63	73.13	52.50	31.20
Cropping intensity (%)	74	98	127	143
Institutional arrangements for tank maintenance and water control	Weak	Strong	Strong	Weak
Rice yield in tank command area (kg/ha)	3,420	3,750	4,010	4,265
Agricultural labor use in tank command (no. of person-days per ha)	117	132	154	193
Percentage of tank-fed agricultural income to household total income	23.14	25.65	31.46	38.59

ha = hectare; kg = kilogram; no. = number; % = percent.
Source: Authors' field survey.

APPROPRIATION PROBLEMS REGARDING TANK FISHERY AND FORESTRY BENEFITS

Another important challenge is the multiple controls over various tank usufructs, such as tank fisheries and forestry. For example, while the tanks are under the control of the panchayat or the irrigation department of the state government, fisheries are controlled by the panchayats and the fishery department of the state government. The local panchayats and the revenue and forest departments of the state government have stakes in tank forestry. A complete lack of coordination among these departments not only results in underutilization of the productive potential of tanks (fisheries, forestry, silt, grasses), it also undermines the power to protect these usufructs from misuse. Researchers have reported the value of fish production/ha of command area to be in the range of Rs130 (Palanisami and Meinzen-Dick, 2001) to Rs200 (Palanisami et al., 1997), while official fishery production estimates put the value of fish production in tanks at Rs1,200–2,500/ha of command area. Such a huge gap between the official estimates and researchers' field-level estimates is due possibly to the gap between de jure fishing rights and de facto enjoyment of them. In more than three quarters of

the tanks where fishery production is active, although the de jure fishing rights are vested with the local or state government, farmers' associations reportedly take over government fishing rights through fake auctions by paying a bid amount of a few rupees to the Government and then re-auctioning these rights to private contractors for much higher amounts—sometimes hundreds of times higher than the actual bid amount paid. The difference between the amounts they pay and receive from private fishing contractors is credited to the village common funds for temple repairs and festivals.

Many studies and this study's fieldwork show that the multiple controls over tank usufructs, the tension between de jure and de facto rights, and the gross inadequacy of the government machinery to enforce and supervise the fishing rights (Government of Tamil Nadu, 1995) have resulted in the underutilization of the productive potential of the tanks. Moreover, whatever income is generated from tank usufructs is used for purposes other than tank maintenance in most of the tanks (Palanisami et al., 1997; Balasubramanian and Selvaraj, 2003). An important corollary of these observations is that multiple controls over tank usufructs coexist with no control—a typical case of state property degenerating into an

open access resource or private property, thus leading to underuse or misuse of tank usufructs.

Tank rehabilitation: A critique of past efforts and an agenda for the future

This section attempts to demonstrate the vicious cycle in tank degradation: tank degradation—poverty—private coping strategies—further degradation of tanks. Past efforts to revive tanks through externally assisted tank modernization projects have made little headway in reversing the process of tank degradation.

SOME FAILURES OF TANK MODERNIZATION EFFORTS

Many attempts at tank modernization have failed. Of the 39,000 tanks in Tamil Nadu, about 1,300 have been modernized with an outlay of about Rs5 billion (\$1 = Rs44) over a period of more than 20 years. External agencies funded about 75% of these modernization investments. Modernization works have been remarkable uniform, despite the vast differences in tank irrigation problems across different agro-climatic and socioeconomic localities in the state. In most cases, the institutions have become defunct and the modernized physical structures have been poorly maintained. Some possible causes for these failures include

- **Lack of a livelihoods perspective and multiple-use benefits of tanks.** The first major drawback of past tank modernization projects was the failure to view the tanks from the perspective of people's livelihoods. Tank rehabilitation was never linked to other resource conservation programs, such as watershed development, community wells, forestry, and wasteland development. Similarly, a link was never established with poverty reduction programs, such as micro-finance, food-for-work, and drought relief. The multiple-use potential of tanks rarely has been recognized and has been grossly underestimated, while the potential benefits from agriculture have been overestimated. Selsky and Creahan (1996) emphasize the role of secondary and tertiary stakeholders in the sustainable use of resource systems. However, the roles of secondary stakeholders, such as fisherfolk, agricultural labor households, pastoralists, and non-agricultural households, have been neglected completely in tank modernization. These stakeholders could have been included in the tank community to create a formidable alliance

against vested interests and encroachers, and to build a broader community of tank users.

- **Lack of involvement of farmers.** Modernization of physical structures, such as field channels and sluices, has been overemphasized. Meanwhile, very little has been done to ensure the active participation of farmers in decision making, removing and preventing encroachments, and handing over benefits from tank usufructs to the village community.
- **Lack of community wells for the poor.** Despite uncertainty in tank filling and the need for supplementary well-irrigation, few attempts have been made to provide poor farmers with access to groundwater through group or community wells.

These factors have led to the emergence of a different kind of vicious cycle in tanks: externally assisted rehabilitation of tank structures—inadequate attention to sustainable institutions and multiple uses of tanks—poor maintenance and degradation of tanks—further dependence on externally assisted rehabilitation.

TANK MANAGEMENT MIGHT NOT BE VIABLE IN ALL CASES

Rural households will not conserve a resource unless its usefulness is fully perceived and realized. As noted by Long (1989), resource users find themselves in complex and uncertain situations. Based on their social experience, they have to choose between different courses of action by weighing the costs and benefits of contributing and conforming to the existing resource management regime against those resulting from an array of different strategies (Edwards and Steins, 1998). In tanks, these strategies include the development of private groundwater extraction to supplement tank water; migration and nonfarm employment; and neglect of agriculture and tanks wherever the latter have become extremely undependable. Thus, it is unrealistic to attempt to revive tanks that have lost their importance in people's livelihoods for various reasons, such as poor water supply with limited scope for groundwater development, migration, and significant livelihood diversification away from agriculture. The Vallakulam tank cascade in Ramanathapuram District, which was modernized with European Community support, is a case in point. The institutions that were revived with support from a local NGO have become dysfunctional for the reasons mentioned above. In another village within the Villoor tank cascade in

Madurai District, a similar program was implemented. However, the story was different: political divisions spurred by legislative and panchayat elections undermined the institutional arrangements.

For some tanks, the physical and institutional structures have reached the point of no return. Several tanks in the poorer region in East Ramanathapuram District have unpredictable rainfall and saline aquifers, which have forced the farmers to seek nonagricultural coping strategies, such as the production of charcoal using local bushes, migration, and other nonfarm employment outside the villages. In these situations, bold initiatives should be taken to reduce reliance on tank-fed agriculture for income by providing alternative employment opportunities. Exploitation of nonagricultural benefits from tanks, such as tank-bed fishery and forestry, are other possible alternatives to manage the decline in tank performance.

TANK MANAGEMENT SUCCESSES

Several institutions have solved provision and appropriation problems successfully and effectively by, for example, (i) maintaining feeder channels and diverting water from rivers, (ii) appointing common irrigators for water distribution, and (iii) removing sedimentation from the water spread area of tanks.¹⁴ In a few tanks—such as Parambur in Pudukkottai District and Kedar in Villuppuram District—the tank institutions have put aside local political differences and devised clear rules and strategies to exploit and share tank usufructs. When tank water is scarce, some of the strategies followed in a few of the tanks include acreage restriction, rotational water supply, and prohibiting well owners from using tank water. A comparison of self-organized, traditional institutions with those modernized by the Government with European Community support suggests that locally evolved institutions are more effective and sustainable. This also has been reported in other parts of the world (Ostrom and Gardner, 1993).

AGENDA FOR FUTURE TANK REHABILITATION PROGRAMS

Selectivity. Future tank rehabilitation efforts should focus on the careful selection of tanks with location-specific priorities for improvements decided by the beneficiaries and continuous outside technical and financial support.

Manage groundwater. The increasing uncertainty in tank water supply and stagnating profitability from rice monocropping is fueling the neglect of tanks. Tanks alone cannot support successful crop production without additional irrigation from wells. The macro-level econometric analysis of tank degradation has established that wells promote collective action within a specific range. Beyond that point, however, wells have a negative impact on tank maintenance. Therefore, institutional intervention to regulate well-irrigation within tank commands is needed. The high cost of tube wells for the poor can be reduced by providing community wells or group wells linked to continuing microcredit programs. The success of group wells in river-pumping projects in other parts of the state is a model for the success of community wells in tank-fed areas.

Increase nonagricultural benefit from tanks. As crop production is highly uncertain due to huge variations in tank filling, alternative sources of income from tanks have to come mostly from fishing, trees, silt, grazing, and other minor uses. Intensive rice–fish production could be made possible by transferring fishing rights to the farmers and developing appropriate skills. Successful cropping and fish production are possible in years of water scarcity by following the proportionate acreage restriction strategy used in Parambur and Kedar tanks. Planting trees with different economic uses and gestation periods could provide livelihood security in drought years. Exploitation of the multiple-use potential of tanks is found to improve tank performance significantly (Palanisami and Meinzen-Dick, 2001). Handing over tank usufructs in exchange for a commitment from the beneficiaries to utilize the income for tank rehabilitation is essential.

Promote tank-based microcredit. Part of the income from tank usufructs needs to be saved through microcredit programs to protect livelihoods during drought years. Coherently implementing crop insurance and community wells through microcredit groups would reduce informational problems besetting rural credit and insurance markets.

Proactive state that promotes greater farmer involvement without complete handover. A departure from the top-down, bureaucratic, civil engi-

¹⁴A water spread area refers to the area over which water is stored in tanks. Naturally, the silt carried by water from the catchment is deposited here causing tank sedimentation problem.

neering perspective of tank maintenance and water distribution is needed. However, that does not mean a complete handover to the villagers without considering the range of uses of the resource, the diverse interests of users, and the capability of local institutions to take on additional responsibilities (Williams, 1997). As Mosse (1997b) states, “people do not demand a reduced state but a better, responsive state.” In addition to providing technical and financial aid, the State (Grafton, 2000; Rangan, 1997) should enforce property rights, resolve conflicts, and coordinate the multiple uses and multivillage users of tanks.

