

POVERTY AND BIODIVERSITY

Improving Poverty Reduction and Conservation Outcomes in the Grassland Ecosystem of Mongolia

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Introduction

Mongolia is home to the world's last and largest example of an essentially intact temperate grassland ecosystem. Only 1% of Mongolia is considered arable land, while about 34% of Mongolia's people depend directly on livestock production (most as traditional nomadic pastoralists) and an additional 26% indirectly do so. The annual per capita gross domestic product (GDP) is approximately \$600, with 40% of the country's 2.7 million people living at or below the poverty line. Poverty reduction must integrate the unique economic and environmental needs of the people who inhabit the steppe (temperate grassland ecosystem) and depend on its resources for their survival.

Mongolia's unique grassland ecosystem and poverty reduction

Mongolia's extensive grazing system functions over large areas, typically thousands to tens of thousands of square kilometers. The nomadic movements of pastoralists and wildlife in search of scarce resources cover areas larger than even the largest protected areas and communal management units. Thus, a substantial percentage of the human and wildlife populations depend directly on a fragile natural resource base. Past and present transhumant pastoralism is a direct and historically successful result of coping with this delicate balance. Unfortunately, traditional livelihoods are imperiled by overgrazing, particularly around *soum* (county) centers; a wide range of animal diseases, including some that

are zoonotic (i.e., transmissible to humans); and limited access to water for livestock. The ability to foster a multiuse landscape that allows traditional nomadic pastoralists to preserve their livelihoods without destroying the natural resource base on which they depend will determine, in part, the success of a conservation and development strategy for the steppe.

The Mongolian countryside provides significant natural resources that buffer poor rural populations from the worst effects of low cash incomes. In the Eastern Steppe, wild game and fish account for 13% of the average annual household protein consumption, according to household surveys. Market sales of game meat and furs also provide supplementary cash income, with sales totaling approximately \$180,000 per year (observed at just three provincial town markets) (Scharf and Enkhbold, 2002). The Siberian marmot, hunted for both meat and fur, is the most economically important species. However, trade in Mongolian gazelle, gray wolf, and red and corsac fox also contributes a significant part of the mix. Many of the skins and higher-value animal products, such as those used in traditional medicines, are exported to the provinces of the People's Republic of China (PRC) bordering the Inner Mongolia Autonomous Region.

However, available evidence suggests that wildlife populations are decreasing dramatically largely due to overexploitation. For example, the range of the Mongolian gazelle is now only about 25–30% of that observed in the 1950s, and the population is thought to be in serious decline (Lhagvasuren and Milner-Gulland, 1997; Zahler et al., 2004a). The same applies to Siberian marmot populations (Reading et al., 1998). A further decrease in wildlife will likely jeopardize food security and increase poverty in Mongolia by limiting opportunities for subsistence hunting. At the same time, this disruption of wildlife populations threatens the stability of the last relatively intact grassland in Eurasia.

Institutional context

Rural communities in Mongolia are suffering the consequences of the rapid national change from a centralized to a market economy. The closure of state factories in rural areas, which has meant a loss of jobs, appears to have set in motion a vicious cycle. More poor people have been driven back to the land, increasing pressure on natural resources and further limiting the economic viability of rural livelihoods. The quality of suitable rangeland for livestock has been compromised in many areas. These factors have combined with the limited rural business opportunities, in general, and the inexperience of the relative newcomers in livestock husbandry and in marketing local products to further complicate the challenge of promoting economic growth based on dwindling natural resources.

More than a decade after the dissolution of state-owned grazing regimes and the adoption of the 1994 land law, herding systems remain in flux. How changing land tenure systems will interact with increasingly prevalent market forces is unclear. However, with many absentee herd owners and the trend toward land privatization, sedentarization, and the subdivision of formerly communal rangelands are likely outcomes. As livestock production becomes more sedentary, stocking rates rise (increasing the potential for rangeland degradation), disease interactions intensify among livestock and between livestock and wildlife, and the movements of livestock and wildlife are restricted to the detriment of both.

High unemployment and poverty are primary concerns of local governments. Young people (15–35 years old) make up 50–60% of the population in the region. Many are unable to attend school, and more than half are unemployed. Meanwhile, without the state-run factories to purchase wool, hide, bones, and other products, herders are finding that they cannot sell some of their products. Lacking business acumen and investment resources, herders are unable to capitalize small-scale enterprises and transport systems to replace the defunct centralized system. They also lack knowledge to effectively negotiate prices for their products, and no government help is available to improve their marketing skills.

Mongolia's national economic needs, as well as strong external demand (most notably from the PRC), are driving oil, coal, gas, mineral, and wildlife exploitation in the region. While these resources could serve development and poverty reduction goals, there is also

the risk that they will be depleted by distant commercial interests with little benefit accruing to local populations. Development efforts in Mongolia must take into consideration the systemic links between poverty, disease, environmental degradation, and unsustainable use of resources. The development of a comprehensive conservation and natural resource management plan to preserve the integrity of the Eastern Steppe, its wildlife, and the unique traditional nomadic culture of its people is overdue.

Three of the most critical components of the Mongolian economy that have direct connections with biodiversity conservation are livestock, development (including the transport and mining sectors), and wildlife consumption and trade. These drivers are investigated in this case study through specific examples that highlight how Mongolia's economy and natural resource base are tightly linked—and why conservation, development, and economic production must be considered as interdependent.

The livestock–wildlife–human health interface

With 2.7 million people and 33 million domestic animals, Mongolia is, indeed, a “land of livestock.” More than half of Mongolia's population depends directly or indirectly on livestock production, which constitutes 30% of GDP. Therefore, the successful management of animal husbandry in the face of societal and economic changes is fundamental to Mongolia's future development, as well as the preservation of its traditional nomadic cultures. A persistent and growing concern is the threat of diseases: those that can pass between wild and domesticated animals, and those that move from animals to people (zoonoses).

Livestock production and wildlife conservation often are linked wherever domestic and wild animals come into contact. Several factors make this link particularly strong in Mongolia. The country's aridity and latitude result in highly variable intra- and inter-annual climate and resource availability. Pastoralists and wildlife respond to this variability by moving opportunistically across long distances to track ephemeral resources, often sharing the same pastures. Livestock and wild grazers have similar requirements that often lead them to the same resources and into physical contact. In some cases, they come into conflict with each other.

A wide range of animal diseases exist in Mongolia, including bovine tuberculosis, brucellosis, foot-and-mouth disease (FMD), Johne's disease, plague, and several parasites that are transmissible among wildlife, humans, and their livestock (Erbright et al., 2003; Lee et al., 1999; Zoljargal et al., 2001). These diseases might harm the health and productivity of humans, livestock, and wildlife, impairing economic development and ecological sustainability. The livelihoods of the rural poor are most severely impacted by disease—human and animal.

Continuing outbreaks of FMD illustrate the complexity of wildlife–livestock–human interactions in Mongolia. FMD is a highly contagious viral disease of ruminants that causes vesiculation of oral mucosa and skin of the feet (Thomson et al., 2001). After the 1970s, FMD had not been reported in Mongolia until an outbreak in domestic cattle and sheep during the winter of 2000–2001. A serological survey of FMD in Mongolian gazelles, which are sympatric with livestock throughout their range, found no evidence of exposure in 1998–1999 (Deem et al., 2001). However, after FMD appeared in livestock in 2001, a second serological survey found extensive FMD exposure in gazelles (Nyamsuren et al., 2006). FMD reappeared in livestock in Mongolia in 2002 and 2004. Whether gazelles can transmit FMD back to livestock is unknown, although livestock appear to be able to spread the virus to gazelles.

The presence of FMD has dramatic consequences for poverty reduction and conservation efforts in Mongolia. When a herd becomes infected with FMD, it significantly reduces livestock production. Moreover, market access is extremely limited for FMD-infected countries since live animals cannot be traded between FMD-infected and FMD-free countries, and the export of livestock products is heavily restricted (James and Rushton, 2002). During the last outbreaks in Mongolia, the Government imposed strict quarantines in affected areas, thus disrupting the traditional nomadic lifestyle of herders. Other FMD-control measures, including culling of affected animals and vaccination, cause further economic hardship. FMD threatens gazelles directly by causing catastrophic mortality (Sokolov and Lushchekina, 1997). The disease also has indirect impacts by triggering drastic, if misplaced, calls for “control” measures, such as culling and the disruption of gazelle migrations that are necessary for gazelle survival during the winter (Leimgruber et al., 2001).

Institutional responses required to tackle livestock–wildlife–human disease challenges

The intersection between government policies and land-use practices that affect disease transmission among people, livestock, and wildlife should be further examined. No one within the Government of Mongolia is responsible for integrating the policies and programs related to disease surveillance and livestock management with efforts focused on wildlife. (Mongolia is certainly not unique in this regard.) Relationships between livestock and wildlife are particularly intense. Improvements in the health of domestic animals likely will improve prospects for healthier wild animals and vice versa: this will ideally lead directly to healthier local people. It is essential to directly monitor community, livestock, and wildlife health parameters, such as the prevalence of zoonotic and animal diseases (e.g., FMD) in susceptible species over time and space; the number of disease outbreaks and types (i.e., by determining the causative pathogen) per year in wildlife under observation; and the incidence of marmot-related plague in hunters.

Stakeholder activism to improve conservation and reduce poverty: experiences from the Millennium Road and the Onggi River Movement

Development projects in Mongolia often have focused on regional growth with little consideration for environmental impacts, local communities, or poverty reduction. Inadequate environmental impact assessments (EIAs), combined with a lack of monitoring, repeatedly have led to environmental problems that directly and negatively affect local communities. This can result in increased poverty rather than improved economies. Two examples, a road and a mine, illustrate this point. The benefits in these cases often have been more likely to accrue to government officials and foreign interests than the local populace. The Millennium Road and Onggi River Movement (ORM) examples presented in this section highlight the need for greater stakeholder involvement in the planning process. They also underscore the need to incorporate stakeholder concerns regarding potential negative effects on the environment and on local economic structures.

THE MILLENNIUM ROAD

The people of the Eastern Steppe critically need transport networks. Much of the country is served by

dirt tracks, meaning hours or even days are required to transport goods to and from the countryside. Paved roads are practically nonexistent, and those that do exist are expensive to maintain due to the severe Mongolian climate and the long distances that must be covered to serve small numbers of people. For more than a decade, the PRC and Mongolia have been pursuing ways to improve regional economic cooperation and cross-border relations. Bilateral discussions, held since the early 1990s, produced trade and economic cooperation agreements at the subregional level between the local governments. However, these accords lacked adequate public notice and comment. A prime example is the Millennium Road project, which was initiated to ease transportation costs and increase herders' access to markets.

In the Eastern Steppe region of Mongolia, the Millennium Road was planned as a simple straight line running between the east and the west. Little attention was paid to the ramifications of the road's straight-line route on market access for rural people, or the potential environmental consequences of this route through the relatively pristine Eastern Steppe region and across the migratory paths of several hundred thousand Mongolian gazelles.

A bridge extending from the Millennium Road through the Nomrog Strictly Protected Area (SPA) also was planned. However, this plan directly contravened Mongolian law. Local government initiatives drove the proposed location of the Nomrog Bridge without adequate public consultation or stakeholder participation. A recent survey found that (i) about 71.4% of residents of the town of Sumber were opposed to the Nomrog Bridge; (ii) about 52.4% thought they would not benefit from this bridge; (iii) about 76.2% estimated that its adverse impact would be significant; (iv) about 76.2% strongly opposed degazetting (removing protected status) of part of the Nomrog SPA; and (v) about 80.9% designated the existing bridge near the city of Sumber as a more favorable cross-border route.

Although one argument made in favor of the bridge was economic, the location was inappropriate for large-scale commercial use, and a more suitable commercial link would be farther north. The proposed bridge over the Nomrog River was more remote compared to the existing bridge near Sumber—the most populated center in the vicinity—and its remoteness and construction would not bring economic benefits to the inhabitants of Sumber. Instead, cross-border trade would benefit the PRC much more than Mongolia.

The Nomrog SPA hosts a number of IUCN Red Book (rare or endangered) species that could be threatened further as a result of development plans. The proposed bridge and road infrastructure almost certainly would lead to a huge increase in poaching from the PRC side—where Mongolian gazelles have been almost annihilated—due to easier access. The infrastructure and transport plans would fragment the habitat of the gazelle population and limit their ability to migrate, contributing to a decline in their numbers. Migration is a critical aspect of gazelle behavior in the harsh winters and during spring, when the animals often must travel long distances to find adequate grazing, escape deep snows, or find safe locations to give birth.

Another argument in favor of the road and bridge was the potential increase in economic benefits from tourism. However, Nomrog SPA does not have the legal mandate or capacity to accommodate an increase in the number of tourists without compromising the level and standard of environmental protection.

The Government of Mongolia considered a border-crossing access bridge over the Nomrog River, the successful result of years of bilateral dialogue between Mongolia and the PRC that was now threatened by opposition. Not only were local communities not asked to contribute to the technical assessment process, some individuals who were invited to share their viewpoints were actually denied permission to do so by the Dornod *aimag* (province) government. At least one individual was threatened with the loss of her job if she attended the public meeting. A Choibalsan-based biology teacher—who made a public statement against the construction of the Nomrog River Bridge at the Eastern Steppe Biodiversity Project–World Wide Fund for Nature (WWF) National Forum on Protected Areas in Mongolia (November 2002)—was intimidated by her school district officials, who received telephone calls from the Dornod aimag government. These retributive actions are a violation of basic political rights and have reinforced the view that the development of civil society in Mongolia is not assured yet.

However, local stakeholder inputs finally may have been incorporated into plans for the road, which is still being built. The resulting alternative route presents a simple, elegant solution that could improve herders' access to local markets and facilitate the transport of market goods—a critical need for poverty reduction—without threatening the steppe ecosystem upon which the vast majority of people on the Eastern Steppe depend directly. The alternative route in the

east includes the economic hub town of Choibalsan, ensuring this center would not be doomed to economic neglect. Furthermore, the alternative route would avoid the gazelles' migration path and, thus, would be more compatible with gazelle life cycles than the original planned route. Using geographic information systems, the Wildlife Conservation Society found that the alternative route would serve 26–50 times more people than the officially proposed route and would require 205 kilometers (km) less road to be built. The alternative route, thus, offers a win-win solution that makes environmental and economic sense.