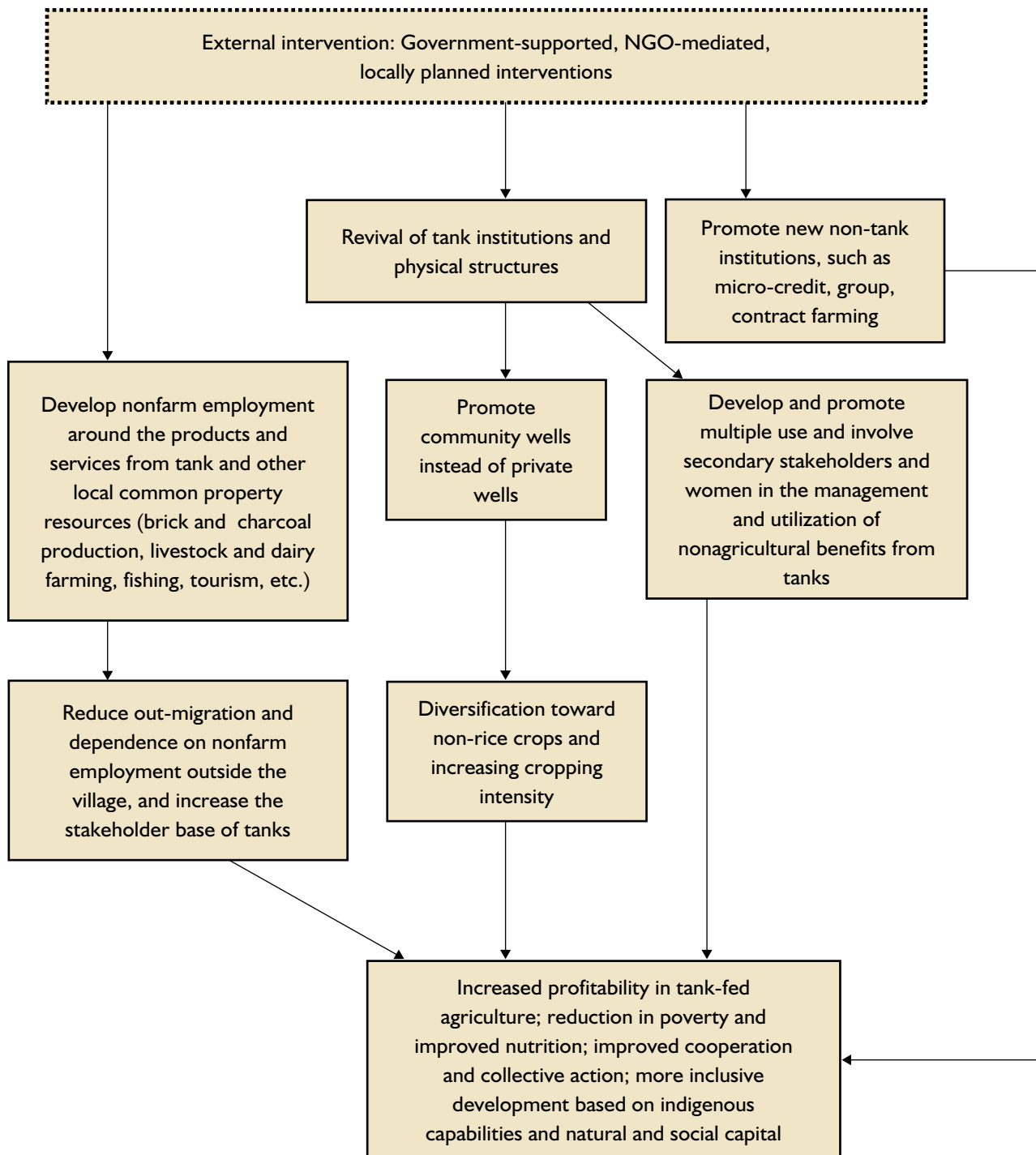
Table 12 summarizes the policy instruments discussed above for rehabilitating tanks and reviving institutions, as well as their possible impact on stakeholders. A plausible model for intervention is in Figure 5. Though not all policies or interventions could be implemented in all tanks, most of them hold promise for wider adoption. Implementation of some of the interventions—such as proportional acreage restriction during water scarcity, restricting well owners from taking tank water, and tradable water rights—might appear imaginative. However, they are not infeasible. The rudiments of these kinds of interventions have been applied in a few tanks.

Table 12: Political Economy of Possible Interventions

No.	Policy or intervention	Gainers	Losers
1.	Removal of encroachment involving secondary stakeholders (Pondicherry model)	Village community, including tank farmers	Upstream encroachers
2.	Regulating private wells	Small farmers	Large farmers with vested interest in groundwater exploitation, water sellers
3.	Turning over tank usufructs to tank users' association, and linking it with microcredit programs	Village community	Government, local panchayats
4.	Promoting community wells and nonagricultural uses of tanks, and linking them with microcredit programs	Small and marginal farmers who are unable to afford private tube wells, and other poor and landless households	Water sellers in the short run; none in the long run
5.	Acreage restriction during years of water scarcity (Parambur, Kedar, and Kongudi tank models)	Small and marginal farmers	Well owners and large farmers
6.	No tank water supply to well owners without tradable permits over tank water (Kedar tank)	Non-well owners	Well owners
7.	Reduced tank water supply to well owners with tradable permits over tank water	Small farmers	None
8.	Government investment in physical structures, crop production technology, and participatory irrigation management	Tank community	None

Source: Tabulated based on authors' work and review and synthesis of other studies on tank management.

Figure 5: From Vicious Cycle of Tank Degradation to Sustainable Tank Management



Community-Based Forest Management in Nepal: Reversing Environmental Degradation and Improving Livelihoods

Krishna Prasad Oli¹⁵ and Keshav Raj Kanel¹⁶

Introduction

Nepal is regarded as a pioneer in the development of progressive forest policy and legislation in South Asia. This focuses on the collaboration between the Government and local communities for community forestry (CF) and leasehold forestry (LF) programs. The twin objectives are (i) setting up common property systems of forest management to restore and rehabilitate degraded forests, and (ii) reducing poverty. The CF program has been implemented successfully for more than 2 decades, while the LF program has been working for slightly more than a decade.

CF consists mostly of preventive measures aimed at protecting forests from degradation and managing large plots of national forest that are handed over to a larger community whose members come from different socioeconomic backgrounds. The communities are mandated to prepare a long-term management plan, which is the basis for the work. They benefit directly from fuelwood, fodder, and litter. The income generated from the sale of surplus timber and other products is invested in community development activities. LF, which is aimed at redistributing assets to the poor, is carried out exclusively in degraded forest areas. Leasehold forests have 1–10 ha of land no farther than 3 km from the settlement, or half an hour walking distance. In this case, 2–10 poor households comprised the group, and the land is leased to them for a maximum of 40 years.

The purpose of this case study is to analyze the features of CF and LF systems in terms of reversing forest degradation, and their contribution to poverty reduction. In doing so, the study also revisits the theory of degradation and land-use change dynamics and their causes. The study analyzes (i) the role of different stakeholders in the implementation of CF and LF policy and legislation; (ii) evolving livelihood strategies of forest-dependent communities;

(iii) forest and protected area management in times of conflict; (iv) the positive and negative impacts of CF and LF policy; and (v) the legislation aimed at improving livelihoods and empowering women. The study is based on evidence from other study reports. Two local case studies from the mid-hills, one on CF and the other on LF, are also presented. This case study concludes with lessons learned, and second- and third-generation challenges for CF and LF.

Country background

Nepal is a mountainous country with much of the land under the Himalayan realm in the subtropical belt. Nearly 77% of the country's 147,181 km² is composed of rugged hills, mountains, and valleys, with elevations ranging from about 90 meters (m) to 8,848 m above sea level. The climate, therefore, is extremely variable, ranging from tropical to tundra. Nepal's population has grown from 8.5 million to 23.2 million over the last 5 decades, and continues to grow at 2.2% per year. The mountains and hills of Nepal are home to 52% of the population; the rest live in the Siwalik and Terai (plains) area.

The gross national income per capita is \$250. More than 81% of the economically active population lives in the rural areas and is engaged in farming. Farming is estimated to contribute about 40% of GDP. The National Planning Commission estimates that 42% of the population lives in poverty. A regional breakdown shows that poverty is concentrated mainly in the mountains (56%), compared to 41% in the mid-hills and 42% in the plain (Terai) areas. Furthermore, the disparities between rural and urban areas are considerable, with 44% of the rural population living in absolute poverty, compared to 23% in urban areas.

Extent of community and leasehold forestry

The CF and LF programs have succeeded because local communities use their innovative system of indigenous forest management through the new community-based institutions, such as user groups and sanctions. These indigenous systems have been operating in Nepal for centuries, and have been documented elsewhere (Messerschmidt, 1986; Gilmour

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and Fisher, 1991; Gilmour and Nurse, 1991). Since the establishment of the modern Nepal, a range of regulatory instruments and policies has been introduced to conserve and manage forest resources. Before the 1980s, commercial policy vested these rights in the hands of a few people, leading to indiscriminate extraction and deforestation. Moreover, the bureaucratic forest laws considered government officials as forest custodians, while local communities were viewed as encroachers rather than forest managers. This encouraged the depletion of forest resources.

After the preparation of the Master Plan for the Forestry Sector in the mid-1980s, progressive forest legislation and policies were put in place. The Forest Act (1993) and Forest Regulations (1995) were critical to the promotion of CF and LF in Nepal. By understanding customary mechanisms, and legitimizing them through statutory law, the Government transferred usufruct rights over forest resources to communities. As a result, more than 1 million ha of forestland, most of which were degraded, have been brought under successful CF and LF programs. CF is by far the larger program, covering about 1.1 million

ha, or 26% of the forest area. LF covers only 10,000 ha, or 0.2% of the forest area. More than 13,300 community forestry user groups (CFUGs) and more than 2,213 leasehold forestry user groups (LFUGs) are managing such forest areas, benefiting in excess of 7 million people—or roughly 1.5 million households.

The impact of community and leasehold forestry in improving livelihoods

Mountain people have adapted different livelihood strategies to cope with their harsh living environments. The most important of these is diversification of income through agriculture, livestock, and the sale of timber and NTFPs. Supplementary income from other sources, such as migration, small-scale tourism, and other aspects, is another important aspect of their livelihood strategies. Poor and vulnerable groups draw on various livelihood sources for their survival. Since the majority of the poor have landholdings that do not produce enough to feed them even for 3 months, their dependency on forest resources, such as fuelwood and NTFPs, is substantial. While women mem-

Table 13: Handover of Forests to Communities From 1988 to 2004

Year of CF handover to community	CFUGs	CF area handed over (ha)	Households
1988	1	27.00	53
1989	10	567.00	35
1990	42	1,972.57	1,115
1991	87	5,011.53	4,492
1992	349	20,844.55	12,973
1993	737	52,121.01	36,214
1994	1,225	88,763.23	80,944
1995	1,655	120,818.00	142,839
1996	1,763	156,899.46	178,670
1997	1,588	133,694.99	196,614
1998	1,442	135,767.01	177,366
1999	1,156	100,026.74	168,770
2000	1,067	90,713.67	135,406
2001	841	83,599.51	121,746
2002	592	50,667.12	93,827
2003	557	40,833.02	62,230
2004	430	32,449.04	49,109

CF = community forestry; CFUGs = community forestry user groups; ha = hectare.

Source: Government of Nepal, Department of Forests. 2004. Data on community forestry handover (unpublished).

bers of a poor household are engaged in household chores and in the agriculture sector, male members migrate or are engaged as wage laborers. A major part of their cash income (60%) comes from agriculture and off-farm activities, followed by small-sized businesses, cottage industries, and wage labor (Adhikari, 2003). Seasonal and annual out-migration varies from one zone to another. One estimate indicates that 40% migrate for seasonal work. Although generating income through migration has been a coping strategy, it sometimes creates a shortage of labor for local production and leads to poverty. Furthermore, mostly men migrate, increasing the workload of women with serious implications on their health and security.

CF and LF are good examples of decentralized governance of natural resources. The policy has provided the poor and others with the rights to organize, manage, and use the resource for their own benefit. However, decentralization alone is insufficient—and, in some situations, it has been seen as an interfering arm of the central Government. The CF and LF case studies show that rural households with capital assets, such as productive private lands and livestock, capture more benefits than poorer CFUG households. Even if CFUGs and LFUGs are allowed to sell the surplus forest products, the income generated might not be used to benefit mainly the poor households. Investments in local community development activities too often result in greater benefits for the rich.

IMPACT OF COMMUNITY FORESTRY ON IMPROVING LIVELIHOODS

The Forest Act (1993) and the Forest Regulations (1995) empowered CFUGs to sell and distribute forest products independently. The new role and responsibilities helped establish local-level institutions (CFUGs and LFUGs) to design rules, apply sanctions, collectively manage forests and funds, resolve conflicts, and monitor activities in the specified areas. The User Group Assembly—the highest decision-making body—prepares a constitution of the CFUG and forest operational plans. It also defines user rights and duties, and mobilizes CFUG funds for different activities.

The forest management strategy ensures the participation of local people in the management of forests, and allows them to procure forest goods and services for their benefit. Although the CF program reportedly has had a major impact on livelihoods, empirical evidence to substantiate this still is lacking at the national level. In an attempt to under-

stand the current situation, Kandel and Niraula (2004) analyzed the economic parameters collected from 1,788 selected CFUGs from 12 districts (1,541 from hills and mountains; 247 from Terai or Inner Terai and Siwalik areas) in two broad ecological zones (mid-hills and mountains, and Terai or Inner Terai and Siwalik). The value of forest products harvested, as well as the income and expenditure of CFUGs, was analyzed. Among the forest products, timber generates the highest percentage of income (69%), followed by fuelwood (19%), and grass fodder and bedding (10%). The communities use more than 79% of the forest products themselves, and a large amount of NTFPs are consumed in the form of medicines. Resin and other products are sold to outsiders. When the current user group forest product price records are considered, the annual income from Nepal's community forests totals Nepalese rupees (NRs)913.8 million (\$1 = NRs73). However, this is grossly undervalued. When the stumpage value (market price) was applied to these products, the income of Nepalese CFUGs totaled about NRs1.9 billion per year.

On the investment side, the CFUGs reinvest 28% of their income in forest protection and management, which is higher than the mandatory 25% stipulated in the Forest Regulations. The analysis showed that little is invested in capacity building (2%). Significantly, however, a high amount is spent on community development (36%). Pro-poor programs receive only 3%, while a large amount (more than 17%) is spent on miscellaneous activities—the gray area in CFUG management. Users contribute voluntary labor for various activities. They spend 42% in the management of CF resources, 19% on attending meetings and the Assembly, and 19% on harvesting forest products. In the Terai and Siwalik areas, only 21% of labor contributions are spent on protecting the forests, compared to 41% on product harvesting. Calculations taking into account the income of CFUGs, based on the user and stumpage prices and expenditures, show that CFUGs are investing NRs586/ha of community forest and receiving NRs1,865/ha/year. A single CF program of the Ministry of Forests and Soil Conservation contributes more than NRs1.9 billion, which was equivalent to the annual budget of the Ministry in 2004 and 60% more than the budget of the Department of Forests. The environmental services provided to the community and areas outside it have not been calculated, although this amount could be significant, as various valuation exercises

elsewhere in the world have shown. The CFUG system reportedly has improved significantly the aquifer water levels (Roy, 2002).

What is still unclear is the equitable use of resources among and between different groups—the rich, middle class, poor, ultra poor, and women. Poor user groups reportedly do not receive as many benefits from CF as the better off (Kanel, 2004). Several authors working in the field of CF recently have raised this issue (Malla, 2002). Heterogeneity among the groups, asymmetrical power relationships, and disparities in land resources, capital assets under private ownership, and human capital have hindered the equitable distribution of benefits from community resources. For example, Richards et al. (1999) found that household members with larger landholdings could benefit more than CF members with smaller holdings. Adhikari (2003) reviewed cases from South Asia and conducted a detailed study to examine this hypothesis in two selected districts in the mid-hills of Nepal, where CF has been operational for the last 2 decades. The study showed that poorer households in forest-dependent communities benefit much less from CF than the middle-income and rich households. The average poor household receives NRs7,756, while the rich households earn an average NRs24,466 annually from CF. Rich households received about 85% of income related to common property resources (CPRs), while the rest went to poor households. When considering gross CPR income as a percentage of household income, wealthier households were more dependent on CPRs than poorer households, which challenged the hypothesis that poor households rely more on CPRs.

Although poverty limits poor people's choices, evidence suggests that the poor are primarily responsible for resource degradation. Often, the rich have contributed much more to this process. Furthermore, when the net income from CF was considered as a percentage of a household's total income from the forest, poor households earned 5%; middle-income households, 8%; and better-off households, 4%. An econometric analysis showed that households with land and livestock assets gained most from CF. Moreover, the use of forest undergrowth, grass, forest litter, and timber—and the benefits from development activities arising from CF—all favor the rich. Because rich people have more assets and livestock, build bigger houses, have larger farms, and use more water for irrigation and leaf litter to fertilize their fields, they will draw more benefits from CF. In addition, CF

sanctions curtail the traditional resource-harvesting systems of poor households—e.g., making agricultural implements and charcoal; harvesting other forest resources; and in many situations, selling their share of CF areas. This has led to the skewed sharing of CF benefits.

Although the goal of the CF exercise is greater equity, legislative reforms followed by mass awareness are needed to address these issues. Another issue concerns the willingness of the community or the Government to transfer CF property rights to community members. Complete handover of CF resources to the CFUG might not solve the problem of equity because of elite capture.

IMPACT OF LEASEHOLD FORESTRY ON LIVELIHOODS

The most degraded lands unsuitable for CF are given to the poor—with a view to restoring and rehabilitating the land, while providing opportunities for the poor to increase their income. Development planners and external funding agencies adopted this as a strategy to simultaneously improve the lives of the poorest of the poor and reverse environmental degradation.

How has this plan fared? Has it impacted livelihoods? The Hill Leasehold Forestry and Forage Development Project carried out an impact study. In their evaluations, Ohler (2000) and Tamrakar and Kafley (2004) reported that the program has increased food security by 16%. Further, income and diversification of income sources are on a clear upward trend. Goats generate cash income for 53% of the households, while buffalo provide income for 20% of households. In older LF groups, earnings increase to 88% from goats, 41% from buffalo, and 16% from the sale of fodder from restored lands. The distance that women cover to fetch fodder leaves has been reduced to 2.5 hours per day, and disparities between male- and female-headed households have decreased. A remarkable shift in the sharing of decision making has been seen. Before the leasehold forests were formed, only 10% of the women could decide for themselves, compared to 25% now. However, this was not the case at the site for this study, as shown in the case study in Kavre (p. 64).

An average of 0.62 ha was handed over to the household, below the projected area of 1 ha of degraded land (FAO, Office of Evaluation, 2003). In the decade after LF began in 1993, the biggest achievement has been the formation of social capital. More than 2,213 groups have been formed and become involved in

income-generating activities. These groups have collected more than NRs3.8 million, which is dispersed as loans to members (ibid). Most group members now have savings in banks. Loans from the group's internal savings are used for household requirements. Further, the LF system has established a virtual moratorium on grazing in degraded lands, despite some conflicts over customary use rights. The LF committee also has provided lease certificates to women, who now feel empowered.

The LF program seems to have succeeded through its integrated and multidisciplinary approach toward restoring degraded areas. Poor lands are turning into productive lands, and stall-fed goats, buffaloes, medicinal plants, pineapple farming, and trees are providing benefits to poor men and women.

Women in community and leasehold forestry management

Persistent gender bias and the biological limitations resulting from childbearing and child care, however, have resulted in women having fewer opportunities than men in terms of asset ownership, employment, and education. Women perform most of the household activities, including collecting fuelwood, fodder, and leaf litter from forests and trees. Women also perform agricultural work on private lands. The handover of sections of national forests to local communities for management and sustainable use raised the role of women in forest management. This has been documented in the Master Plan for the Forestry Sector, which recommended that at least one third of the CFUG members be women. Women's empowerment has been raised continually in CF and LF debates.

The database of the Community Forestry Division of the Government shows 13,644 CFUGs, of which 690 are composed of women only. The latest survey indicates that about 25% of CFUG committee members in Nepal are women, and about 34,000 women are CFUG executive members. Their numbers are increasing as the CFUGs form new committees, so that at least half the CFUG executive members are women. CF guidelines were revised in 2000 to allow a male and a female member of each household to become members of a CFUG. Before the revision, only a male household member could be a CFUG member. This revision will promote women empowerment in CF.

To date, 2,213 LFUGs have been formed. Each group is composed of 5–10 poor households. Some

16,220 households have become members of these groups, receiving 9,798 ha of national forest lands. Because of their small size, LFUGs do not have an executive committee. However, women's decision-making capacity has improved substantially, according to reports comparing the decision-making characteristics of households before and after LFUG formation. Before the groups were formed, only 10% of the women could decide for themselves, while 30% made joint decisions and 60% depended on the decisions of a male household member. Five years later, 25% of women could decide for themselves, while 55% made joint decisions and 20% depended on a male household member. Less time spent collecting fuelwood has enabled women to get involved in additional productive activities, such as educating themselves and generating income. Lease certificates also are provided to women. If a male member is inactive, the lease certificate is transferred to his wife. In addition to enhancing asset ownership, including livestock ownership, this has increased confidence and inculcated a habit of saving. Asset ownership also has increased women's social security.