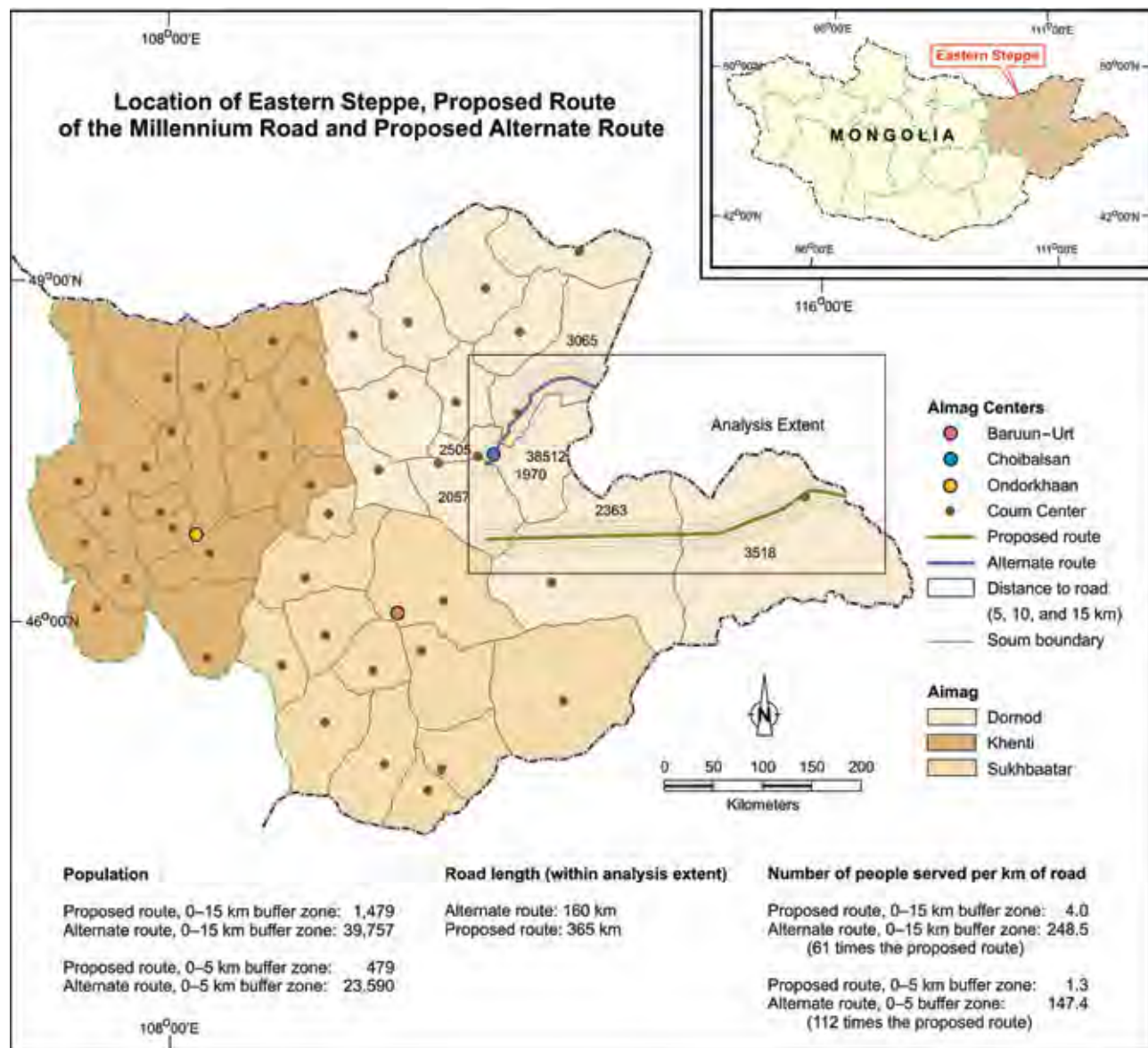
The Nomrog Bridge situation remains unresolved, however. Despite international and local outcry, as well

as a pullout by international funding agencies, a recent agreement between local Mongolian and PRC officials has resurrected the bridge plan—this time with funding from the PRC. Yet, if the residents of the Eastern Steppe are to receive real ecotourism benefits, PRC ecotourists need to be channeled into Dornod population centers. To ensure this happens, the river road from Kholonbuir Prefecture should use the existing bridge over the Khalghol River near Sumber as the international border point and gateway for PRC tourists.

THE ONGGI RIVER MOVEMENT

Mining has become one of the largest and fastest-growing industries in Mongolia. It constitutes more

Map 6



Source: Wildlife Conservation Society.

than 8.6% of GDP and 56% of exports. Mongolian mineral resources include gold, platinum, uranium, copper, zinc, oil, and natural gas. Mining is the fastest opportunity for Mongolia to acquire foreign exchange and lift itself out of poverty. While Mongolia has significant geological potential for such export earnings, current trade in raw minerals does not maximize the benefits for Mongolia, and more consideration needs to be given to increasing local value added in trade. Current trends raise concerns that local populations will receive few benefits, while bearing many of the deleterious effects on health and the environment, including sediment loading, heavy metal poisoning, water extraction, and morphological changes that have resulted in the drying of a number of water courses.

Placer mining—the most common method of extracting gold deposits—has exacerbated river pollution greatly through increased loading of sediment particles and nutrients at numerous sites in Mongolia. Officially, 28 river basins in eight aimags are “heavily polluted,” and some parts of the rivers are “damaged irreversibly.” Recently, hard rock gold mining practices—which use highly toxic agents such as cyanide and mercury that persist in the environment for long periods—have increased rapidly. Chemical spills might wipe out biodiversity within the immediate river ecosystems and have significant impacts on areas, animals, plants, and humans downstream.

In addition to the serious pollution caused by mining activities, water extraction and morphological changes to rivers associated with these activities can have dramatic repercussions. In some locations across Mongolia, they have caused the drying of several small rivers and severe water shortages for local people and livestock.

During the last decade, gold has been exploited in easily accessible areas. However, mining activities recently have expanded into pristine and protected areas. Although these protected areas are unique and offer invaluable opportunities for environmental protection and biodiversity conservation, pressure is growing to degazette many of them. The Ministry of Nature and Environment recently produced proposals to degazette more than 10% of Mongolia’s protected areas to allow the mining sector greater access.

With Mongolia’s weak regulatory structure and lax taxation laws, exploitation of mineral resources largely benefits the country’s wealthiest citizens and foreign nationals affiliated with mining corporations. Local people generally are left with low-paying jobs and a degraded quality of life caused by pollution and

loss of traditional sustainable jobs. The EIA process, including decision making and contract awarding, is inadequate, as are the quality and enforcement of EIA findings. Mining development will continue to be unchecked unless these EIA processes and procedures are amended to be clear, transparent, accountable to public scrutiny, and accompanied by strong compliance and enforcement provisions.

On the headwaters of the Onggi River, mining has silted streambeds, lowered water tables, and polluted entire watersheds with a variety of hazardous chemicals (including mercury). Downstream ecosystems and local communities have been seriously damaged as a result. In a response unprecedented for Mongolia, local communities along this river created one of the country’s first locally driven environmental nongovernment organizations (NGOs). Local stakeholders, who found their health and livelihoods at risk from the uncontrolled development of upstream mining, created the ORM.

ORM consists of 3,000 rural citizens (many of them nomadic herder families) who support restoration of the Onggi River. They have temporarily halted the operations of three gold mines polluting the river and the associated Red Lake. In a Mongolian first, ORM has filed court cases against the companies involved, which has been a key factor in raising national awareness about this and other environmental matters. ORM’s community-driven efforts can be replicated in other locations across Mongolia as a catalyst for change. Further, these efforts can demonstrate how local communities, the private sector, and government agencies can work together to maintain and even improve local livelihoods and environmental conditions.

Unsustainable wildlife hunting and trade

Wildlife species provide numerous economic benefits to local people in Mongolia, including serving as a source of protein and income from the trade of meat, fur, and animal parts used in medicinal markets. For poor people, the availability of wildlife can be crucial to economic and even physical survival. Wildlife provides food and reduces the need to slaughter livestock for consumption, so that instead livestock can provide benefits, such as milk and wool for personal use and for trading against other essential products and items, as well as serve as a combination of savings, wealth, and insurance. When wildlife becomes scarce, the impact is most dramatic on the poor and marginalized rural people.

Mongolia's transition in the early 1990s from a relatively strong, Soviet-dominated economy with strict controls over hunting and trade to a struggling free market economy has resulted in a dramatic increase in illegal hunting and trade. A range of wildlife species have declined rapidly due to a faltering economy, increased reliance on trade with the PRC, porous borders, and little funding or will for law enforcement (Wingard and Zahler, 2006). Much of this hunting is for local trade or consumption, although illegal international trade threatens some species in Mongolia. Evidence suggests that this threat is growing and spreading to new species. Three examples illustrate the unsustainable illegal hunting and trade pressure in Mongolia (Zahler et al., 2004b).

The Mongolian saiga antelope (*Saiga tatarica mongolica*) is a distinct subspecies found in the southwestern part of the country. The population of Mongolia's subspecies of saiga antelope has declined catastrophically from more than 5,000 to less than 800 (an 85% drop) in the last 5 years. The lucrative Chinese medicinal market for saiga horn is driving this collapse. Hunting is focused on the horned males, which has skewed sex ratios and exacerbated the population decline (Milner-Gulland et al., 2003). The saigas' breeding system has been disrupted, undermining its ability to recover from population declines. The extremely low numbers of saiga remaining in Mongolia make them especially susceptible to stochastic events, such as icy winters, that could cause mass mortality and potentially drive the subspecies to extinction. Circumstantial evidence suggests that middle-class people—those with vehicles and money for fuel—are the primary actors in the illegal trade of saiga horns.

Mongolia's red deer (*Cervus elaphus sibiricus*) were once common throughout much of the country. Unfortunately, the number of red deer also has declined catastrophically across Mongolia. A 1986 government assessment estimated the population size at approximately 130,000 in an area of 115,000 square kilometers (km²). The most recent population assessment in 2004 showed that only 8,000–10,000 red deer inhabit 15 aimags of Mongolia—a 92% decline in just 18 years. While habitat loss might play a small role, illegal poaching is the primary reason for this dramatic decline. Much of the poaching and subsequent trade is directed toward the international medicinal market, including harvesting for antlers (\$60–100 per kilogram), male genital organs (\$70–80), fetuses (\$20–50), and females' tails (\$50–80).

Mongolia is home to the world's largest mountain sheep, the argali (*Ovis ammon*). Foreign hunters seek these animals because of their impressive size and long, spiraling horns. Argali are declining in Mongolia, primarily due to an increase in poaching for horns and meat (for export to the PRC), predation by domestic guard dogs, and competition with domestic livestock. Government figures estimated 50,000 argali in Mongolia in 1975 and 60,000 in 1985. By 2001, only an estimated 13,000–15,000 remained—a 75% decline in just 16 years. Despite being listed as a threatened species in Mongolia and internationally, argali trophy hunting remains legal in Mongolia. The number of licenses has been increasing, reaching 80 in 2004. Trophy hunting is a lucrative business, with companies offering hunts for \$25,000–50,000. Although laws exist for the return of revenues to local governments for conservation initiatives, they are not followed. As a result, this program is surrounded by controversy as manifested by growing local opposition, accusations of corruption in the media, and a US lawsuit.

Illegal and unsustainable hunting has become the major threat to wildlife in the past decade in Mongolia. Despite adequate available habitat, some wildlife species are being driven rapidly to the brink of extinction. The recent increase in poaching in Mongolia stems from a combination of strong demand for wildlife products in Asian markets; large numbers of unemployed people struggling to make a living; and poor enforcement or lack of implementation of existing laws and policies on resource use, wildlife trade, and redistribution of trophy hunting revenues.

Institutional responses to address the hunting and trade challenge

Successfully addressing the unsustainable hunting problem will require a blend of programs: (i) social development to provide alternative livelihoods for poachers; (ii) better regulation of commercial and trophy hunting, including openness and transparency, external review, and oversight; (iii) improved use of legal disincentives and incentives; (iv) reform and vast improvement of law enforcement; and (v) creation of some form of national wildlife agency. However, such responses also should be linked to a social development plan that provides alternatives for poor people who turn to illegal practices to survive.

Local people—who depend directly and indirectly on Mongolia's wildlife resources—will be critical to the success of any wildlife management or

conservation program. Recognizing this need, the Government has begun to formulate policies and laws that simultaneously enable communities to engage in conservation and have a stake in Mongolia's resource base. For the moment, proposals have remained focused on forestry, although this could be expanded to include other resources. Unfortunately, only a few Mongolian legal specialists are involved in efforts to promote sustainable community-based natural resource management, and no institution at the national level is fully committed to the concept yet. Mongolia's communities currently have the right to form local organizations and gain access to resources. The development of local organizations, such as herder cooperatives for resource management, including local management of hunting, might be the best hope for Mongolia's wildlife crisis.

Conclusions

The broad scale of human impacts on nature in Mongolia has begun to jeopardize the life support systems on which the poorest disproportionately depend, threatening to eliminate future, more sustainable options for natural resource management. Wildlife, water, and rangeland for livestock—all critical inputs to the rural economy—are under pressure in many parts of Mongolia today.

All development, poverty reduction, or conservation efforts in Mongolia also must consider transboundary effects and other pressures on natural resources that originate outside the country. The influence of the PRC, which has a population nearly 500 times that of Mongolia and is one of the fastest-growing economies in the world, threatens to overwhelm Mongolia's efforts to determine its own future. External demand should be perceived and channeled as a positive force to generate foreign exchange earnings and investment, and business development in Mongolia. Whether most effects to date have been positive remains unclear, however. Many decisions apparently have been made in view of short-term gains rather than long-term environmental sustainability and local needs. Mongolian national agencies, working with the support of international development agencies, lenders, and local stakeholders, should consider carefully how to optimize the flow of benefits to create long-term economic opportunities for the Mongolian population. International processes also must be secured to enable the transboundary management of migra-

tory wildlife populations (e.g., gazelles) to ensure that hunters across the border do not exploit and, thus, potentially negate improved Mongolian wildlife policies.

Biodiversity conservation alone cannot reduce poverty in Mongolia. However, poverty reduction efforts that do not adequately consider conservation and sustainable natural resource use will not be successful in the long term. Mongolia's unique environmental conditions, historic culture of nomadic pastoralism, low human population, and high poverty rates make the country a distinctive test for linking poverty reduction and conservation on an ecosystem scale. Domestic political will, coupled with strong international donor support for holistic approaches, can allow Mongolia to achieve the economic modernization it needs and raise living standards, while protecting the natural resource base that remains the backbone of traditional Mongolian culture and livelihoods.