Forest degradation and land-use changes in community and leasehold forestry

An estimated 39% of land is categorized as forest and shrub land (Forestry Research and Survey Department, 1996). In the early 1960s and 1970s, several theories on degradation and deforestation emerged. Various authors (Eckholm, 1975 and 1976; World Bank, 1978) described it as the "Himalayan degradation" Theory. The World Bank predicted mass degradation of forests in Nepal by the turn of the century, which focused the world community's attention on the need to arrest environmental degradation in the Himalayas (Gilmour and Fisher, 1991). However, Ives and Messerli (1989) questioned these hypotheses after a comprehensive analysis of the Himalayan degradation theory. Earlier works had clearly undermined the vision and ingenuity of local people and community institutions in developing new ways of managing forests to mitigate the perceived scarcity. Since the early 1980s, research into the causes of mountain and hill degradation, and their relationship to poverty, has been undertaken (Gilmour and Fisher, 1991). New systems of resource management were developed and legitimized through policy and legislative reforms (Adhikari, 2003). These reforms required considerable efforts in understanding how

local people managed their forest resources. Several institutions, including the Forest Department of the Government, development partners, and researchers, were involved in designing these policy reforms (Messerschmidt and Rai, 1992).

The shift in land use from forest to arable agriculture in the hills and mountains was not a viable proposition. However, the fertile plains of the Terai had potential for this land-use conversion. Permanent habitation became possible in the Terai only after a malaria eradication program was carried out from the mid-1960s to the 1970s, and modern health and business services had gradually evolved. The Terai attracted waves of people—those migrating from the hills and mountains, repatriated from Myanmar, and displaced from the plains of northern India, as well as refugees from Bhutan. This resulted in large-scale deforestation and infrastructure development. Other incentives for migration to the Terai included the Government's policy of resettling people in the area, as well as opportunities for the illicit harvesting of forest resources, especially valuable hardwood. Thus, migration was a major cause of deforestation in the Terai.

Although downward migration is continuing, it is not clear whether forest degradation is a major problem in the hills and mountains of Nepal. Nevertheless, the myth of degradation continues. The existing scenario is explored below.

A nationwide study on land-use systems carried out by the Land Resource-Mapping Project (LRMP) found no significant change in forest cover in the hills and mountains between 1964 and 1978 (Government of Nepal, 1985). In fact, the project reported a slight increase in forest areas in the hills and mountains. In some cases, however, tree density declined (Nield, 1985), and tree crown cover dropped by 2.1% per year. Increased demand for fuelwood and timber to make agricultural implements and construct buildings in the satellite town centers, as well as infrastructure development, reduced crown density in the remaining forests.

Land-use changes long have been associated with the changing socioeconomic dynamics of growing human populations. Brown (1997) reported a 7% increase in forest cover in a mid-hill village. Similarly, Oli (2002a) observed a 9% increase in forest cover in the eastern mountains over 15 years. Fox (1993) found a considerable increase in forest cover in the Daraundi watershed in Gorkha District in the western hills. Due to increased awareness and the economic incen-

tives of forest management in CF and LF, deforestation reportedly declined in the Upper Pokhara Valley (Oli, 2002b). In Dhankuta District in the eastern hills, despite a 19% increase in the human population, land use was found to be stable between 1978 and 1990 (Virgo and Subba, 1994). A significant increase in mature forest in the Rupa watershed in the Pokhara Valley also was reported (Oli, 2002b). Branney and Yadav (1998) assessed the change in forest conditions, as well as the management of community forests, from 1994 to 1997 in four eastern hill districts. They found an overall improvement in the condition of community forests. Similarly, Jackson et al. (1998) studied land-use changes in two central hill districts, and compared forest conditions between 1978 and 1992. This study reported positive effects of CF on forest cover at lower altitudes. In another study of land-use change, Gautam et al. (2003) reported that connectivity between different patches of community forests was emerging due to forest regeneration. A livelihood forestry project carried out a baseline study among CF users in four eastern and three western hill districts. In the west, 93% of CF users felt that forest conditions were improving, while 72% of those in the east reported improvement (Livelihood and Forestry Program, 2003). Karna et al. (2004) analyzed data from seven forests in five locations to assess forest degradation and the conditions of community forests. Forest areas under community management had higher levels of protection, while forests under government control showed higher levels of harvest and lower levels of protection. This demonstrated that the density of forests under community custodianship has improved greatly, while pressure on national forests continues as a result of free access. This situation suggests that the management of national forests should be handed over to communities.

The majority of CF studies are limited to the hills and mountains. Rana (2004) analyzed remote sensing data to examine the forest conditions of the Terai Saptari District, and concluded that the condition of community forests was improving. Ohler (2000) reported changes in vegetative composition and high tree density in LF areas in the central hill districts. These works show that the implementation and practice of CF and LF has increased forest density and greenery, contributing directly to halting hill and mountain degradation. While data on land-use dynamics are available for specific sites in the country, data for the full range of CF and LF programs across the country has not been gathered since the publication

of LRMP results in 1985. Therefore, available data is insufficient to substantiate fully the claim that mountain and hill degradation is being reversed.

The Forest Resource Survey in 1964 estimated forest cover in Nepal at 47.7% (Sharma and Amatya, 1978). The National Planning Commission estimate was 37.7% in 1985. Between 1964 and 1979, 400,000 ha of forestland were converted to agricultural land in the Siwalik and Terai areas (Vinod, 1999). Furthermore, between 1978 and 1985 alone, 160,000 ha of forestland were converted to agricultural land. By 1992, an estimated 4 million ha of forest remained in the country. Today, an estimated 4.2 million ha (29% of the country) is covered by forest, and about 1.5 million ha of land (11%) is covered by shrubs and potentially could be restored to forest (Ministry of Population and Environment, 2003). Table 14 compares forestland changes since the publication of the LRMP report with the Forestry Research Survey data.

Overall forest cover in the country has increased by almost 4% (Table 13). In terms of physiographic regions, forest cover increased the most in high Himalayan (27.1%), middle hills (14.6%), and high mountains (7.7%). At the same time, forest area declined in the Siwalik and Terai regions due to illegal logging and the conversion of forestland for agriculture and infrastructure development.

Impact of community and leasehold forestry on biodiversity conservation

Conserving biodiversity, managing watersheds, and producing forest products for the local community are crucial for the sustainable development of CF

and LF in Nepal. Concerns have been expressed that earlier land degradation has altered biodiversity composition and communities, lowered forest and range conditions, destroyed riparian areas, reduced wildlife and wildlife habitat, and caused soil erosion. Loss of biodiversity is an inevitable result of these changes. Have CF and LF reversed these processes? Is biodiversity increasing in these restored areas? Has CF led to enhanced biodiversity? How is the altered ecosystem functioning?

Unfortunately, long-term research to evaluate the effects of CF and LF in the mid-hills (Oli, 2004a), mountains, Siwalik, and Terai is limited. Thus, answers to these questions are not readily available. However, research conducted by the International Forestry Resource Institute in two districts of the mid-hills from 1994 to 2000 (International Fund for Agriculture Development [IFARD], 2003) showed that the diversity of plant species in the LF increased by 57%—from 37 species in 1994 to 68 species in 2000. At another site, species diversity increased by 86%—from 70 species in 1995 to 130 in 2000. A substantial increase in tree saplings and tree species was recorded in the study sites. The regeneration of sal (*Shorea robusta*), sissoo (*Dalbergia sissoo*), and other native trees had caused the reduction of unpalatable understory. Oli (2004a) reported a 65–85% rise in plant species diversity over 10 years within the community forests of the eastern hills. The number of Avifauna, insects, reptiles, rodents, jackals, pangolins, and monkeys rose significantly. The increase in crown density and forest cover helped restore soil moisture in adjacent land, allowing farmers to interplant nutritious grass species along the edges. The authors of an LF case study in

Table 14: Forestland Change Dynamics in Nepal, 1985–1996

Geographic area	Total land area ('000 ha)	Forest and shrub lands 1985 ('000 ha)	% of total land	Forest and shrub lands 1996 ('000 ha)	Difference between periods ('000 ha)	Difference between periods (%)
High Himalayan	3,507.8	155.2	4.4	197.3	42.1	27.1
High Mountains	2,925.2	1,631.5	55.8	1,757.0	125.5	7.7
Middle hills	4,278.0	1,794.1	41.9	2,056.8	262.7	14.6
Siwaliks	1,889.9	1,444.7	76.4	1,329.6	(115.1)	(8.0)
Terai	2,117.2	591.3	27.9	487.3	(104.0)	(17.6)
Total	14,718.1	5,616.8	38.2	5,828.0	211.2	3.8

ha = hectare; % = percent.

Sources: Government of Nepal, 1985; Forestry Research and Survey Department, 1996.

Kavre (p. 64) observed similar trends. Sharma and Chettri (2003) reported that forest management is an instrument for biodiversity conservation, although sustainable harvest and equitable distribution are major challenges.

In the eastern hills, cardamom plantations initiated under alder forest canopy within CF and LF areas have stabilized the poor and unstable areas below 2,000 m, where landslides were common in the past. The perennial evergreen nature of the plant has restored the ecological stability of these areas. The crop is grown under alders, and both species bind the soil and protect the land from erosion. This ecologically stable farming system has improved many farm economies greatly, and farmers now have reasonable standards of living (Sharma and Chettri, 2003). Even a farmer producing 80 kg of cardamom reports earning more than NRs30,000, a considerable sum in these areas. Moreover, this system does not require much institutional support from government organizations and NGOs. At lower elevations in the area, land allocated for crop production also is being converted gradually to cardamom and alder plantations. The CF and LF areas in the larger landscape are a mosaic of contiguous, forested areas for migratory wildlife and are increasing the connectivity between protected areas (Oli, 2004b).

Stakeholders involved in community and leasehold forestry

Many stakeholders—local communities, local-level authorities, the Government, multilateral agencies, bilateral agencies, donors, and NGOs—have been involved in developing LF and CF. Previously, local officials governed highly formalized institutions called Jimwals or Talukdar. This system linked communal usage to ownership of land in the rural areas. Office holders administered CPRs, including the community-managed forest areas. Therefore, the concept of CF or common resource management already existed, and some say that the modern CF concept is merely “old wine in a new bottle” (Gilmour and Fisher, 1991). The evolution of development planning in the forestry sector started in the 1970s with the transition from the top-down approach to a more development-from-below approach to meet basic community needs.