Poverty Reduction, Forests, and Conservation in Viet Nam: Understanding the Trade-offs

William D. Sunderlin and Huynh Thu Ba

Summary

This case study assesses the possibilities of improving rural livelihood while reversing the loss of forest resources in Viet Nam. A review of the literature yields a mixed answer. As in many other developing countries, livelihood in Viet Nam has been improved in part through the massive conversion of forests to other uses. Why then should a reversal of the loss of forests be expected to improve livelihood? The answer is that the continuation of some forest conversions, combined with forest protection and restoration, can contribute to the maintenance and improvement of livelihood. One of the great challenges that policy makers face is knowing how to distinguish between these two uses of resources, and how to manage them optimally.

Introduction

Viet Nam has made great strides toward eliminating poverty in the last 20 years. In the mid-1980s, seven of 10 Vietnamese lived in poverty. Ten years later, this proportion had been halved (World Bank in Viet Nam, 2000). From 1993 to 2002, poverty in Viet Nam decreased from 58% to 29% (ADB et al., 2003).

One of the Government's highest priorities is to follow through on this achievement and, thereby, eliminate remaining poverty.

In the last half century, Viet Nam, like many developing countries, has rapidly lost its forest cover across the country. The forested areas in Viet Nam were estimated to be 181,500 km², or 55% of the total land area of 330,000 km², in the late 1960s. By the late 1980s, forests covered only 56,680 km², or 17% of the total (Collins et al., 1991; De Koninck, 1999). With the loss of two thirds of its forest cover during this period, Viet Nam experienced the most rapid deforestation among Southeast Asian countries (De Koninck, 1999). Vo Quy (1996) estimates that said forest cover declined from 43% in 1943 to 20% in 1993. ADB estimates that Viet Nam's natural forest cover decreased, on the average, by 185,000 hectares (ha) per year from 1976–1990 (ADB, 2000). In the late 1990s, the Government announced it would halt deforestation and restore the forest cover in many areas of the country. This plan is called the Five-Million Hectare Reforestation Project.

Is Viet Nam's poverty reduction program compatible with its Five-Million Hectare Reforestation Project? This is an important question because, arguably, the loss of forest cover has been linked to an increase in per capita resource use and well-being. Would a sudden turn toward arresting deforestation and restoring forest covers threaten to undo some of the livelihood improvements?

These questions are best addressed against the backdrop of recent literature on forest transitions and the environmental Kuznets curve²⁹ related to forests, which suggests the compatibility between livelihood improvements and forest conservation is ultimately a developmental issue. In response to this literature, this study asks three questions regarding Viet Nam:

- (i) Is it best to wait for economic advancement to eliminate poverty and deforestation?
- (ii) Might forces other than economic development act in the defense of remaining forests?
- (iii) Can existing forests support poverty elimination?

The following three sections discuss (i) the theories on the relationship between poverty reduction and deforestation (forest transitions and the

environmental Kuznets curve); (ii) the relationship between poverty and deforestation in Viet Nam; and (iii) the potential compatibility between protecting and improving livelihood, and protecting and restoring the forest cover in Viet Nam (i.e., an exploration of the aforementioned three questions). The final section provides a summary and a conclusion.

Theories on poverty reduction and deforestation

Worldwide, forests have been disappearing rapidly in net terms. In the last 8,000 years, the earth's forest cover has declined from 6.2 billion ha to 3.3 billion ha,³⁰ and much of this loss has happened in the last 30 years (Bryant et al., 1997). From 1990 to 1997, approximately 6 million ha of humid tropical forests were lost each year, and about 2.3 million ha of forests were degraded (Achard et al., 2002). Forest cover loss generates deep concern for various reasons. Forests support the livelihood of millions of forest-dependent people, play a crucial role in the earth's carbon cycle, and encompass the highest species diversity and endemism among all terrestrial ecosystems. In addition, the genetic library of forests supports important functions, such as the improvement of agricultural crops through the introduction of germplasm of wild relatives found in forests, the introduction of new food, and the supply of medicinal plants and pharmaceuticals (Myers, 1997).

However, deforestation is not entirely bad. In fact, the conversion of forests to other land uses arguably has been instrumental in improving living standards worldwide for hundreds of years. The development of agriculture was a key factor in enabling a quantum leap in the ability of humans to exploit natural resources. The transition from hunting and gathering to swidden agriculture (sometimes called "shifting agriculture" or "slash-and-burn") and then to sedentary agriculture resulted in more than a five-fold increase in per capita appropriation of energy. Sedentary agriculture supports a much larger human population than was possible with previous modes of natural resource use. Moreover, the development of agriculture laid the foundation for the establishment of industry and urbanization, and through these, even higher per capita appropriation of energy and natural

²⁹The environmental Kuznets curve concept says that environmental deterioration displays an inverted U-shaped pattern over time. It is low prior to economic development, increases in the course of economic development, and then decreases when per capita income reaches a "turning point."

³⁰This is converted from Bryant et al. (1997, pp. 1 and 9): 62 million square kilometers (km²) to 33 million km².

resources. Agriculture has been developed mostly at the expense of forest covers. From 1700 until 1980, 19% of the world's forests disappeared, while the area occupied for agricultural purposes increased four-and-a-half times (Richards, 1990). It is no accident that, on the average, the worldwide decline in forest cover has been concurrent with extraordinary increases in human welfare.

Does this mean that continued improvement of living standards and continued increases in human population will lead to the disappearance of all forests? Apparently not. Countries that have a high standard of living paradoxically also tend to be countries where forest covers have stabilized and, in some cases, are increasing.

The reasons that forest cover stabilization and restoration tend to happen in countries with high per capita income vary. They include (i) a reduction of the relative share of agriculture in the economy, and associated rural–urban migration; (ii) agricultural mechanization; (iii) a decrease in agricultural prices, making agriculture on marginal lands less attractive; and (iv) a shift from the use of fuelwood to commercial fossil fuels and from wood to nonwood construction materials.

Literature on the environmental Kuznets curve hypothesizes that at a certain level of per capita income in developing countries (called the “turning point”), environmentally favorable outcomes usually begin to occur. A subset of this literature is concerned specifically with forest cover stabilization and restoration once the turning point has been reached (see, for example, Patel et al., 1995; Madhusudan et al., 2001; Culas and Dutta, 2002). The so-called forest transitions literature documents historical country case studies where forest cover stabilization and restoration have been achieved.³¹

Livelihood improvement and deforestation in Viet Nam

In Viet Nam, as in many other countries, the gradual increase in per capita income and natural resource use generally occurs with a decline in the country's area of natural forest. This is true in general terms, though recent history demonstrates an apparent lack of concurrence. The period after 1950 was one of economic stagnation, low per capita income, and massive

poverty in the early 1980s. Over this same period, forests were disappearing at an increasingly rapid pace. The great strides in reversing massive poverty began in 1986. Deforestation appears to have peaked in the early 1990s, though this is mere speculation.

In Viet Nam, the argument that improved living standards are related to the disappearance of forest covers is largely conjectural. It can be explained first by looking at the reasons for the improved living standards after 1986, and then at the reasons for rapid deforestation.

What were the keys to success in Viet Nam's poverty-reduction policies? The policy shift began in 1986 when Viet Nam converted from a centrally-planned economy to a market economy, abandoning its socialist industrialization model in favor of agriculture-led growth. Beginning in 1988, through its *Doi Moi* (renovation) policies, the Government abolished compulsory grain-purchase quotas, instituted free trade at market prices, ended collectivized agriculture, and distributed farmlands to individual households (Irvin, 1995; Dollar and Litvack, 1998). The reforms increased the relative prices of rice and other agricultural products, provided considerable incentives for rural producers with land and agricultural knowledge, and increased per capita rice production to historical highs for Viet Nam by 1988 (Dollar and Litvack, 1998). In the early phase of *Doi Moi*, the reduction in poverty resulted from the distribution of land to agricultural households and the provision of economic incentives to increase farm production (ADB et al., 2003). Moreover, the diversification of on-farm activities can explain most of the dramatic improvement in living standards from 1993–1998 (World Bank in Viet Nam, 2000).

Explanations on the causes of deforestation in Viet Nam vary considerably, though they tend to give agricultural expansion a prominent place. An ADB report states that the leading causes of deforestation in Viet Nam have been a population-driven demand for forest products and agricultural land, as well as the logging of large tracts of forest by State Forestry Enterprises (ADB, 2000). The author of *Deforestation in Viet Nam* found that the fundamental causes of rapid deforestation have been “demographic growth; economic growth; increasing demand for food and export crops; and increasing demand for forest products—primarily wood for the pulp and paper industry—for

³¹ For case studies on Denmark, France, Italy, and Switzerland, see Fairbairn and Needle, 1995; Mather et al., 1998; Mather et al., 1999; and Mather and Fairbairn, 2000.

construction and for fuel” (De Koninck, 1999, p. 15). He identifies four “instrumental factors” in Viet Nam’s deforestation: excessive reliance on swidden agriculture by some ethnic minorities, agricultural expansion, logging, and collection of forest products for subsistence needs (De Koninck, 1999, pp. 15–16). Lang (2001) sees three main causes: the second Indochina War, postwar resettlement and migration, and logging. De Koninck and Lang state that ethnic minorities have been wrongly accused of playing a primary role in the deforestation of Viet Nam (De Koninck, 1999; Lang, 2001).

In the 1990s, Viet Nam’s innovative rural development policies led to the dynamic growth of the agricultural sector, with the growing of perennial crops on forest lands (e.g., coffee, tea, rubber, and cashew nuts). This substantially improved the incomes and welfare of the rural population (ADB, 2001). Exports of agricultural crops almost doubled from 1988–1991, and accounted for more than half the value of Viet Nam’s exports (Fforde and Sénéque, 1995). From 1990–1999, Viet Nam’s cropland area grew at 3.4% per year, reaching 12.3 million ha (Economist Intelligence Unit, 2001). How much of this agricultural expansion took place at the expense of forest covers is unclear though.

In summary, deforestation in Viet Nam after World War II was associated with a rapidly growing population of rural producers, though not necessarily improved standards of living. Beginning with Doi Moi in 1986, policies favoring considerable increases in agricultural investment were instituted. This, in turn, intensified the clearing of forest lands in favor of farmlands. However, at least two important exceptions to this association between improving living standards and deforestation can be found.

First, deforestation can lead to a decline, rather than an improvement, in the standard of living in many instances. One important instance is the massive logging of areas where forest-dependent people (often ethnic minorities) are deprived of their main source of subsistence. In the 1950s, when the war against the French had begun, the Government of Viet Nam restricted local people from exploiting timber and nontimber forest products (NTFPs) to ensure forest resources could be used to support the war effort. Ethnic minorities reportedly suffered as a consequence of this prohibition (Nguyen Van Dang, 2001). Another important negative effect of deforestation is swidden cultivation under conditions of excessive population density, leading to shortened fallow periods, overuse

of soils, declining agricultural yields, and poverty. This phenomenon has been widely evident in Viet Nam (see, for example, Jamieson et al., 1998).

Second, an assumption that conversion to sedentary agriculture is the only explanation for the reduction in poverty would be wrong. Poverty reduction is a multisectoral and multidimensional process, and the contribution of the forest sector is just one part.

Nevertheless, the core of this study’s argument should be emphasized—that the conversion of forest lands to agricultural land has been one key factor in Viet Nam’s ability to feed a growing population and to raise the average per capita use of resources and standards of living.

Livelihood improvement and forest conservation in Viet Nam

The information presented in the previous sections yields three important sets of questions. The first question is: If forest conversion has been an important factor in the improved standards of living in Viet Nam, and if the ultimate trajectory of this change (based on the experience in rich countries) is the slowing of deforestation and, ultimately, reforestation, why worry about forest conservation and biodiversity? Will these problems not take care of themselves in the course of economic development?

For several reasons, the forest environmental Kuznets curve and the forest transition phenomenon cannot be relied upon to avoid undesirable losses of high-value forests, rare species, and environmental services. First, the recognized turning point at which reforestation begins is an annual per capita income of \$4,000–6,000 (Wunder, 2003). Viet Nam is still far below this threshold, and will not reach it for at least 10–20 years. Second, in countries where reforestation has occurred, many of the “new forests” are monoculture plantations, which do not restore much of the original biodiversity. The challenge of restoring biodiversity is generally greater in the tropical forests of developing countries, where biodiversity, on the average, tends to be higher than in temperate forests. Third, the consequences of allowing deforestation to proceed unabated are greater now than when the European forest transitions occurred, in part because of the key role of tropical forests in the global carbon cycle. Fourth, the forest transition involves trading one kind of environmental problem for another that might be more serious. Deforestation is often controlled at the cost of high per capita consumption of

hydrocarbon fuels (oil, coal, etc.), which is directly related to the greenhouse effect and global warming.

The second important question is: If the remaining natural forest cover and forest biodiversity in Viet Nam are timely and satisfactorily “saved” by the environmental Kuznets curve and forest transition, what forces will act in defense of these vital resources before they are lost?

The answer has two parts. First, forests in the remote and hilly regions of Viet Nam are unlikely to be destroyed, precisely because of their remoteness. Some forests will never be exploited (or exploited heavily) because they are on inaccessible terrain that would be too expensive to log (except by using a helicopter). Moreover, many of these forests are unsuitable for permanent agriculture, not just due to their remoteness, but also because they sometimes overlie soils of low fertility.

Second, social and political forces will defend the remaining natural forests and biodiversity in places where remoteness does not act as a biophysical barrier. This will happen where the value of natural forests in supporting and improving livelihoods and providing vital environmental services is recognized empirically, and the knowledge is converted into an effective policy at the national and provincial levels. However, this reality embraces a profound problem. The national Government’s view of what constitutes “vital forests” is often not the same as that of villagers. The recent history of the Five-Million Hectare Restoration Project is a case in point. The national Government plans to reforest vast areas that are said to be “empty lands.” However, a closer look reveals that these are often lands where the local people have evolved elaborate systems of resource use. Establishing plantations in these areas would not necessarily benefit society in net terms because many livelihoods would be displaced.

The third question is: In what ways might existing natural forests be important to continued progress on poverty elimination in Viet Nam?

Ethnic minorities in Viet Nam (who are usually the poorest of the poor) tend to rely on forest resources (ADB et al., 2003); thus, maintenance of those resources is vital for protecting and, in some cases, improving their livelihood. This statement is open to challenge, however, because in some cases the continued reliance on forest resources might be an obstacle to improving living standards. For example, a pessimistic outlook on the poverty reduction potential of forests holds that the extraction of forest

resources “is usually labor-intensive, land-extensive, and supply is inflexible vis-à-vis demand changes” (Wunder, 2001). A more optimistic outlook is justified in cases where forest resources play a vital role in avoiding or mitigating poverty (i.e., not necessarily in eliminating poverty); where local people express a preference for continuing to rely on forest resources and are able to do so; and, of course, where forest resources can help eliminate poverty.

The convergence in Viet Nam between areas of high poverty incidence and areas of remaining natural forest cover is significant. This can be seen in Maps 7 and 8, which juxtapose a map of poverty incidence countrywide and areas of remaining natural forest. Both tend to be situated away from the major cities (Ho Chi Minh City and Hanoi notably), away from the coasts, and concentrated in the remote and hilly areas of the north and central portions of the country.

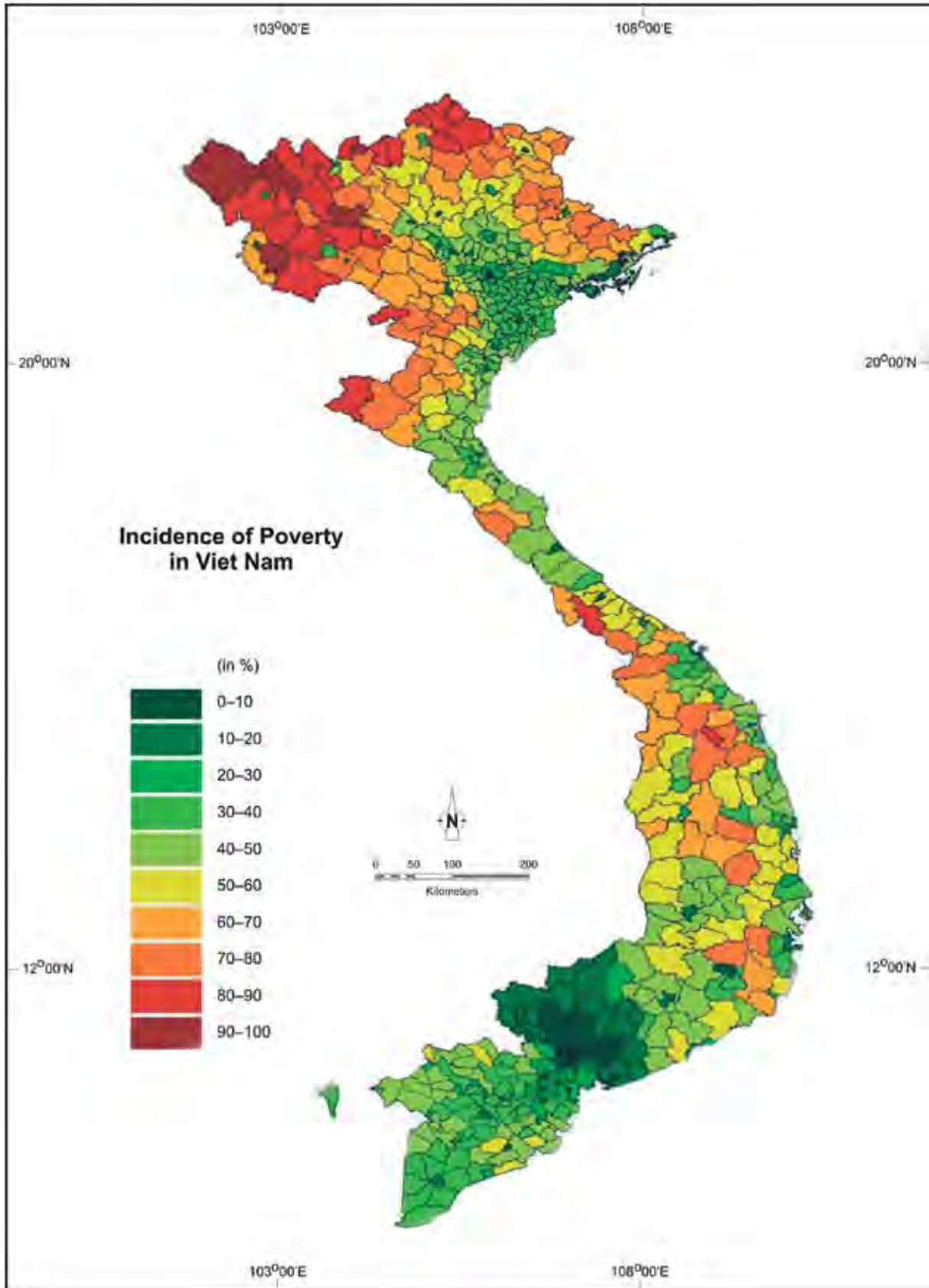
This is no accident. The areas of high poverty incidence and remaining natural forests are largely out of reach of the modern economy, and far from urban areas, large paved roads, and ports. For natural forests, elevation reinforces this phenomenon and explains why some have remained relatively intact.

These facts help clarify why (i) the poor in Viet Nam, and especially the ethnic minorities, are disproportionately dependent on forest resources; (ii) some of the poor in Viet Nam use forest resources as a safety net; and (iii) the continued use of forest resources in these areas might be favored for poverty reduction. Forest resources are relatively abundant in some of these areas, and few alternatives are available. However, some exceptions to this pattern can be found.

The protection of forests can be important for the maintenance of livelihood through direct harvesting and marketing, as well as other channels. Forests often provide vital local environmental services (e.g., restoration of soil fertility in swidden systems, regulation of water cycles, germplasm for agriculture, control of erosion, etc.).

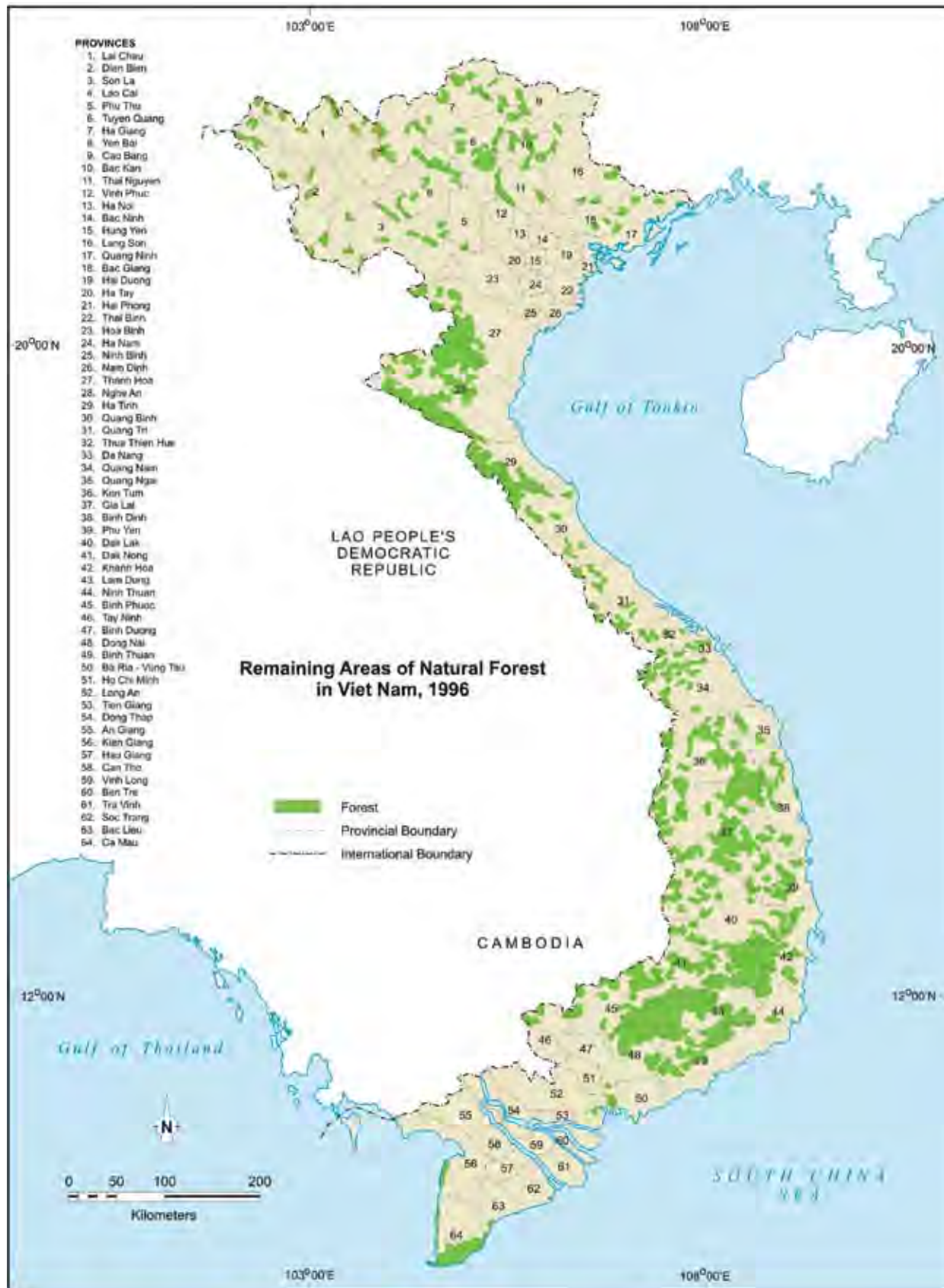
Poverty reduction can be favored not just by protecting certain kinds of forest resource use by smallholders, but also by developing new income sources. Due to their proximity to areas of natural forest, the poor might have a comparative advantage in harvesting, processing, and marketing forest products. Their proximity to forests also might give them a comparative advantage in managing payment schemes for environmental services, such as the protection of watersheds and biodiversity, ecotourism business, and carbon sequestration markets. The poor do not

Map 7



Source: Minot et al., 2003.

Map 8



Source: Rhind and Iremonger, 1996.

have a comparative advantage in terms of the knowledge, skills, and capital required to carry out these marketing opportunities. However, prudent policy support can minimize these disadvantages.

Summary and conclusion

In Viet Nam, as in many other countries, improvements in living standards have been contemporaneous with, and partly linked to, the rapid loss of forest covers. This process has yielded mixed results. On the one hand, deforestation has been related to the establishment and expansion of sedentary and modernized agriculture, urbanization, and the growth of industry, as well as the rising per capita consumption of a growing population. On the other hand, this process has undermined certain livelihoods, disrupted the local environmental services of forests, decreased national forest produce supplies, damaged biodiversity, and provoked costly downstream effects, such as land erosion and river sedimentation.

Are policies aimed at eliminating remaining poverty, arresting deforestation, and massively reforesting the country, compatible goals? Potentially, they are. However, sensitivity to certain realities is needed to optimize this compatibility. These realities can be summarized as follows:

While economic development can slow and reverse forest cover loss in certain circumstances, reliance on this phenomenon in Viet Nam would be unwise. The turning point is many years off, and forest transition entails a different set of environmental problems that could be worse.

Historical deforestation has favored increased per capita income in Viet Nam to the detriment of the environment. While this process has slowed, it has not ended.

Deforestation has disrupted the livelihood of some low-income communities, particularly in remote areas where ethnic minorities historically have relied heavily on forest resources, and where alternative livelihoods are not easy or possible to establish.

In some cases, reforestation can strongly favor local livelihood improvements, especially where people can participate in the planted forest economy via smallholder projects (e.g., outgrower schemes where farmers plant trees to supply private companies), or through wage labor on large plantations. The conditions must be optimal for livelihood improvements, including reliable markets, stable prices, and security of tenure for smallholders. However, the poorest of

the poor tend not to have land or security of tenure by definition.

Under certain circumstances, reforestation can be extremely detrimental to local livelihood, especially where massive reforestation is superimposed on so-called empty lands that, in fact, are supporting local livelihood.

Two linked conclusions can be drawn from these findings. First, the effects of changes in forest covers (i.e., deforestation and reforestation) on possibilities for achieving poverty reduction vary greatly, depending on the local configuration of livelihood. Second, given this complexity, blanket forest policies aimed at wide, contiguous areas of land should be avoided. A needs assessment in villages and communes is important to evaluate ahead how policy changes might affect livelihood and, thus, make local policy course corrections as needed.

This reinforces the importance of allowing a great deal of discretion on the formulation of forest policies at the provincial and district levels where the nature of local livelihood is usually better understood. This local level fine-tuning of policies is complemented best by participatory stakeholder assessments to ensure forest policies have the greatest chance of serving the needs of people who are most disadvantaged.

Efficient communication and decision making among ministries and government institutions is needed at all levels in Viet Nam to ensure optimum resolution of the trade-offs between poverty reduction, on the one hand, and forest cover protection and restoration, on the other. Two factors inhibit this kind of communication and decision making, which is a cause for concern. First, responsibility for these two issues tends to be compartmentalized. The Ministry of Labor, Invalids, and Social Affairs has the lead responsibility for poverty reduction and allocates virtually no attention to forestry issues. Conversely, the Forest Department of the Ministry for Agriculture and Development is responsible for forests, but almost does not give explicit attention to poverty reduction. Second, coordination and information exchange between the central and provincial levels are limited. As a result, policy breakthroughs at the national level would not translate necessarily into effective implementation at the provincial and subprovincial levels. On the positive side, however, steps were taken in early 2005 to increase the integration of poverty reduction planning and policy across ministries at the national level. This could mark the

beginning of a process in Viet Nam that truly integrates poverty reduction and forest conservation.

Poverty Reduction, Increased Conservation, and Environmental Protection through Participatory Breeding: A Case Study from India

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Introduction

In this case study, poverty refers to poor and grossly inadequate household income that manifests itself in several ways. For example, farming communities residing in tribal areas have difficulty in producing rice for their own consumption, even for a few months, due to low yields in staple food crops. And since these communities are poor, they cannot afford to buy food grains from open markets to meet their needs. Thus, inadequate food intake is one reason for malnutrition and other health problems.