The CF and LF programs were designed to increase the involvement of local people in the management of forests. Over time, communities

were empowered through exposure and training, and entrusted with usufruct rights. The role of the Forest Department gradually changed from policing to facilitating. Before the initiation of the CF and LF programs, the Government was responsible for managing the forests, while local people used them. The formulation of the 1993 Forest Act and the 1995 Forest Regulations resolved this asymmetry between management roles and responsibilities and forest usage. These laws and regulations clearly specify the roles, responsibilities, risks, and rewards of the Government (forest service officials), CFUGs, and LFUGs. Government officials became facilitators and extension agents, and the Government took on the role of monitoring forest use to protect them from being overharvested or converted to other land uses. The groups, meanwhile, took over responsibility for management and sustainable utilization.

The Federation of Community Forest Users of Nepal (FECOFUN) was formed 11 years ago to lobby for the promotion of CF in Nepal. FECOFUN has district and zonal units working for the benefit of CFUGs and community forests. About 70% of the CFUGs are members of this federation. FECOFUN participates in national CF debates and runs programs to empower CFUGs. Similarly, other federations, such as the Nepal Forest Users Group and the Himalayan Grassroot Women’s Natural Resources Management Association, were formed to cater to the various needs of CFUGs in Nepal. Support for the formation of the federations and networks came from bilateral funding agencies, such as the International Center for Integrated Mountain Development, the Ford Foundation, and the Swiss Agency for Development and Cooperation (SDC), in collaboration with the Government of Nepal. Some support was also provided for program implementation.

Several NGOs also are working on CF and LF. Their involvement and assistance has focused largely on social mobilization, improved governance, and income-generation activities. The Tenth Five-Year Plan (2003–2007) also includes a provision for involving NGOs and civil society in the promotion of CF and LF in Nepal. At the Fourth National Level Community Forestry Workshop, more than half of the 350 or more participants were from NGOs, civil society, and federations and individuals working for the promotion of CFUGs in Nepal.

During the initial phase of CF development, the Government of Australia provided technical and financial support for pilot CF models in two districts

adjoining the Kathmandu Valley. Subsequently, the World Bank provided loan assistance for the implementation of a CF program in the mid-hills. The success of these early programs fostered interest from other funding agencies. The Danish International Development Assistance is supporting CF programs in 38 hill districts, while the United Kingdom's Department for International Development is providing financial and technical assistance in 12 hill and mountain districts and three Terai districts. Similarly, the Government of the Netherlands (through SNV Netherlands Development Organisation) is supporting CF in eight Terai districts. The Government of Germany (through the German Agency for Technical Cooperation) is providing support in three Terai and inner Terai districts. The United States Agency for International Development is supporting CF programs in one hill and three Terai districts. SDC is supporting CF programs in three mountain and hill districts. The Government of Australia, which has been supporting CF programs since its inception, is still doing so in two mountain and hill districts. International NGOs, such as the World Wide Fund for Nature (WWF), IUCN, and the Cooperative for Assistance and Relief Everywhere, also are promoting CF, LF, conservation area, and protected area management in the country.

The work of these agencies has helped build local institutions and enhance the capacity of forest officials and users in the management and sustainable use of forest resources. In addition, members of expatriate staff working on CF projects have taken their experience of CF, LF, and buffer zone management from Nepal to other parts of the world, especially in matters of community involvement in conservation and forest management. Today, CF and LF are so well established in Nepal that they are self-sustaining without the support of these agencies, provided the Government remains responsive and accountable to user groups, and collaborative links with various agencies are maintained.

Second- and third-generation challenges and opportunities for community and leasehold forestry

The first phase of CF and LF focused on expanding forests in degraded and deforested areas with the active participation of local people. The majority of stakeholders agree that the first-generation objective of expanding greenery has been met reasonably. The social objective of promoting grassroots-level gover-

nance and livelihood promotion was somewhat ignored in the first CF phase. Therefore, second-generation issues now demand attention, especially amid reports that local elites are capturing most of the benefits from CF and monopolizing key CFUG executive positions.

The theme of the Fourth National Level Community Forestry Workshop was "Twenty-Five Years of Community Forestry: Contribution to Millennium Development Goals." The workshop identified good governance, livelihoods, and sustainable forest management as the three key second-generation issues that need to be resolved in the coming years. It also suggested that implementation of strategic reforms on these three issues could contribute directly to the attainment of the Millennium Development Goals (MDGs).

External funding agencies provide about 60% of the national CF programs' development budgets. The way the Government and funding agencies participate and form partnerships going forward will have implications for the performance and future of CF programs in Nepal. Iterative interactions of the three key second-generation CF reform issues will impact directly their contribution to the MDGs. However, challenges lie ahead in all three areas.

- **Governance.** The formulation and enforcement of rules to coordinate the activities of individuals within the CFUGs, as well as a facilitative role for the Government, are essential elements of effective and adaptive forest governance. The heterogeneity of individuals in terms of interests, asset ownership, and access to power make collective action challenging. Nepal's bureaucracy has changed over the last 5 decades, and especially since 1990. Previously, the main focus was on channeling goods and services from tenant farmers to the Government and, to a lesser extent, to the people. Now the flow is in the opposite direction. However, a change in attitudes and approaches has not accompanied the changed context. Moreover, Nepal is a multicultural society in which each caste and ethnic group has a strong tendency to favor its own. This means that minority members and women user group members might have less voice than their male counterparts. The extremely poor, unlike the less poor, might not be receiving any benefits at all. Dealing with such heterogeneous groups is a challenge. Political patronage and favoritism in decision making are other threats to the equitable sharing of benefits.

- **Livelihoods.** The purpose of development is to increase human freedom by expanding human capabilities for full and creative lives (United Nations Development Programme, 2004). This demands that people be the beneficiaries of development, as well as the agents of change that drive development. Equitable participation in decision making and in benefit sharing is the key to human development in community forests. Rapid assessment data taken from 12 districts, which were compiled and analyzed by the Community Forestry Division, show that substantial income can be generated from community forests. The challenge is to streamline those resources and the CFUG institutions to achieve livelihood improvements for the poor, the marginalized, and women. Again, the involvement of all the stakeholders in the process is essential to address this issue.
- **Sustainable forest management.** Community and leasehold forest conditions have improved by devolving authority to local CFUGs. The availability of macro-level data on changes in forest conditions can assist policy reform. CF programs and projects funded by external sources of assistance should generate policy-relevant information to fill the gap. Community forest users and foresters working in the field suggest that CF be managed passively.

To address the second-generation CF and LF issues, the Government is planning to create subgroups of poor households within CFUGs. The subgroups will be given part of the community forestland with the consensus of CFUG members. The groups will plant and promote high-value NTFPs, such as medicinal and aromatic plants, in these lands. The Government will provide the subgroups with initial technical and financial backstopping. The produce from the land will be sold in the market or processed locally. The subgroups' entrepreneurship and negotiation skills will be enhanced with support from the Government, bilateral projects, civil society, and CFUGs themselves. Assistance for marketing the products will also be sought. CFUG governance reforms will help the inclusion of the poor and women in the CFUG executive committee membership. Similarly, fund utilization guidelines will be formulated, in collaboration with CFUG, to ensure that at least 25% of the CFUGs' income is spent on pro-poor programs. However, although these constitute

a few strategies for reducing poverty and promoting greater equity, major implementation challenges lie ahead. Until the bargaining and negotiating capacity of the poor vis-à-vis the local elite is enhanced, CF and LF will continue to have limited scope in poverty reduction.

Forest and biodiversity conservation in times of conflict

Nepal has been facing a Maoist insurgency for the last 9 years. As of early 2005, the conflict had claimed more than 11,000 lives. Like other sectors, forest and biodiversity conservation in Nepal are threatened by the conflict. Although pro-people policies have helped forest and biodiversity conservation in many ways, violent conflicts threaten CF, LF, and protected areas (McNeely, 2004). This section examines the effect of the Maoist insurgency on the conservation of Nepal's forest and biodiversity resources.

HOW DO COMMUNITIES MANAGE FORESTRY RESOURCES IN TIMES OF CONFLICT?

The breakdown of law and order in the country as a result of the armed conflict has weakened the chances of lasting peace and diminished hope for sustainable development in Nepal. At the core of the local sustainable development efforts are community-based institutions—traditional institutions that functioned locally, mobilizing local resources and working toward community development. The spirit of voluntarism and philanthropy is nurtured carefully in these institutions. Many of them are still working to meet their goals of serving the community, albeit on a much subdued scale. Many others have stopped functioning.

Among the local institutions that have survived despite the conflict are the CF, LF, and buffer zone user groups. A sense of self-help, combined with the values of conservation and economic gain, has motivated their efforts. However, the prolonged conflict has challenged many of these values. Threats from the rebels and the evolution of a donor-driven NGO culture have influenced the core values that defined such local-level civil society and people's engagement. Despite these challenges, some local-level institutions have survived to provide a neutral cushion against the insurgents and the government army. Because of their resilience and continued presence at the local level during the conflict, urban-based civil society, NGOs, and others also have started to align themselves with, and work through, these institutions. In many places, these grassroots user-group

institutions are the only link between the people, the Government, nongovernment institutions, and the Maoists in forest and conservation area management. However, most of the funds accumulated by the user groups (including poor members' loans) have been diverted from their savings to community development work out of fear that rebels will ask the CFUGs and LFUGs for "donations," or that their funds will be looted.

With the conflict, employment and funding in the development sector reportedly have declined. Thus, many poverty reduction programs have become victims of the Maoist insurgency (Oli, 2004c). This has forced many NGOs to seek ways to continue working at the local level, including becoming more transparent regarding their financial commitments and expenditures, and developing alliances with CFUGs and LFUGs. Once this innovative NGO approach was understood, some government ministries also began to make their funds transparent in public places.

Today, local CFUGs, LFUGs, and buffer zone community user groups in and around protected areas are the main program implementation vehicles for natural resources management in Nepal. Maoists have forced NGOs to register with the Maoist "government" (*Jana satta*), an exercise that allows the rebels to track fund flows and charge taxes. Although many CFUGs and LFUGs expressed their reluctance to register with the Maoist regime, quite a few reportedly have made secret arrangements and secured permits from the rebels to continue working in the rural areas. The CFUGs' strategy is to keep the arrangements from becoming public. In addition, political factors have helped them to continue functioning. These factors include the use of user groups and their federations of CFUGs, LFUGs, and leasehold cooperatives, as well as their alliances for political motivation and bargaining. Also, the groups are organized into specialized organizations, and power-sharing arrangements are becoming more democratic and decentralized. With 36% of the CFUGs' income invested in community development, including school support, road construction, irrigation, and primary health care, the social justice system also is improving. Further, about 3% of CF income is spent on pro-poor programs, which reportedly are increasing (Kandel and Niraula, 2004).