The introduction of high-yielding varieties (HYVs) mitigated India's food crisis in the 1960s. These HYVs were developed using formal plant breeding methodologies, initially in staple food crops, such as rice and wheat. The Green Revolution, as it is popularly known, helped the country achieve food security and, eventually, produce a surplus. However, several inputs and specific management were needed in the production of HYVs. This meant that only the richer farmers had access to these varieties, while large rural and tribal areas were left behind.

High levels of chemical inputs were applied to lands cultivated with HYVs season after season, eventually leading to soil degradation. Furthermore, although the HYVs were developed for their resistance to biotic stresses, pests and diseases associated with the HYVs increased over time. The negative changes in the agricultural environment and natural resources began to have an impact on biodiversity and associated ecosystems.

Traditionally, farmers routinely preserved rice diversity at their own cost. However, poor and unstable rice yields forced farmers to grow HYVs although they did not prefer these varieties. The Government's large-scale initiatives, which involved providing seeds and other chemical inputs at afford-

able prices with buy-back arrangements for grains or provision of local markets for their sale, enabled farmers to earn income. This was an incentive for farmers to cultivate HYVs. This income, however, remained far below realistic needs. Thus, farming communities were compelled to borrow from moneylenders at exorbitant interest rates, which made them vulnerable to economic exploitation. Naturally, rice diversity began to decline.

As the situation in India demonstrates, poverty is strongly linked to conservation, ecosystems, and the agricultural environment. The key question was whether the undesirable links between poverty, the environment, and health could be broken through the formal plant breeding methodologies that formed the basis of the Green Revolution. If not, what were the alternatives? This study analyzes the food situation in a tribal and a rural area from this perspective, and identifies people-friendly and environmentally sound options for improving the yields of varieties preferred by farmers. It aims to demonstrate the following hypotheses:

- Improving the yields of preferred varieties would meet household consumption needs, while excess grains would fetch good market prices. The profits could be used to purchase the inputs needed to improve yields of subsequent crops, thus contributing to poverty reduction;
- Better farming techniques, cooperative storage of grains at village seed banks (VSBs), and equitable sharing of marketing benefits would promote self-management and capacity building at the village level, and improve yields;
- The use of traditional agricultural inputs, such as farmyard manure in the pristine lands, would ensure conditions similar to organic farming, protect the ecology and environment, and allow access to profitable markets for land races;
- Food security in the form of adequate availability of, and access to, food for consumption would contribute to good health; and
- Economic stability would help revive rice diversity and conserve land races.

Experimental sites

TRIBAL AREA

In India, a tribe is described as "a social group with territorial affiliation; endogamous, with no specialization of functions, respecting tribal leaders, hereditary

or otherwise; united in language or dialect; recognizing social distance from other caste structures; following tribal traditions, beliefs, and customs, illiberal of naturalization of ideas from alien sources; and above all, conscious of a homogeneity of ethnic and territorial integration” (Madhava Menon et al., 1996). Tribal farmers also have evolved distinct characteristics. For instance, they rarely diverge from their ancestral livelihood path, including cultural and agricultural practices, despite being economically poor. They account for 8.5% (according to the 1991 census) of the Indian population, with the highest proportion in Madhya Pradesh and Orissa states.

The ecology and environment of the tribal areas are unique. For example, the crops in these areas have evolved a set of traits selected over a long period by the local people. Important traits are those relevant to cooking and consumption preferences, including taste and quality (Worede and Mekbib, 1993). Such traits are specific to each site and variety. Such adopted, people-specific varieties are termed land races to reflect their evolutionary path.

Jeypore block in the State of Orissa is a popular tribal tract, home to many rice land races. It is deemed to be a center of origin of rice. According to the 1991 census, Orissa has a population of 31.66 million, of which 7.03 million (22.2%) are tribal people.

In Jeypore, rice is cultivated at altitudes ranging from 100 meters (m) to 200 m above sea level. Uplands usually are 200 m above sea level, while lowlands are about 100 m and below. Lands in between are referred to as medium lands. Since irrigation is rarely possible, all lands depend entirely on rainfall, which is erratic and irregular. In the years of this study (1998–2002), rainfall varied widely during the active crop growth period (July–September) and around harvest time (November–December). Most of the farmers apply farmyard manure, though quantities might be insufficient. The planting of preferred land races is timed to allow grains to be harvested and used during festivals and family rituals.

RURAL AREA

Thalli is a rural area about 80 km from Bangalore. Unlike the tribal areas, the environment in rural areas is conducive to growing HYVs. However, several farmers still value tradition and traditional land races. Hence, the identification of ways for those preferring land races to secure their livelihood, while conserving their agricultural diversity and natural resources, is important.

Thalli hosts a range of nutritive millets, and farmers were particularly keen to upgrade the performance of a preferred land race of finger millet referred to as *pichakaddi ragi* in the local language. The seeds of this land race existed as mixtures, and crop yields raised from those seeds were poor and unstable. The first requirement, therefore, was to purify *pichakaddi ragi*.

In the tribal and rural areas, farmers needed to be able to purify their preferred land races, select good seeds before harvest, and develop a cultivation plan to achieve profitable yields. Such initiatives were positioned to ensure sustainable livelihood security and provide economic and social benefits. In describing such a poverty reduction process, the study explains how participatory processes with farmer-identified priorities potentially can lead to the conservation of natural resources and the protection of the environment. Further, the study suggests how the lessons learned can be harnessed to replicate and enhance successful programs that integrate conservation and poverty reduction.

Participatory plant breeding

Participatory plant breeding (PPB) is a participatory process integrating science, plant breeding, and the traditional knowledge of farmers. Scientists involve farmers on an equal plane, and demonstrate methods of improving their livelihood by imparting and enhancing their scientific knowledge. Logical evaluation of practical approaches to meet the needs of the farming community rated PPB as an optimal option. PPB allowed people to improve their preferred land races in their own environment. The methodology could be tailored to draw on the strength of the farmers’ traditional knowledge and remain within their means. Thus, in many respects, PPB has specific advantages over formal plant breeding methods.

Earlier experience made it clear that for any farmer-partnered programs to succeed, farmers should have confidence in the organizations they work with. In particular, the program must incorporate the farmers’ indigenous knowledge, and associate farmers as equal partners from the beginning. The program also should be integrated with the Panchayat Raj Institutions (PRIs), which includes farmers as regular members, to ensure smooth and efficient implementation.

The M.S. Swaminathan Research Foundation (MSSRF) in Chennai and the Green Foundation in Bangalore have been working with farmers in their

Map 9



PPB = Participatory plant breeding.

respective sites for such a long time that people recognize and respect these institutions as their benefactors. An MSSRF site office at Jeypore was an added advantage in working with the local farmers. Farmers were to participate in the work to ensure sustainability and the possibility of replication. Safe participatory strategies were adopted such that the

new paradigms were kept simple, productive, and cost-effective to promote voluntary participation. After visiting the farmers' fields and talking with the farmers, cultivation methods were modified to purify popular land races. These were carried out despite the constraints in the fields and with respect for the farmers' tastes and strong preferences, leaving

complex PPB options as a long-term goal and focusing first on short-term benefits. The strategies were adopted to suit the current and updateable knowledge base of farmer-partners.

STRATEGY USED TO PURIFY JEYPORE RICE VARIETIES

Using effective methods of sharing scientific knowledge, farmers were persuaded that they needed to modify their cultivation methods to achieve higher yields. By consensus, experimental plots of equal size were laid adjacent to one another. Traditional practices were used on one plot and modified methods on the other. Both plots were sown and harvested by the farmers with practical guidance from, and participation of, the MSSRF scientists. The plots that used the modified method showed a substantial improvement in grain yield (Table 17). At harvest, farmers were trained on the concept and utility of pure seeds, and how to select these pure seeds from individual plants. Over three seasons, farmers gained sufficient knowledge and experience on growing good rice crops, purifying land races, and producing pure seeds.

METHOD OF PURIFYING THALLI FINGER MILLET

Since an authentic record describing the diagnostic features of pichakaddi ragi did not exist, five farmers were identified as indigenous technical knowledge holders (ITKHs) using a new method of identification. Selected farmers grew several rows of pichakaddi

ragi in well-laid plots in several sites. Like rice, effective cultivation methods of pichakaddi ragi were used to raise good crops. The ITKHs were asked individually to tag the plants in the reproductive phase that, based on their knowledge, resembled authentic pichakaddi ragi. Selected plants carrying multiple tags numbered 1–5 were harvested separately, and their seeds saved for planting the following year. Further selection was made based on statistical analysis of data on several quantitative traits of selected plants. This cycle was repeated over three seasons. The process not only purified pichakaddi ragi, it increased yields severalfold. Farmers observed yield improvements of up to 200% compared to what they used to obtain. They attributed this yield increase to seed purity, row planting with more spacing (allowing proper tillering), synchronous maturity, and good seed filling.

Salient features of the studies

PPB, with the equal participation of farmers, respected the requirements of the farmers, and was implemented with their cooperation. When the technology was initially operationalized, scientists worked with the farmers in the field. Problems—such as field layout and spaced-out planting in rows with minimal labor support—were addressed, and remedies suggested. This process increased the farmers’ confidence in the technology and ensured that they used

Table 17: Yields of Selected Rice Land Races under Traditional and Modified Cultivation Methods at Jeypore

Land type	Land race	Average yield (kg/ha)		
		M	T	M/T
Lowland	<i>Machchakanta</i>	1,671	1,418	1.20
	<i>Bayagunda</i>	3,679	2,321	1.60
	<i>Gadakuta</i>	1,524	961	1.60
	<i>Barapanka</i>	3,438	2,533	1.40
	<i>Kalachudi (Umriachudi)</i>	2,562	2,007	1.30
Medium land	<i>Bodikaburi</i>	2,838	1,736	1.60
Upland	<i>Pandakagura</i>	1,188	1,178	1.01
	<i>Paradhan</i>	1,028	622	1.70
	<i>Matidhan</i>	1,199	1,133	1.06

ha = hectare; kg = kilogram; M = modified cultivation methods; T = traditional cultivation methods.

it faithfully in subsequent seasons without assistance from the MSSRF. Farmers never needed monetary or other incentives. This implied that once basic constraints and opportunities for participatory action had been recognized, respected, and acted upon, the participation of farmers—even those in difficult economic conditions—would be voluntary and total.

By the end of the 3-year experiment, some important lessons had been learned. For instance, the amount and distribution of rainfall during the experimental seasons in Jeypore were highly erratic. Conditions ranging from cyclones to long spells of drought and high temperatures were experienced within a single-crop season, resulting in varying magnitudes of yield stress. Nevertheless, community-preferred crops, such as rice land races, were genetically resilient and withstood the harsh weather. Meanwhile, HYVs in nearby areas suffered irretrievably. Thus, even in the face of multiple risks and ecosystem uncertainty, the PPB program succeeded. The main reason for this success was the synergy between the adaptive management of the rice crop and the farmers' cultivation experience and indigenous technical knowledge.

The appreciable yield improvement during the first year through modified cultivation methods, despite the uncertainties and odds, satisfied the farmers. This suggests that waiting to have all the information in place before taking action, and judging outcomes beforehand, might be impractical and even imprudent in unpredictable ecosystems.

Upscaling through participatory extension

Replication and upscaling of the PPB initiatives were the next steps in Jeypore. This would help transfer the economic benefits of upgraded land races to farming communities in the experimental sites and other villages in the region. In this context, farmers felt that those in nearby areas should visit the plots under modified cultivation and hold on-the-spot discussions. MSSRF encouraged the PPB farmers to take the lead in this activity. This farmer-to-farmer extension, put in place over a 3-year period, worked extremely well. The modified cultivation technology spread to several villages, increasing the demand for quality land race seeds and creating a new urgency for stepping up seed production. Simultaneously, at the farmers' request, periodic training and demonstration visits by MSSRF scientists helped farmers gain technical knowledge that they could integrate with their

traditional skills. For example, they used a long bamboo pole to mark rows, and women quickly adapted to spacing seedlings 20 centimeters apart quickly. Such modified practices were integrated with newly acquired technical knowledge, such as the application of farmyard manure before the crop season as the monsoon receded, to allow degeneration and incorporation of nutrients in the soil. Such initiatives sustained and improved the benefits of PPB.

One village, Nuaguda, that was not a test site for PPB participated voluntarily in all the meetings with farmers held by MSSRF, despite being about 40 km from Jeypore. Nuaguda turned out to be the best village at popularizing the modified cultivation module at the village level and substantially increasing the yields of land races. This was an instance of farmers voluntarily applying useable PPB technology to non-experimental areas.

While purifying land races, farmers identified the *Kalajeera* race as suitable for immediate seed multiplication and marketing. With its black husk, this land race has traditional significance since black is the preferred color for tribal functions. It has a strong aroma, and the cooked rice is white with a highly desired taste. Tribal farmers know that people living in Orissa's urban areas also would like *Kalajeera*. MSSRF facilitated the display of this land race in public exhibitions and local functions. Demand for this land race indicated its rising popularity and potential to fetch attractive prices. Within a year, the selling price of *Kalajeera* paddy shot up from Rs4–5 to Rs18–20 per kilogram, and *Kalajeera* rice from Rs7–8 to Rs22–25 per kilogram.

Participatory seed production also was profitable. In the first year, eight farmers in the village of Tolla allotted a contiguous area of 6.42 acres for seed production. With the participation of MSSRF, farmers learned the correct techniques for raising seed crops and selecting seeds. The net profit was 40%, equivalent to about Rs7,950 per hectare (Table 18). This benefit is expected to trigger an increase in seed production by farmers over the coming years.

Farmer-to-farmer extension is an easy way to replicate and scale up the PPB model in adjacent and remote sites. For example, the *Kalajeera* seed production strategy initially put in place in one village spread to 20 villages, covering 87 farmers located 12–120 km from the Jeypore PPB activity site. Coverage went from about 6.5–70 acres, with yields of 3–4 tons per hectare. MSSRF did not interfere, except to offer advice when needed by farmers.

Table 18: Benefit–Cost of Kalajeera Seed Production in Participatory Demonstration Plots of Seed Production

Village	Tolla
Contiguous plots (no.) assigned by farmers	8
Total area (acres)	6.42
Costs (Rs)	
Cost of initial seed provided by the MSSRF 170 kg x Rs7	1,190.00
Labor (transplanting)	750.00
Male: 30 x Rs.25	3,880.00
Female: 194 x Rs.20	3,600.00
Farmyard manure	1,000.00
Pesticides	450.00
Transport of material from field	2,000.00
Labor (harvest)	
Packing	1,500.00
Minor contingent costs (gunny bags, etc.)	659.00
Total cost	15,029.00
Seed yield	29 quintals
Quantity of seed sold	21 quintals
Quantity of seed retained by farmers for their use	8 quintals
Total sale of fresh seeds @ Rs17/per kg [2,100 x 17] (Rs)	35,700.00
Benefit [Rs35,700 – Rs15,029]	20,671.00
Benefit–Cost	1.4

kg = kilogram; MSSRF = M.S. Swaminathan Research Foundation; quintal = a unit of weight equivalent to 100 kg; Rs = Indian rupees.

Storage and marketing

In view of the popularity of the Kalajeera variety, villages felt that cooperative storage of grains and seeds was needed. In response, five villages constructed VSBs on their own initiative in village common areas. A VSB consists of a small, well-ventilated room (approximately 8 meters [m] long, 6 m wide, and 4 m high). The room has two cubicles where pure seeds are stored in one cubicle and grains in the other. Seeds and grains are stored in bamboo bins of appropriate

sizes and well-sealed with dung in accordance with the farmers' indigenous technical knowledge.

Self-management of VSBs and marketing

With counseling from MSSRF, the farming community unanimously decided on the management policies of VSBs:

- The Panchabati Grama Unnayan Samiti (PGUS), the apex body of farmers managed by a few elected representatives (usually five or six) from the member villages, would supervise the management of Kalajeera seed and grain production, marketing, and equitable distribution of profits, with the help of the PGUS president and five elected members; and
- Subcommittees with defined functions would help the Kalajeera Management Committee. Supervisory staff from MSSRF in Jeypore would be participating as counterparts of the committees, and would train and demonstrate the operational procedures. MSSRF also would oversee and advise the Kalajeera Management Committee on optimal functioning.

The focal points of markets also were discussed, and the following priorities were decided upon:

- To ensure quality, seed samples would be examined at the VSBs for uniformity and quality based on the farmers' indigenous practices. Likewise, grains would be appraised and graded according to two categories (Grades 1 and 2).
- Paddy that has been stored for a few months is known to fetch higher prices. However, farmers brought to the scientists' notice that some poor farmers would prefer to receive payment immediately. Thus, the options were to (i) advance some money as a loan, or (ii) sell fresh paddy at a lower price. After discussion, farmers agreed that 20% of the grain would be kept in VSBs, while the rest would be sold as fresh paddy in the first year and the sale amount shared proportionately. From the second year onwards, the stored paddy could be sold at a higher price.
- The possible markets that were identified include (i) fellow farmers from nearby villages, (ii) small local markets, (iii) local medium- and large-sized markets, and (iv) rice millers. The committee in charge of sales will explore feasible markets with the help of MSSRF scientists. People will decide the next course of action at their PGUS meeting.

- Problems related to a selected land race losing ground over time due to competitive markets selling the same land race, and the consequent fall in prices, were discussed at length. Farmers concluded that scientifically grown, purified, and graded land races would withstand competition. To be safe, farmers have started producing seeds of a few other preferred land races that could constitute the supportive second line of land races for commercialization. Provision has been made for midcourse corrections of this pilot marketing model after 1 year of operation.

PPB, food security, agro-diversity conservation, and poverty reduction

PPB offers a successful poverty-reduction approach that promotes the conservation of natural resources or agro-biodiversity, enhancement of these resources, cooperative marketing, and equitable sharing of benefits. Most importantly, this has led to purposeful conservation at no extra cost to the farmer. Specific outcomes are given below.

Food and nutritional security

The improved productivity of land races demonstrated by PPB has spurred farmers to purify other land races with an assortment of preferred attributes, such as medicinal properties and different levels of aroma. Thus, people could produce and market a variety of desired land races in addition to meeting their diverse food requirements. Such options should ensure food and economic security at the village level, which is crucial for poverty reduction.

An earlier hypothesis put forward by P.V. Sukhatme (1982) was that insufficient calorie intake generally results in protein malnutrition. An adequate supply of nutritious rice land races should help overcome calorie deficiencies and, in turn, reduce nutritional deficiencies. However, the projects did not quantify this general observation on health security.

Economic and social benefits

The demand for purified land races, such as Kalajeera, and the marketing model put in place are expected to go a long way toward ensuring economic gains and stability for poor farmers. Before the introduction of PPB and VSBs, people suffered as a result of the scarcity of good seeds and/or the high cost of seeds in conjunc-

tion with poor yields. A lack of adaptation strategies in the face of unpredictable weather and the unsuitability of traditional cultivation practices compounded these problems. Furthermore, farmers often were forced to borrow money at exorbitant interest rates, which intensified their income insecurity. With PPB initiatives and their associated empowerment strategies, the communities recovered and moved toward a state of economic and social stability.

VSBs provided a mechanism to help the poor and needy following the traditional process prevailing in local governance structures, such as the PRI. Under the PRI system, the village community identifies the needy and lends them seeds for planting or grains for consumption (or both). After the harvest, 150% of the quantity of seeds or grains borrowed must be returned. Such PRI codes of conduct ensure timely help for the poor, while replenishing and increasing VSB's stocks. The operation of PRIs provides important lessons in self-determination and decentralization of governance structures, especially in relation to natural resource management and poverty reduction.

VSBs constitute important links for people to bank their farm produce and money. The banks operate with cash and kind (seeds, grains, etc.), and have become an important depository for quality rice and *ragi* land race grains produced using organic farming techniques. The cooperative storage facility enables the disposal of seeds and grains at optimum time and profit. Furthermore, the low benefit-cost ratio has encouraged communities to extend the PPB model to other crops and cropping systems. The increased income enabled people to meet their clothing, housing, and other family needs, thus raising their social status significantly. Many farmers pointed this out when interviewed by scientists on the impact of PPB.

Catalyzing conservation

A cultivation-cum-conservation plan in which farmers grow their family-preferred germplasm around large plots where they cultivate a productive land race, such as Kalajeera, was demonstrated also. Farmers adopted this avenue to grow one or two lines of each land race they desired for their family functions. Across a set of farmers, the entire germplasm then would be multiplied. This new model was tested, found to work well, and did not involve special funds or incentives.

Recognizing gender roles

The PPB model enlisted the participation of women. Though men and women carried out a majority of the work together, men generally undertook the heavier chores, such as plowing, leveling, and land preparation. Women performed “nurturing” tasks, such as transplanting, weeding, seed preparation, seed selection, and care of livestock. The PPB model has helped women reduce the drudgery of haphazard transplanting of rice seedlings in the traditional way. Row planting allows them to stand after each row has been planted on instead of bending over continuously, as required by traditional haphazard planting.

The application of chemical and biochemical inputs was gender-related. Men mostly decided on the application of chemical inputs, whereas women mostly decided on matters relating to the preparation and application of biopesticides. The Green Foundation noted this difference, and encouraged women to become entrepreneurs in the production and sale of biopesticides and natural fertilizers, such as vermicompost. Women also mostly decided on the time of harvest and attended to post-harvest work, such as winnowing and cleaning of seeds. Proper storage in VSBs was also their responsibility. Poor women, particularly the landless, took part in PPB and benefited from the VSBs.

Lessons learned

- High-end technologies have little place for poor farmers. The only viable options are those that farmers can implement, appeal to their traditional logic, are cost-effective, can meet their food needs, and provide immediate economic relief.
- Farmers should “feel” the scientific remedies. In the case of land race purification, they understood where the problem was and how to address it. PPB options in which farmers test advanced generation material developed in laboratories (as found in many PPB studies across the world) do not provide that feeling. Consequently, farmers do not “own” such materials for upscaling, and instead consider them ready-made recipes. The PPB options of this case study were contrasting and farmer-centric in many respects.
- The entry point for any farmer intervention should emphasize the local block or village-level PRI. The farmers and PRIs should be partners in the management of field activities by helping each other and participating in a coordinated manner.

In Jeypore during the first year of the study, clear evidence was found that meaningful observations were impossible when people took insufficient care of our exploratory pilot trials. The situation changed dramatically in subsequent years when PRIs were made an integral component of PPB activities. Since elected PRI members can command the necessary administrative and implementing authority, they should be involved in replicating and upscaling activities.

- All experimental inferences and decisions must be shared with the farmers. Their comments, based on their experience, are often valid and must be given due weight.

Constraints

- Enhancing participatory strategies to cover diverse crops and cropping systems, and integrating them with livestock management at the household level, was a key demand from the community. Avenues to address such legitimate demands must be incorporated into projects.
- Planning and having a framework are requisites, although networking activities across partner institutions are important. This would involve additional resources, as well as the capacity of the project to address such issues adequately.
- Focusing on projects regarding important farmers’ problems should allow adequate space for partnering with the Government, whose help is essential in reaching all areas of a state. Government initiatives on plant breeding still focus mainly on endowed areas and high-end technology. Such formal plant breeding options must act in synergy with site-specific PPB to derive cumulative benefits.
- Providing an avenue to increase the calorie intake of the poor by improving the production of nutritious and farmer-desired crop varieties, this project though does not focus specifically on health and nutrition. Farmers who observe that their traditional crops and varieties satisfy their hunger more effectively than HYVs corroborate this to an extent. PPB, therefore, should focus more on nutritional security.

Recommendations

Conservation based on incentives or government funds are usually unsustainable. The farming community

will not integrate with a mandated activity. Thus, conservation stops with funding. On the other hand, the utility and economic benefits of biodiversity can be catalytic in sustaining conservation. Hence, the aim is to make conservation an integral part of poverty reduction paradigms rather than carry out conservation for its own sake.

The purpose of sustainable development is to derive optimal economic, social, and environmental benefits from natural resources and technologies. Consequently, it should be developed based on the indigenous knowledge and capacity of the recipient communities, rather than textbook technology. As local communities are willing to learn from practice, an option to benefit the local poor must take into account their problems and prioritize them with their participation (e.g., a PPB option to improve a land race). If the top priority can be addressed successfully and can meet the needs of the community, more complicated pathways would become candidates for participatory evaluation.

Farmer-to-farmer knowledge extension to replicate beneficial paradigms is one way of enhancing the capacity of local communities to promote development. Capacity building in securing sustainable livelihood would trigger the growth of newer options for community development.

Policy perspectives

Concerted help from the Government in furthering proven technologies and development paradigms would contribute significantly to poverty reduction efforts. Based on the PPB case study, the following help avenues become apparent:

- One area of great concern to the poor when putting together a strategy for their livelihood security based on integrated natural resource management is the marketing of economic produce generated through the activities. Deterrents in development initiatives include the dynamics of the market, fluctuating prices of commodities (such as purified rice land races), and falling demand due to good or bad proliferation of the seeds of land races or other produce. The Government could step in to ensure a stable price or arrange buy-back programs for poor farmers.
- Large-scale seed production of farmers' land races in smallholdings owned by the farmers poses a problem. Further production of seeds in farmers' fields under uncertain weather and

organic conditions would not ensure identical good quality seeds. With additional financial and infrastructure support, farmers can offset problems in the production of quality seeds to a certain extent. Such support could include, for example, building life-saving irrigation systems, including micro water-harvesting facilities; providing threshing yards and large organized seed storing systems; and procuring farmers' seeds.

- The experience of large-scale diversified government efforts in meeting the needs of a large section of the population should be harnessed and adopted to solve the problems of the poor. Such efforts should include a scope for formal and participatory approaches to ensure synergy. More synergy means more benefits in the short term.

From Field to Policy: Linking Livelihood, Health, and Conservation in Baimaxueshan Nature Reserve, People's Republic of China

Wu Yusong

Introduction

With a population of 1.3 billion and sustained annual GDP growth rates nearing 10%, the People's Republic of China (PRC) is the world's largest and fastest developing nation. The changes in the livelihood of the PRC people over the last 20 years of transition to a market-based economy are obvious, particularly in large cities and eastern coastal provinces. However, 70% of the population still live in far less-developed rural areas, and depend directly on natural resources for their livelihood through land modification, resource extraction, animal husbandry, tourism, etc. These rural people, who rely on natural resources, also tend to be the PRC's poorest. More than 100 million of them live below the international poverty line of \$1 per day. Moreover, because of economic destitution and heavy reliance on rapidly degrading natural resources—often coupled with a lack of civil society, communication, or education—the PRC's rural poor are particularly vulnerable to changes in policies, institutions, microeconomies, and the environment.

In the modern PRC, however, change is the status quo. This is particularly true in the light of policy

directives formulated by the central government and filtered down to every level of administration throughout the provinces, counties, townships, and villages. Central directives, such as the one in 1998 that banned logging following massive floodings due to the overflowing of the Yangtze River, have a history of radically altering the terrain for poverty reduction, rural development, and environmental preservation.

In 2001, with support from the World Wide Fund for Nature (WWF) Macroeconomics for Sustainable Development Programme Office and WWF United Kingdom, WWF China initiated the Poverty and Environment Project. Its aim was to demonstrate a win-win strategy for community-based resource management and biodiversity protection that could be disseminated to policy makers. This case study will present the success of community-based natural resource management within the Baimaxueshan Nature Reserve, Yunnan Province of the PRC, and show how the livelihoods of local communities have improved. Further, it will demonstrate how sustainable use of natural resources has had a positive impact on rural livelihood, while improving women's health care through sound and equitable environmental management networking, policy dialogue on local rights, and institutionalizing the process.

Understanding the Southwest PRC's forests

BIOLOGICAL IMPORTANCE OF THE SOUTHWEST PRC'S FORESTS

The uplands of the southwestern PRC, stretching from Shaanxi's Qinling Mountains to the Hengduan Mountains of northwestern Yunnan Province, are home to some of the country's last large stands of natural forests. In addition to providing timber for construction, fuelwood for local communities, and countless plants and animals for food and medicinal uses, these forests protect the upper watersheds of Asia's mightiest rivers. The Mekong, Yangtze, Bramaputra, and Salween originate from the Tibetan Plateau and flow through this area, cutting through gorges over a mile deep, and creating some of the most spectacular and forbidding landscapes on earth. Many ancient species, once widely distributed in Asia, that survived the harsh effects of the Pleistocene Period and the subsequent Ice Age can be found only in the deep valleys of this region. As a result, the southwest PRC has the most biologically diverse temperate forests on earth.