CFUGs have emerged as impartial vehicles for conservation and development by adopting a neutral position vis-à-vis different parties, creating awareness regarding the management of resources, and establishing strong cooperation between different ele-

ments of society. Furthermore, CFUGs and LFUGs have continued working successfully during the conflict by taking action against corrupt CFUG and LFUG members, seeking diverse financial support, and maintaining good working relations with different opposing parties. However, the frequent abduction of rural people by the insurgents and the outflow of able-bodied men from their villages have made effective CF and LF management difficult. The army's occupation of CF areas to set up camps, barracks, or firing ranges, which increasingly has threatened the people's access to CF resources and livelihoods, has compounded the difficulties (*Kathmandu Post*, 2005).

FOREST CONSERVATION DURING THE CONFLICT

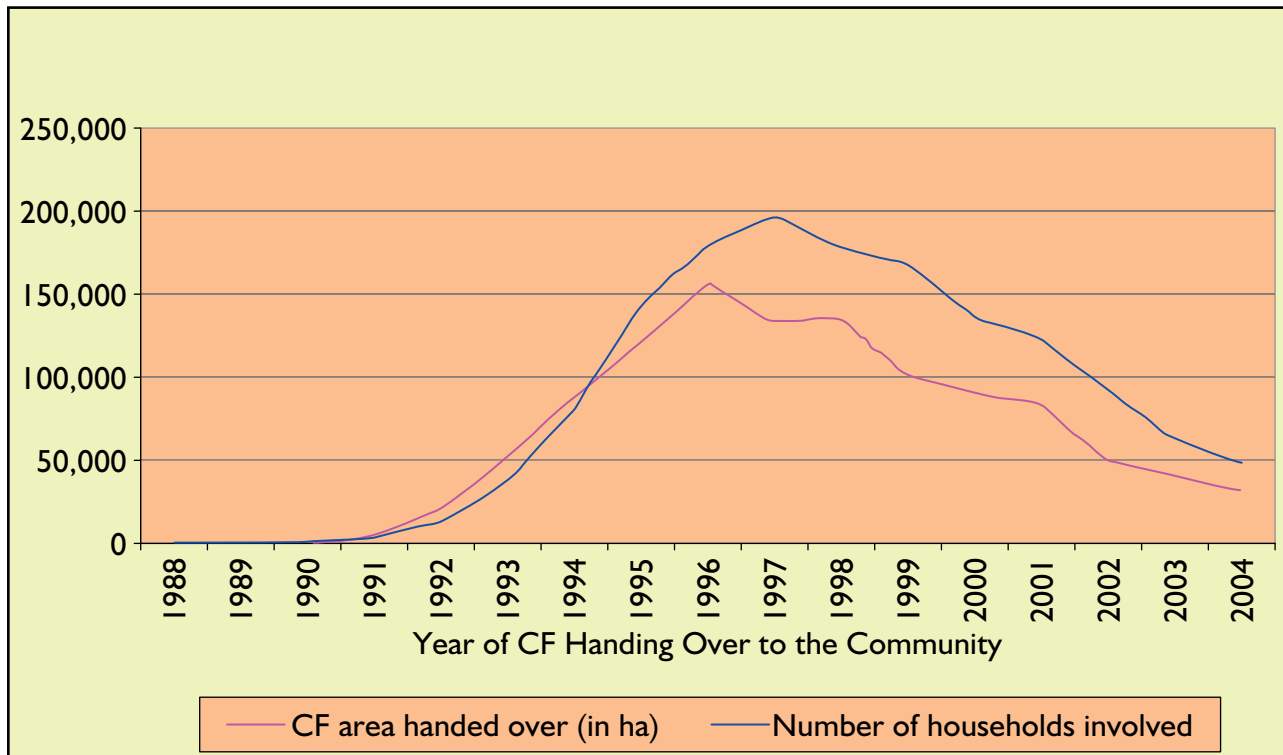
The Maoist insurgency has severely undermined the functioning of CF and LF by restricting the mobility of government officials in the field, and by destroying forestry sector infrastructure. The Forest Department has lost offices and range posts following rebel attacks (Figure 6). Community members and forest guards are afraid to enter forests because of the risk of attacks from security personnel and from the Maoists. In the absence of forest offices and forest guards, timber smuggling also has increased (*Kathmandu Post*, 2002).

Significant damage to government property also has affected the functioning of CF and LF, as well as the handover of CF and LF areas to communities (Figure 6). Under the law, government sanctions are required for the registration and monitoring of CF and LF. The preparation of operational forest plans requires a detailed assessment of the area to be handed over to the community, as well as technical inputs. Forest officials and community members do not want to risk their lives by entering insurgency-hit areas. Since 1996, the handover of CF and LF areas has slowed considerably, which coincides with the intensification of the conflict.

The intensity of the Maoist insurgency differs in each district (Map 3). Furthermore, not all impacts are negative, nor can all impacts be attributed to Maoists. The majority of negative impacts can be attributed to criminals seeking opportunities, while others originate out of need or from the lack of security. Most positive environmental impacts can be attributed to strong community groups, or the fear of violent consequences.

Timber poaching, which is not uniform throughout the country, is especially prevalent in accessible areas. Timber extraction in some CF areas in the Siwalik and Terai continues unabated in the absence

Figure 6: Community Forestry Handover Situation Before and During Conflict



CF = community forestry; ha = hectare.

Source: Department of Forests, Community Forestry Division, 2004.

of any security measures. In these areas, solidarity and social dynamics among community members—and with adjoining communities—are still prevalent. Furthermore, as Siwalik and Terai forests were used commercially for revenue generation and resettlement, indigenous institutions were not involved in their management. Third, India is a great market opportunity for timber and NTFPs. Thus, the management of Terai forests is a major challenge for communities and the Government, even during normal times. Areas that are patrolled by government security forces rarely fare much better because poachers know the whereabouts of the patrols. Furthermore, security forces usually will not venture far from their barracks, and they head back to their bases well before dark.

Maoist-controlled areas depend on local cadre leadership. In some areas, Maoists protect forests and hunt down poachers, depending on their needs and opportunities for the sale of forest products. For example, a group of Maoists evicted some 200 squatters by destroying their illegal dwellings in the Koshi Tappu Wildlife Reserve. Eyewitnesses reported that the Maoists beat the squatters and ruined their rice

fields by letting their cattle graze on them. The area is generally a safe haven for timber smugglers, although they often clash with Maoists (*Himalayan Times*, 2004). In other areas, rebels have taken over community forests and are using the profits from timber sales to finance their activities (*Kathmandu Post*, 2003c; *Himalayan Times*, 2003; *Nepali Times*, 2004).

The Maoist insurgency's greatest impact on the lives of forest-dependent communities is double taxation, i.e., being forced to pay taxes to the Government as well as to the insurgents. The impacts on NTFPs are not well-known because of the security situation. However, NTFP dealers have reported that insurgents have fixed the rate for the export of medicinal plants and cardamom normally at 10% of the market price.

High-value products are taxed differently. For example, yarsa gumba (*Cordyceps sinensis*)—an expensive medicinal herb that grows wild in the western highlands and is believed to be an aphrodisiac that cures impotency and increases vigor—is highly sought after on the international market. Its price in the local market is said to be NRs70,000–100,000 (\$900–1,300) per kg. However, it can fetch as much

as NRs200,000 (\$2,500) per kg in the international market (*Kathmandu Post*, 2003a; *Kantipur Online*, 2004). Maoists reportedly are benefiting from the large-scale smuggling of yarsa gumba out of Nepal to India and the PRC. Merchants transporting the medicinal herb pay the tax to the controlling force in a particular region, whether Maoist or the Government (*Kathmandu Post*, 2003a).

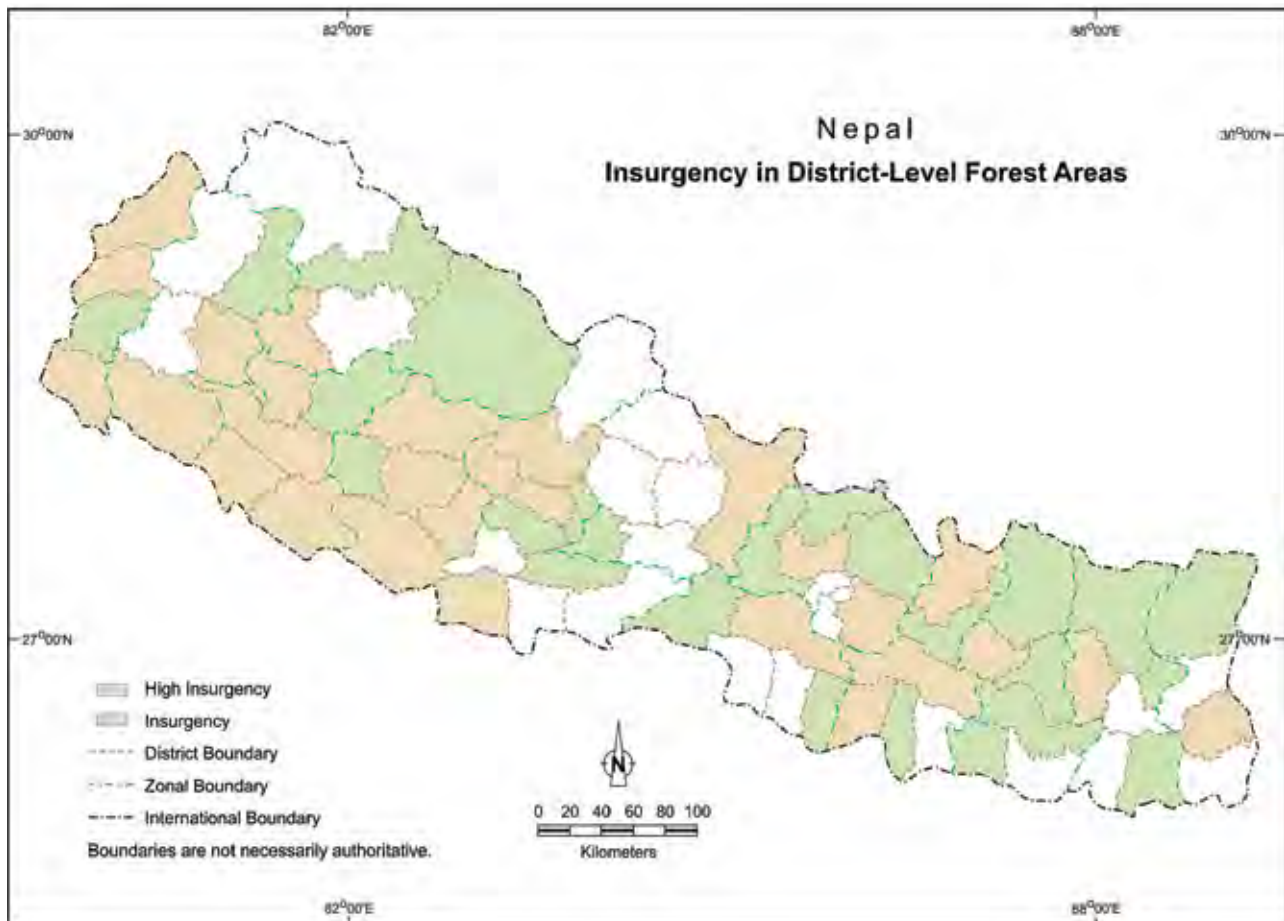
In some areas of Nepal, positive environmental impacts of the Maoist insurgency have been observed. The most visible impact has been the regeneration of forests and NTFPs in some mid-hill regions. Two such districts east of Kathmandu—Kavre and Sindhupalchok—have seen dramatic growth in forest cover over the past several years. Forest regeneration has been so successful that locals also are noticing a return of wildlife species (*Nepali Times*, 2004). The primary reason for forest regeneration in some mid-hill regions in Nepal is the out-migration. More than 200,000 people were displaced as of 2003, according to one estimate (Uprety, 2004). Men in many villages