PEOPLE OF THE SOUTHWEST UPLANDS: POVERTY AND CULTURAL DIVERSITY

The tremendous biological diversity of the uplands of the southwest PRC is matched by an equal diversity of cultures. More than half of the 56 officially recognized ethnic minority "nationalities" of the PRC are found here, and in much of the region, Han Chinese are in the minority. The people of the region are among the PRC's poorest, however. Indeed, the same forbidding terrain that has protected ecosystems from overexploitation and slowed the processes of cultural assimilation also has served as a barrier to economic development. The southwest PRC's upland farmers live far from markets in areas that are ill-suited to high-input intensive agriculture, and were left behind during the surge in the PRC's rural economy during the 1980s. Economic activities in these areas often have involved unsustainable extraction of mineral or forest resources. This has taken a serious toll on complex and fragile upland environments while bringing limited benefits to local communities. In Yunnan Province alone, 73 counties register per capita incomes below the national poverty line of 825 yuan (CNY) (\$1 = CNY8.28) per year. This indicates that the eco-region and the people living there are vulnerable.

THE COUNTY, THE NATURE RESERVE, AND THE COMMUNITIES OF THE CASE STUDY

Deqin County, in the northwest of Yunnan Province, is sandwiched between the Mekong and Yangtze rivers at elevations ranging from 1,500 m to 5,400 m above sea level. It is bordered by Sichuan Province to the north and the Tibetan Autonomous Region to the west. Deep valleys and tall mountains characterize the county, resulting in extremely diverse climate, soil, and vegetation patterns and unique and fragile ecosystems. Baimaxueshan (White Horse Snow Mountain) is one of the more than 20 peaks in the area with an elevation of 5,000 m or more. It gives its name to the nature reserve that covers one third of the county. Some scholars have speculated that it was this region, not Tibet, that inspired James Hilton's classic utopian narrative of Shangri-la, *Lost Horizon*. Baimaxueshan is the habitat of more than 10,000 species of higher plants and a large number of endemic birds and mammals, including the highly endangered Yunnan snub-nosed monkey (*Rhinopithecus bieti*). The upland temperate forests here and elsewhere in the southwest PRC are the most biodiverse in the world.

With a territory of 7,504 km², Deqin County has 11,557 households and 58,168 people. The population has been growing, although it is still a sparsely populated county for the PRC with only 7.75 people per km². It has 13 ethnic minority nationalities, with Tibetans accounting for more than 80% of the population. Deqin is a nationally designated “poverty county.” Up to 30% of its households are in food deficit for 4–6 months of the year. As of 2001, 17% of the total population (about 10,000 people) lived in poverty, according to domestic standards (per capita income of CNY825). Of these people, 60% live in and around the nature reserve.

Fuelwood and (more rarely) hydropower are the major sources of energy. WWF China measured an average daily fuelwood consumption of 5 kg per capita in 1998. A typical household subsists on staple grains they have planted (e.g., maize, mountain barley, winter wheat), a few grazing animals (e.g., goats, yaks, cows), and also on a few apple or walnut trees they have grown. As in most upland minority areas, access to formal education is limited. Women, who are chiefly responsible for animal rearing, fuel and water collection, and other domestic tasks, experience particularly high rates of illiteracy (about 80%), with a corresponding low ability to gain access to technical knowledge and training. Language constraints and high rates of illiteracy make wage labor outside the village rare. A meager cash income is derived from the sale of fuelwood and edible fungi foraged from the forests. Housing, animal pens, water pipes, and other basic infrastructure are made from timber harvested from the forests.

Dilemmas of conservation and development in the Southwest PRC's forests

In a region with virtually no industry and few resources other than those from the forests, worsening poverty increases the pressure on those resources. In many upland areas, local government revenues come primarily from taxes on logging. Therefore, the ban means fewer funds are available to support forest protection. At the same time, traditional local subsistence depends on the use of local resources and attempts to generate income from activities such as collecting fuelwood, harvesting timber, grazing, collecting edible and medicinal plants, and hunting animals. This brings local people into increasing conflict with forestry staff.

Nevertheless, the situation in Baimaxueshan is representative of the wider phenomenon. In an extreme case, after the establishment of the nature reserve, every family in one of the villages included in WWF China's pilot site had at least one member who had been fined or arrested for timber or fuelwood cutting. Local forestry staff reported that illegal encroachments in the reserve have increased since the 1998 logging ban. Communities lack the incentive to maintain or improve their livelihood without degrading their natural surroundings. Nature reserve employees have neither the skills nor the resources to manage the vast forest areas under their jurisdiction effectively, or to engage communities in anything but an adversarial way. Furthermore, lack of fiscal and policy support exacerbates the problems of local communities and local government.

LOCAL CONTEXT ANALYSIS: DEQIN COUNTY AND BAIMAXUESHAN AREA

This section presents the conflicts that have resulted from the demands made on natural resources and local development policies.

Local community aspects

- **Food and water shortages.** A shortage of farmland, lack of sufficient productive inputs, poor irrigation channels, and frequent natural disasters due to intensive logging contribute to the lower-than-average grain production (compared to the rest of the Yunnan Province). This results in 3 months of food shortages per year on the average in this area, which in turn is also one main reason for illegal logging and hunting in this area. Poor irrigation channels due to increasingly serious topsoil erosion and forest degradation also lead to water shortages for human and animal husbandry needs. Poor infrastructure and inadequate technology and information are the most important factors linked to food and water shortages.
- **Heavy dependence on forest products.** Forest products have direct and indirect uses. Fuelwood consumption and timber requirements for house construction are well above the average for the Yunnan Province. The average household consumes roughly 20–25 cubic meters (cm³) of fuelwood per year, and roughly 150–200 cm³ of timber for house construction. Total fuelwood consumption is estimated at about 200,000 cm³ annually.

Another direct use of forests is the collection of NTFPs. Since local communities are unable to produce enough grain to satisfy their needs, they must buy grain from the market. Before the logging ban, people could earn cash by laboring for or serving logging companies. Since the logging ban, however, the main source of cash income has shifted to NTFP collection, which accounts for 80% of cash incomes. Edible mushrooms and traditional Chinese medicinal plants are the primary targets for collection. As with timber, access is open with no limitation on collection and no management system. This has caused a decline in the availability of NTFPs and, thereby, threatening forest quality and biodiversity, as well as long-term chances for income generation in this area. In addition, due to high but fluctuating prices of some NTFPs, serious conflicts over NTFP collections among local communities are reported frequently.

Similar problems regarding grazing lands also arise. Animal husbandry is the second largest source of cash income for local communities, and has become especially important since the logging ban. For historical and geographical reasons, tenure regimes for grazing lands follow a traditional scheme that does not limit the size of each family's herd. In addition, Tibetan culture emphasizes the intrinsic value of livestock ownership for social status over possible cash profits in the market, and market-bought chemical fertilizers (as opposed to manure) are inaccessibly expensive for local farmers. As a result, overgrazing has become increasingly acute. Consequently, the quality of grazing lands has declined, reducing the amount of milk produced by yaks to make butter. To preserve production levels, therefore, families have increased the size of their herds, aggravating the situation even more. Such conflicts decrease incomes for all parties, and harm long-term local relations.

- **Labor shortage and poor health care.** Despite the diversity of rural income generation and production activities, income is still insufficient to support livelihood. Each household typically will conduct about 10 kinds of productive activity. Since there has been a direct ratio between a family's labor and income from the advent of the household responsibility system in the early

1980s, this shortage has resulted in high rates of school dropouts. As in other areas in the PRC, women are marginalized in terms of education, health care, and capacity building.

Poor basic infrastructure services lead to time-consuming, labor-intensive activities for women. Traditionally, one family will consume 50–60 kg of fuelwood for cooking. This means an adult woman has to carry about 75 kg of fuelwood each day from the mountain. On the average, this will take 2–3 hours and can only be done twice a day. The situation is the same for collecting water, fodder, and so forth. Women commonly have gynecological health problems due to years of carrying heavy loads.

Poor sanitary conditions are another cause of health problems among women and children. According to local Tibetan living customs, only rich families (about one or two families in each subvillage) have an indoor toilet, and this is reserved for monks and men. Women can use only a toilet in the stable or outside.

One of the main problems that local people face in terms of sustainable livelihood improvements is the link between poverty and diseases. Based on WWF China's 10 case studies and 100 household questionnaires in the Baimaxueshan area, the poorest of the poor of the community have one patient per family. Due to low cash income and low yields from farmlands, any income from the sale of forest products is used mainly to buy food grains. Local people seldom see a doctor unless their illness is serious. The vicious cycle, whereby poverty causes disease and disease causes further poverty, is one of the biggest barriers for local people. Village women often cannot go to a hospital or buy medicine due to the lack of cash.

Policy and governmental aspects

The local government is focusing on accelerating the pace and process of local development. Its main strategies include upgrading basic infrastructure (e.g., building roads, improving irrigation channels, producing biogas, and developing tourism). Although this is important, the local government has built roads within the nature reserve to improve local transportation and communication, leading to biodiversity loss and deforestation in key areas. These roads also make illegal logging more convenient. Good intentions leading to negative impacts also

can be found with tourism development. The local government has launched an ecotourism campaign, with the reserve included in the plan. However, local government officials lack a clear understanding of what ecotourism means and what a sustainable plan entails. Future potential threats include biodiversity pressures from increased population density, and local conflicts arising from the lack of a benefit-sharing system.

In addition, compensation for wildlife damage is insufficient at the provincial and county levels. Therefore, even though the central government has a compensation policy, annual payouts are determined centrally, regardless of conditions, and the amount locals receive remains inadequate. Indeed, the average wildlife damage compensation represents just one tenth of the true value. This has caused serious conflict between reserve authorities and the local community.

Also, management staff in the nature reserve is insufficient. Further, the staff follows the traditional conservation discourse that considers local people a threat and an enemy of the forest. This is directly linked to the lose-lose situation in terms of the development of local livelihood and conservation targets. The Baimaxueshan Nature Reserve in Deqin County covers approximately 220,000 ha, yet the reserve staff comprises just 40 people—meaning each employee is responsible for 5,500 ha of reserve land. This shortage of human resources precludes any coordination of community affairs and limits the staff's ability to enforce logging regulations inside the reserve. Consequently, reserve authorities act as little more than forest guards and are unable to consider the effects on or input from local communities.

MESO CONTEXT ANALYSIS

Due to the PRC's size and governmental structure, provincial-level institutions were considered as the meso-influential factors. This is so because of their role as implementors and adapters of central directives at the local level and quasi-independent policy-formulating organs.

Yunnan Province is in the PRC's relatively undeveloped southwestern corner. The national institutional and market reforms that have driven the PRC's breathtaking economic growth over the last 25 years along the eastern seaboard and in large urban centers have been muffled at best in the country's western interior. Until recently, the latter regions lacked area-

specific government attention and typically receive foreign direct investment representing roughly one order of magnitude of the eastern provinces. Ecologically, however, areas of the western interior tend to support far more biodiversity and are more ecologically critical than the eastern lowlands.

Provincial poverty reduction. Provincial development agencies, such as the Yunnan Poverty Alleviation Office, are the main government agencies focusing on rural development and poverty reduction. Each county has earmarked funding for poverty reduction, with the local governor acting as the executive in charge of such work. This situation is unprecedented in the PRC's history and among many developing countries. The development of basic infrastructure in these rural areas has been given major impetus. Despite the possible impact of infrastructure construction on biodiversity conservation, this emphasis, nevertheless, has built a strong foundation for long-term rural development—improvements that could not have been achieved by development at the individual household level.

Provincial development philosophy has shifted significantly from county- to community- and household-targeted development. These changes have incorporated, at least in part, the concept of local participation and decision making in poverty reduction, which indicates a gradual ripening of the methodologies and practices of poverty reduction.

Nevertheless, a thorough analysis of new potential causes of poverty is lacking. After 20 years of the central government's poverty reduction program, poverty has declined in many areas. Zones that remain poor—the poorest of the poor—often face particularly complicated poverty-inducing situations. Besides economic factors, issues—such as environmental degradation, access rights for natural resource use, health care, and tax burdens—are emerging as important drivers of the poverty reduction process. In June 2004, central government agencies reported that despite recent advances in the battle against rural poverty, 800,000 people in the PRC had fallen back below the domestic poverty line (approximately \$100 per year) due to natural disasters in the previous year. Annually, the PRC experiences many natural disasters, such as floods and droughts. Several of them are the result of geographical location. Over the past decades, however, some disasters have been exacerbated by continued and severe environmental degradation, including

deforestation, resource mining, unchecked erosion and siltation, and air and water pollution.

Provincial environmental protection. Yunnan Province is covered by 9.5 million ha of forests, representing 7.4% of the PRC's forest land. Population growth and rapid economic expansion have led to considerable deforestation, including a 30–50% decline in forest cover over the last 50 years. However, 44% of Yunnan Province still is covered with forests. Typical of a province with rich forest resources, Yunnan has many protected areas, including 166 nature reserves with more being created yearly. The establishment of protected areas began in the early 1950s to conserve special types of resources and ecosystems. Protected areas account for 15–20% of the province's natural forest area, covering 2 million ha.

Multilevel legislation and policy burden the PRC nature reserves. In addition to following the national Forest Law and Nature Reserve Management Regulations, reserves must implement a series of locally specific laws and regulations. Moreover, the top-down approach to establishing a protected area in the PRC does not involve consultation with stakeholders. This can be the root cause of conflicts between nature reserve authorities and other stakeholders, such as local communities.

The main purpose of establishing a protected area is to preserve the biodiversity or unique endemic species. However, nature reserves exist within the social realities of increased competition for resources, compounded by growing populations, rapidly changing policies, the presence of multiple stakeholders with diverse interests, and other development trends. To conserve biodiversity and forest resources, the most valuable forests often are delimited inside a protected area. Unfortunately, mainstream understanding of poverty–environment links often omits natural resource access as a fundamental aspect. Moreover, based on conventional assumptions about resource use and management, nature reserve authorities tend to consider local people one of the greatest threats to forests and wildlife. As such, the laws and related regulations of forest reserves often aim to limit the access rights of local peoples.

The transitional phase of understanding poverty seldom includes the concept of the rural poor gaining more extensive control over productive assets such as land, water, forests and other natural resources, as

well as capital, infrastructure, technology, and other resources established at the center of rural poverty reduction goals.