have left out of fear of being recruited into the Maoist forces; others have left their villages out of fear of being targeted as collaborators by security forces.

The poachers' fear of entering forests is another reason behind forest rejuvenation and the return of wildlife in some districts. Maoists and security forces have been known to severely injure or kill poachers. Poaching also has decreased in some districts because security forces and Maoists have confiscated firearms from local populations. An additional rationale is that the increased insecurity has decreased the mobility of some rural people.

The positive environmental impacts observed in some regions of the country, however, are usually to the detriment of other areas. The out-migration from some mid-hill districts, for example, has placed additional environmental burden on other areas of the country. Depopulation of the hills has increased the pressure on forests in the Terai in the south and along Nepal's northern border with Tibet (*Nepali Times*, 2004). The scale of the migration has not been documented fully.

Map 3



Source: Habitat Himalaya, 2002.

PROTECTED AREAS IN TIMES OF CONFLICT

Murphy et al. (2004) reviewed the impact of the Maoist insurgency on conservation. A general feeling of lawlessness prevails in many areas of the country, which has created a free-for-all mentality regarding natural resources in some regions. The current state of Nepal's protected areas leaves many species at risk from poaching or overexploitation. In some regions, the working mechanisms that oversee sustainable resource use are absent; in others, protective measures have broken down completely. This potentially could erase—or at least set back—many conservation successes in Nepal.

The only reliable data on the poaching of significant species is for the Asian one-horned rhinoceros population. This is undoubtedly the result of decades of successful, high-profile conservation efforts for this flagship species. While records exist for a few other species from smuggling seizures, the data are scant. Poaching of one-horned rhinos increased significantly after a state of emergency was declared in November 2001. The reduction of Royal Nepal Army (RNA) units within the protected areas, and the ensuing attacks by Maoists on park offices and security forces, left rhino populations vulnerable to poachers. Nepal was home to 612 one-horned rhinos, according to a 2000 census. The Royal Chitwan National Park (RCNP) recorded the bulk of this endangered species with 529 at the time of the census. Others were reported in the Royal Bardia National Park (RBNP) and the Royal Suklaphanta Wildlife Reserve. Six rhinos were poached in the RCNP in 1998, according to the Wildlife Department Annual Report (*Kathmandu Post*, 2003b). Between April 2002 and March 2003, 23 one-horned rhinos and 8 rhinos were killed by poachers in RCNP. From April 2003 to March 2004, poachers took 17 one-horned rhinos in RCNP and RBNP. The decrease in poaching is credited to the arrest of 50 rhino poachers, as well as the strengthening of anti-poaching units within the rhino parks (*Kathmandu Post*, 2004).

The Maoists began their assault on protected areas by strategically striking and destroying outlying protected area guard posts and park offices. As these targets were remote and sparsely staffed, they were extremely vulnerable. The Maoists continued attacking outlying posts, commonly burning most to the ground. This pushed the RNA and park staff into

government-controlled district centers. Many protected areas are now unguarded and vulnerable to unchecked resource extraction and biodiversity loss. Protected areas can be categorized in two ways: those with army soldiers and those without. Maoists are believed to use the protected areas that are free of soldiers as training grounds. Two protected areas where Maoists have total control are the Dhorpatan Hunting Reserve and the Makalu-Barun National Park.¹⁷ The Dhorpatan Hunting Reserve is in midwestern Nepal, where the Maoist movement originated. Makalu-Barun is in northeastern Nepal, adjacent to Sagarmatha (Mount Everest) National Park. One major concern is that Maoist control could spill into Sagarmatha, a World Heritage site and arguably Nepal's most famous national park. Before Maoist attacks on protected area infrastructure, Nepal's parks had 112 guard posts positioned throughout the system. This number had decreased to 34 by 2002, a 70% reduction (Yonzon, 2004).

Officials are concerned about projects in the Annapurna Conservation Area after Maoist rebels waged numerous recent attacks on various offices. The King Mahendra Trust for Nature Conservation launched the Annapurna Conservation Area Project in 1986, the first and largest conservation area in Nepal. The project was initiated as an innovative approach to protected area management through the use of community user groups. In November 2002, Maoists attacked the main office, setting it ablaze (*Himalayan Times*, 2002). Demands for "donations" from park workers are reported to be frequent.¹⁸

Earlier, Maoist insurgents threatened the local community engaged in conservation. Since then, as part of a local-level conflict management strategy, more than 1,000 community members from these remote areas agreed to pursue conservation work for the benefit of the people. In doing so, they asked the insurgents not to hinder their activities and prevent the meager funds from flowing into their poor areas. All the same, it has become extremely difficult for the community to engage in conservation (*Kantipur Daily*, 2005).

Clearly, the Maoist insurgency's impact is not limited to the continuing forestry management programs; it also has impacted biodiversity conservation and development in general. The local-level elected

¹⁷ Personal interview with a World Commission on Protected Areas (WCPA) official, August 2004, whose identity is protected for security reason.

¹⁸ Personal interview with a WCPA official, August 2004, whose identity is protected for security reason. A "donation" is the term used to describe extortion by the Maoists. Though not widely admitted, this form of extortion is prevalent in Nepal.

Map 4



Source: Department of National Parks and Wildlife Conservation-Park People Program, 1999.

bodies have been dissolved, leaving behind crises over the ownership of projects and plans. The local-level user groups face blame from the Government if they collaborate with the insurgents on conservation or development. On the other hand, user groups working in collaboration with the Government face punishment from the insurgents.

To ease this situation, neutral institutions are important. IUCN and WWF have worked in the conservation sector for more than a decade. However, their approach toward conflict management, especially in conservation, seems to be to keep away from the warring factions rather than to help develop codes of conduct for biodiversity conservation during times of violent conflict. Instead of facing the challenges of mediation for biodiversity conservation, their strategies have been to support local-level NGOs or user groups as a conduit for their project implementation, and to continue monitoring them from the center. Yet IUCN and WWF, because of their international position, could raise awareness among all the parties

and develop strategies to boost the morale of park and conservation authorities during conflict. They also could forge alliances with conservation groups, federations, and journalists, thereby putting pressure on warring factions. In the absence of any support from mainstream conservation organizations, the fate of biodiversity conservation in times of conflict is in the hands of powerless community user groups.

Lessons for the future

Based on experiences gained through Nepal's CF and LF programs, some lessons on how to use improved forest management to contribute to poverty reduction in rural areas include

- The old theory of Himalayan degradation linked only population and resources. The review found that institutions mediate between population and resources. Therefore, institution building at the local level is essential—and more important than planting trees on degraded lands. Further,

though the population of the mid-hills has risen, the quality and area of forests have increased with reforms in the institutional setup governing the use of these resources.

- One of the roles of the Government is to enhance the capacity of decentralized, autonomous, and incentive-compatible institutions and organizations. This is a prerequisite for assigning resource management authority to them. The other roles of the Government are to facilitate collaborative partnerships with these institutions and organizations, and to continue to invest in infrastructure and services. The Government also must develop policies that favor CF and LF, ensuring that markets for the produce function better, and the risk and effects of market failures are minimized.
- Even if a decentralized system of forest management is set up and activated, the local elite might capture these decentralized units through proxy participation, low accountability, and lack of transparency and equity. To prevent this, disadvantaged groups need to be brought into all levels of the decision-making process. Consequently, the reform of local-level governance is also fundamental.
- The concept of user groups is related to more than forest resource management. User groups are also the platform and vehicle for undertaking different development activities defined and articulated by the local people. Their capacity, therefore, needs to be enhanced continually.
- National ownership of the aid process is increasing. NGOs and civil society groups that work directly through these local-level organizations and institutions can improve the life of the people and reduce the conflict.
- Because of their resilience, local-level institutions can act as a neutral forum for conservation, development, and peace building, and continue working in times of conflict.
- Transferring resource-use rights to women and the poor instills confidence in them and enhances their livelihood opportunities and security.
- Technical intervention to increase the productivity of the forest should be prioritized in areas where the institutions at the user-group level are robust. The first priority should be to strengthen the institution, followed by technical intervention. Only then can forests generate more livelihood opportunities for the poor, women, and disadvantaged groups. This also will help them

manage resources in a more sustainable and scientific way.

- Continuous monitoring should be carried out in a locally understandable manner to allow CFUGs and LFUGs to capitalize on their success and rectify their mistakes. Geographical information system techniques need to be used more extensively to support monitoring, evaluation, and planning.
- Compromise between needs-based and rights-based approaches to forest management is essential. Transferring ownership rights to needy people also will help users understand their rights.
- Alliance building and the roles of federations, journalists, and the media have to be understood to enable forestry to become a vehicle that contributes to poverty reduction.

Case study of Bhasme Pakaha and Alche Chour Tallo Pokhari leasehold forestry groups in Kavre District

In Rabiopi Village Development Committee (VDC) of Kavre District, in the mid-hills of Nepal, the local forest did not have a single standing tree left for fuelwood or fodder due to exploitation. Before the implementation of the LF model, harvesting of forest products was punishable by law. Although people were denied legal access for any activity, they continued to exploit the forest products indiscriminately. These areas were suffering the tragedy of the commons.

In collaboration with the Forest Department and the local community, the poor groups living close to the two degraded sites were identified, and a decision was made to hand over the degraded areas on lease to the poor community. The project began with the formation of community user groups from among the poorest households. Ten hectares of degraded land (one with an area of 4 ha; the other, 6 ha) were leased for 40 years to the two poor groups, which consisted of six and seven households, respectively. The committees designed their own management plan in consultation with technicians from the Forest Department. The representation of women in the committee was low. The first committee had one woman, who is the chairperson; the other had two women. Once the lease agreement had been executed with the Forest Department, the committee divided the land equally between the user-group households, and each household demarcated its area to reduce potential conflict.

The first LF group was established in 1994; the other, a year later. The authors of this report visited the sites and conducted a subjective assessment in consultation with user group members. The first LF group is now 12 years old, while the second is 11 years old. When the first LF group applied control and protection measures, pine seedlings appeared naturally within the first year. In the second site, which is near sal trees (*Shorea robusta*), sal forest seedlings began to appear. The forest users then planted mangoes, bamboo, and pineapples, as well as some fodder species.

After nearly a decade, users seem to be self-sufficient in terms of fuelwood, forest litter, and animal fodder. During this period, government agencies, particularly the forest and livestock departments, worked closely with the groups to provide technical know-how and inputs, such as seedlings, goats, and buffaloes. Both groups reported that 5 years into the LF project, 50% of their fuelwood requirements came from the forest. Now they are self-sufficient in fuelwood. Forest density has improved from virtually no trees to 2,400–4,000 trees/ha of leasehold forest area. Each household harvests 250–300 kg of fuelwood per year from the forest.

With training on livelihood options, user groups also have planted fodder trees on their farmland. Today, each farm in the project area has about 35 fodder trees. This, along with other farm by-products, is sufficient to meet local fuelwood needs. The trees in the LF are not ready for use as timber, although poles required for farm operations are harvested. The regeneration of forests close to the settlement helped reduce the time women spend collecting fuelwood, fodder, and leaf litter reportedly from 8 to 5 hours, saving about 3 hours per day. The women are investing this saved time in vegetable cultivation and animal care, significantly increasing household income. The sale of milk, goats, and vegetables generated a reported net off-farm income of more than NRs35,000 per year. The other important contribution of LF, according to users, is from leaf litter. The soil organic matter on farms has increased as a result of the use of forest litter and farmyard manure. Earthworm activity, which is a good soil organic matter indicator, was visible everywhere on the farms.

LF groups invest 30% of their income in community development, mainly to pay for the services of a schoolteacher, minor irrigation, and some religious and cultural activities. Another 40% is invested

in capacity building of user group members, 10% is reinvested in forest plantation, and 35% goes toward protecting the forest. This relatively large investment in protection was in response to the fear of encroachment by outsiders, a major issue.

The biodiversity status of the LF sites also was assessed during the field visit. A quadrat of 5 m² was prepared, and measurements were taken from five sites in each leasehold forest. Vegetation species and the number of trees within each quadrat were counted and converted into per hectare averages. Based on these measurements, plant density was found to have increased 66%, while species richness had increased 49%. Users reported a 30% increase in avifauna, and a 40% rise in the occurrence of transitory wildlife, including leopards, jackals, and hares. They also reported a 40% increase in reptiles, such as lizards, snakes, and pangolins. Further, users reported a 10% increase in various NTFPs.

Entrusting the community—especially the most marginalized sections of the community—with the management of degraded public lands has increased their sense of responsibility and ownership over the resources. Through their own organization of user committees, the poor have become the custodians of the LF area. They have invested time, effort, and resources in the restoration and rehabilitation of the land. The groups have undertaken forestry and planted horticultural crops and fodder grass, which has helped conserve biodiversity and increase household incomes. This contractual change—leasing degraded areas to the poorest sections of the community, and enhancing their capacity through the deployment of local NGOs—has helped to arrest land degradation, increase forest crown density, and improve soil structure.

While this is a success story, second- and third-generation problems are emerging. For example, what will be the status of the LF area when the 40-year lease expires? Will the lease then extend to the descendants of the current users, who have made huge investments to restore the degraded land and conserve biodiversity? What benefits will user group members have if they migrate out of the area? Will they be allowed to sell their share? Since land resources are finite, what alternative arrangements for their use will evolve in the future? What new forest-related management modalities for product processing and marketing could be developed to help these groups? These are just some of the emerging issues that need further attention.

Case study on Community Forestry: The Kafley Community Forest of Lalitpur District

Kafley Community Forest in Lalitpur District is about 18 kilometers east of Kathmandu. It is one of the 10 community forests of Lamatar VDC. These forests cover about 550 ha and are managed by 782 households. These lands were handed over 14 years ago to a CFUG, known as the Mul Ban, which managed the resources as a single community forest. Later, the community forest and the CFUG were split into 10, one of which was Kafley. This was created in 1993 as a separate community forest with its own constitution. The 550-ha forest is the watershed at the foothills.

Kafley Community Forest covers 94 ha. Its operational plan was revised in 2002, and 68 households now manage the forest. CFUG members of this forest reported that only 2 households were very poor, 50 were of middle income, and the remaining 16 were better off. CFUG members have elected 11 executive committee members, of which five are females (two from poor households). A closed canopy of pine (*Castanopsis* spp./*Schima* spp.) covers about 70% of the CF area. The remaining 30% comprises shrubs, bamboo, and ferns. The users protect the forest from grazing, encroachment, fires, and hunting, while managing the gullies. They voluntarily patrol the forest on rotation. The executive committee regulates the harvesting of forest products by season, as well as harvesting equipment.

LIVELIHOOD STRATEGIES

The two poorer households do not have any private agricultural land and are engaged in daily labor. The daily wage rate is NRs175 for males and NRs95 for females. The 50 middle-income households produce enough food on their own farms for about 8 months. Each of the better-off households sells food worth about NRs10,000–12,000. About 80% of people from middle- and higher-income households also are engaged in salaried jobs, although the proportion of females is less than 10%. Two males have gone to work in Malaysia. About 5% of households sell milk, and about 7% of households also are engaged in small-scale businesses or shops. Some households have started to grow vegetables (tomatoes, green peas, cauliflower, etc.) to generate income.

IMPROVEMENT IN FOREST CONDITIONS

The Government started a pine plantation in 1980 to improve the condition of the forest. However,

people showed little interest in conserving the forest. When this and other forests were handed over to the Mul Ban users committee about 16 years ago, the overused and degraded area was covered mainly with ferns and shrubs. However, after 2 years of collective management, the 550-ha forest was divided—first into seven community forests, and then into 10. The handing over of the forest to the users (now 68 households) heralded a process of forest regulation and rule. The users crafted the rules and regulations by consensus, and sanctioned rule breakers. The design and enforcement of operational rules by the users themselves, in addition to the continuous support from the District Forest Office (DFO) and exposure visits and training of the users, inspired the users to improve the condition of the forest and use it in a more sustainable way. Before the forest was handed over, it was degraded; now it is a high and dense forest. Except for the rocky and bushy area that accounts for 30% of the community forest, the forest has many poles and trees. The density of plants and trees has increased substantially. The latest forest inventory shows 7,088 regenerated plants, 141 poles, and 31 trees per ha of forest area. The forest is divided into five management blocks. The forest has no invasive species. Avifauna has increased; deer, rabbits, leopards, snakes, and other animals are present in great numbers. Medicinal and aromatic plants, including cardamom, also are plentiful. Last year, the user groups also planted 20 culms of bamboo.

The impact of these improvements on forest conditions is visible. Moreover, the water flow in streams has increased substantially, even during the critical season. The users used to collect fuelwood from Phulchauki, about 15 kilometers from their residence. Now, the fuelwood from the community forest is sufficient for all the households, and CFUG sells the surplus to outsiders. Even the number of trees on vacant private land (near the gullies and streams) has increased. The relationship with forest officials has improved significantly: the users do not need to obtain a permit from them to harvest the forest products. They follow the operational plan, which they prepared and endorsed in collaboration with DFO. The underlying factors leading to the improvement of forest conditions reportedly were (i) the facilitative forest policy of the Government, (ii) increased awareness of the users, (iii) support from the forest officials, (iv) devolution of forest control to users, (v) regulation of forest harvesting by the users,

- (vi) forest guarding and patrolling by the users, and
- (vii) provision of training to the users.

DECISION MAKING AND BENEFIT ACCRUAL

The users hold a General Assembly at least once a year. The users elect an executive committee, which is accountable to the users. The forest products are distributed among the users based on fiscal equivalence or equality. However, one of the poorer households received free timber (0.57 cm³). The users have decided to provide NRs8,000 to the children of *Dalits* (lower caste) to enable them to attend school. Similarly, 2 *ropanis* (equivalent to 0.1 ha) of the forest have been allocated to one poorer household to plant cardamom; the household can take 80% of the produce, while the remaining 20% accrues to the CFUG fund. With regard to the benefits women receive from the forests, users reported that their time spent fetching water, fuelwood, and leaf litter has decreased substantially. Further, the drudgery of carrying heavy loads over long distances also has declined because of the easy availability of water and forest products from the community forest. Women also have become more assertive, which is reflected in their participation in public forums and meetings. They use their saved time to grow green vegetables and attend ceremonies. However, many users said that the Dalits,

the poor, and women have not benefited as much from the training. The following reasons were cited: (i) the training sessions are attended mostly by the committee's chairperson and vice-chairperson, who do not share the skills and knowledge acquired; (ii) the incentive to attend the training is mainly for the daily subsistence allowance; and (iii) decision making is still the domain of the rich and the elite.

INCOME AND EXPENDITURE FROM THE COMMUNITY FOREST

The CF has maintained a record of the amount of products harvested from the forest for the fiscal year 2004–2005. The main forest products harvested are fuelwood, twigs, timber, grass, and leaf litter. The users have sold some of the surplus fuelwood (125 head-loads) to outsiders as well. CFUG also keeps track of the sources of funds generated and their utilization. The figures are publicly audited, and a copy of the audited report is shared with DFO. During the fiscal year 2004–2005, CFUG generated NRs145,067, part of which was spent on various activities, leaving a balance of NRs67,384 in its bank account. This money could be used toward a poverty reduction program. The users need a sensitization workshop to initiate programs to improve the livelihoods of the two poor families.