MACRO CONTEXT ANALYSIS

The Government of the PRC recognizes the importance of the southwestern forests and the need to deal with persistent poverty in the area. The official attitude toward forests and forestry has undergone a transformation over the last 15 years—from an almost exclusively logging-oriented approach to a focus on conservation. During the 1980s and 2000s, hundreds of protected areas were established in the southwest, and large-scale watershed protection and reforestation schemes were launched. This culminated in the declaration of a ban on logging in natural forests of the upper Yangtze watershed following severe floods along the central and lower Yangtze in the summer of 1998.

While the logging ban and expansion of protected areas show the depth of the PRC's commitment to protect the southwestern forests, such measures could increase poverty among the local population. The impoverishment of these people does not guarantee effective biodiversity protection. And since the PRC's system on protected areas is chronically underfunded and understaffed, conflicts with local people tend to produce outcomes that are suboptimal for conservation and the local people's welfare. Without security of use rights, local people exploit natural resources opportunistically. They also have no incentive to practice sustainable management. As a result, the benefits they receive are unpredictable, and they live with the constant threat of fines or arrest.

Over the last 15 years, the Government has also attempted to address the growing gap between rich and poor regions. Areas of endemic poverty were identified, and special poverty reduction funds were created in an attempt to help these areas share in the rapid economic growth elsewhere in the country. As one of the country's last centers of persistent poverty, the southwest region received billions of yuan from such funds. The results, however, have been mixed. The Great Western Development Plan, drafted in 2000 and which affects 12 western provinces, is meant to close the development gap between the PRC's relatively poor, rural, inaccessible, and geographically and ethnically diverse west and the more prosperous east. Though this initiative encourages environmental improvement, which is considered important to economic development in poor areas,

it does not recognize the PRC's nature reserves as necessary vehicles in implementing this synergy and demonstrating the feasibility of ecologically integrated development.

One of the largest government development programs in the PRC is the Village-Based Integrated Poverty Reduction Plan for the Poorer Western Region, or Village Plan, started in 2001. Poverty reduction planning in the PRC previously was undertaken at the township or county level, isolated from other local policies. In the new program, the village is the planning unit, allowing better targeting and integration with other local development activities.

In addition, national legislative and planning initiatives include:

- **The 11th Five-Year Plan.** This directive, formulated by the State Development and Reform Commission, serves as a road map for all national initiatives during the planning phase. Formulated every 5 years since the ascendance of the Communist Party, this plan sets the agenda and the direction of development work at all levels of government. The next Five-Year Plan might incorporate an emphasis on environmental preservation as an integrated facet of poverty reduction and regional development.
- **Nature Reserve Law.** This legislation, to be developed by the State Forestry Administration and approved by the National People's Congress, will govern the management and philosophy of the PRC's 1,999 nature reserves. This revision might make room for, and emphasize, local community participation in natural resource management.
- **Village Organic Law.** This policy, which calls for democratic participation in self-governance at the village level, is a cornerstone in national recognition of village civil rights. A strengthening of this policy could extend village management rights to local natural resources and improve tenure contracts for village residents.

The central government announced an initiative to create a "Green GDP," a concept that entails measuring yearly environmental changes alongside traditional economic ones. Though this indicates that the Government is paying some attention to environmental issues, the initiative is still in its infancy. The concept would include only environmental factors for the index, ignoring social and cultural impacts.

Strategic interventions: design and action—comanagement networking for better livelihood

A wide range of experiences in developing countries has shown that provision of infrastructure, social services, technological improvements, and credit are necessary components of strategies designed to address rural poverty. Without a stable access to land and environmental resources, however, the rural poor are left without a solid foundation for increasing incomes and reinvesting in environmental resources. Research also shows that imbalances are heavily biased against women, who have been excluded and marginalized from the process for a number of historical and contemporary reasons, and in a number of ways.

This study believes that (i) poor people are not the cause of most environmental degradation since their consumption and production are much lower than those of the rich, yet the poor bear the consequences of environmental degradation; (ii) given the right incentives, the poor will invest in environmental improvements to enhance their livelihood and well-being by applying their own technical knowledge and adopting new technologies that are appropriate to their needs and circumstances; (iii) local communities are major and important stakeholders in the planning process, which means that bottom-up or participatory planning approaches should be considered a factor of success in managing natural resources—i.e., poor people must be seen as part of the solution rather than part of the problem, to improving environmental management; (iv) viewing local communities as unified stakeholder groups with similar needs and interests is always a danger; and (v) institutional reforms must allow the rural poor to increase their control over, and access to, natural resource wealth and environmental assets in the areas where they live.

The interventions designed in Baimaxueshan are meant to address the causes of challenges observed in the poverty and environment nexus. Since the Baimaxueshan area was chosen as the pilot site, the project plan emphasized local issues in their wider context. At the same time, however, it was designed to be easily adopted and reproduced in similar areas across the region.

COMMUNITY PARTICIPATION IN INTEGRATED CONSERVATION AND DEVELOPMENT ACTION

The community collective forest covers more than half the forest in Baimaxueshan Nature Reserve.

The study concluded that 80% of the average total income came from free access to environmental goods, meaning, the forest provides rural dwellers with a means of livelihood. To achieve a win-win solution in terms of livelihood development and natural resource conservation, WWF China acts as a facilitator to build trust among local communities, Baimaxueshan Nature Reserve Bureau, and outside NGOs. Local villages have participated in the integrated conservation and development project, which includes

- intensifying land use through the introduction of new seed varieties, establishment of a seed fund system, technical training, improvements to irrigation channels, etc., thereby alleviating food shortages (yield increases of 50–150%);
- improving animal husbandry productivity through veterinary training and establishment of a village veterinary fund;
- reducing fuelwood consumption by more than 50% through the introduction of wood-saving stoves and new fodder preparation techniques;
- building physical infrastructure improvements, water tanks, and grain processing facilities, etc., while emphasizing sustainable management of these assets;
- involving local communities in sustainable natural resources management techniques, such as the reforestation of previous logging sites; developing local environmental protection regulations; and facilitating the comanagement of NTFP use, such as *matsutake* mushroom harvesting; and
- cooperating with local Tibetan Buddhist monastics to invite *Gexi* (doctoral-level Buddhists regarded as living Buddhas) to pray for mountain enclosure for reforestation, strengthening enforcement of local regulations.

After 3 years of project implementation, local villagers' progression from their initial status as observers to participants in self-initiated activities has had a tremendous positive impact at various levels. Livelihood levels improved with a 60–150% increase in cash income. The quality and quantity of forest covers improved, with better management of about 20,000 ha of community collective forests and habitat for the Yunnan snub-nosed monkeys. Local governance and resource management capacity was strengthened with the establishment of a comanagement network on sustainable NTFP management, and a forest patrolling system initiated by the local community. By involving 74 sub-villages in

Baimaxueshan, the project has had positive impacts on other communities. These improvements are in addition to other community development activities, such as improving sanitary toilet conditions and providing health training to women and children. In addition, WWF China found out that the livelihood improvements achieved in the reserve have benefited local women particularly.

Women play an important role in the collection and management of NTFPs. During the collection season, almost 80% of local women are involved in collection on the mountain. Further, more than 80% said they have more confidence when they improve their cash income from NTFP collections. Involving women in the business and marketing of NTFPs gave them more opportunities to interact with outsiders and improve their capacity for self-governance (e.g., negotiating with outsiders, enforcing local regulations, etc.) and financial management. Most importantly, all women thought that an increase in cash income from collecting NTFPs allowed them to spend more money on children's education, health care, and ritual activities.

These women were concerned about the damage to, and collapse of, irrigation channels during the rainy season. Heavy rain and soil erosion easily destroy traditional irrigation channels constructed and linked with timber. In addition, the rainy season comes when men are away from the villages for work, leaving the women and the elderly at home. In this situation, women find it almost impossible to rebuild destroyed water channels, resulting in water shortages or the consumption of muddy water. The project implemented schemes to help solve this major problem faced by women.

Heavy labor has undermined women's health. New energy-saving stoves and fodder preparation techniques helped women save time spent on housework and other laborious activities, while the chimneys on the new stoves reduced the rate and risk of developing eye diseases, and the new demonstration sanitary toilets lowered the risk of women and children contracting other diseases.

These achievements have not arisen from WWF China's endeavors alone; they also are linked to the efforts of local government agencies and the wisdom of local communities. Influenced by WWF China's Integrated Conservation and Development Project concept, local government agencies (e.g., the local Agriculture Bureau, the Hydropower and Water Resource Management Bureau, and others)

participate in the conservation effort. In particular, they support basic infrastructure improvements that WWF China, as an NGO, cannot carry out. In addition, by taking into account traditional religious beliefs regarding conservation and the community's views on NTFP management, these agencies are learning from local wisdom and traditional practices. In brief, the project is a joint effort of government agencies at different levels, local communities, and WWF China.

MAKING SPACE FOR COMMUNITY PARTICIPATION

The sustainable management of matsutake was thought to be one of the main alternative approaches to generating more income, while linking conservation and development issues at the community level. However, no single party can achieve this goal alone, which illustrates the basic concept of comanagement of natural resources involving multiple stakeholders. The comanagement project focused more attention on empowering the local community in decision making, and setting up an equitable benefit-sharing system. Local farmers organized themselves into groups based on the established sustainable NTFP management system, and discussed participatory management. These talks covered the sustainable management of grazing lands, cutting regulations within the reserve, the resource management agreement, new technologies, the sharing of market information between the management bureau and local communities, and the establishment of a regular communication channel between officials and local communities.

As a result of these activities, local people's income has increased considerably. For example, in previous years, one family might have collected 30 kg of matsutake and earned about CNY2,000. Now, the same family might collect 50–60 kg, generating about CNY6,000—an increase of 150–200%. (These figures represent averages for the region.) Following these successes, a network for sustainable natural resource management was created, and more local communities have asked to join the network and share the responsibilities and benefits of the cooperative efforts. Among the local staff and farmers, the capacity for and awareness of resource comanagement has improved significantly during project implementation.

The concept of comanagement techniques introduced and implemented in reserve villages, whereby villagers are involved in the management of the nature reserve alongside reserve staff, is not new.

It is recognized at the national level in the PRC as an important problem-solving technique, particularly for resource disputes. However, some issues still remain regarding the understanding of true comanagement practices. Many government leaders see comanagement as a work-based system (e.g., hiring local villagers to enforce reserve regulations alongside outside staff), as opposed to a rights-based system that gives villagers, as residents of the land, the authority to be involved in the decision-making processes that control the course of their lives. Consequently, important aspects of the project include training villagers and staff in comanagement negotiation skills, setting up communication channels, and improving awareness of both parties of the issues at stake. Ultimately, comanagement philosophies are to be incorporated into local policy, with villagers often suggesting new management techniques.

Comanagement was the guiding principle for on-the-ground demonstrations and policy advocacy. Through comanagement, the project hoped to empower local communities by involving them in decision-making processes, particularly in the formulation of reserve policies, and to increase official recognition at all levels of a rights-based local initiative. Comanagement, therefore, should be understood more as a new paradigm rather than a practice. It can be implemented and achieved only through teamwork and cooperation among multiple parties. Based on this understanding, some power sharing in making decisions and controlling outcomes is a precondition for any system of comanagement.

After implementation, the project achieved its planned goals, objectives, and outputs. Sustainable resource management approaches were developed and tested in selected project sites, and then disseminated to the other areas. During project implementation, the staff of Baimaxueshan and local farmers enhanced their capacity for forest management. In particular, local farmers' negotiating skills improved in terms of protecting their rights.

Focus of the policy dialogue process on local rights in natural resource management

Today, the World Bank's definition of poverty as a "pronounced deprivation in well-being" is widely accepted. From this perspective, poverty is regarded as the deprivation of a multifaceted set of material goods, assets, conditions, and opportunities. These

aspects suggested that it was crucial to consider poverty and environmental links to provide useful insights to policy makers on how to improve the overall situation in similar areas.

WWF China views poverty more specifically as a social relationship of competition among individuals, social groups, and the Government in the pursuit of wealth and political power. This definition has significant policy and operational implications because it requires not only economic growth to overcome poverty, but also a transformation of the social relations at the root of poverty.

AWARENESS BUILDING AND POLICY DIALOGUE BASED ON FIELD DEMONSTRATIONS

Many attempts to support comanagement encounter difficulties that originate in the social or physical environment where the activities are taking place. Rather than being generated organically, outside sources in the international community often drive comanagement initiatives. In addition, though local governments often recognize the benefits of comanagement, their current institutional arrangements cannot satisfy human and financial resource requirements. Most important, however, is the continued refusal of government organizations at different levels to recognize the capacity and rights of local people to manage resources and to decide. These essential aspects of a comanagement program can be referred to as the enabling environment.

Based on previous project implementation and comanagement training in Baimaxueshan Nature Reserve, local government officers have realized the importance of comanagement as an alternative for achieving sustainable resource management and livelihood. The Baimaxueshan Nature Reserve Management Bureau proposed adjusting past institutional arrangements to support future comanagement activities in the Baimaxueshan area. Local communities and related community-based resource management issues are considered one of the main objectives of work within the official management system.

CONSTANT POLICY DIALOGUE THROUGH THE NATIONAL ADVISORY COMMITTEE

To fully understand poverty and environment problems in the study area, numerous visits and discussions were held at provincial, prefecture, and county levels, particularly in the early stage of the project. Further, by identifying some key policy makers who would become members of the National Advisory

Committees (NACs), the project developed a sense of ownership of the project outcomes among the members and the government agencies they represent. The wide coverage of government policy-making bodies at national and provincial levels where advisory committee members are associated, was instrumental in helping them better understand poverty and environmental problems and their dynamic links from different perspectives, as well as build links to disseminate outputs.

During the preparation of the national policy assessment work, NAC members provided the team with strong support, including up-to-date insights on policy directions. NAC members in the State Forestry Administration, the State Environmental Protection Administration, and the Poverty Alleviation Office of the State Council provided special help. Local government officers also provided a large amount of valuable information and data to help with fieldwork and case studies. The establishment of NAC also helped foster dialogues among stakeholders, policy makers, researchers, and field practitioners.

CONFERENCE ON POVERTY AND ENVIRONMENT LINKS AT THE NATIONAL LEVEL

In recent years, an increasing number of domestic, international, government and nongovernment institutions, and individuals have been involved in practical experiences of environment–poverty links in the PRC. To provide a forum and facilitate dialogues among the Government, other PRC organizations, and international experts, as well as to raise awareness and exchange experiences on how environment–poverty challenges might be addressed in the PRC, WWF China initiated an alliance in cooperation with the United Kingdom’s (UK) Department for International Development (DFID), the World Bank, and ADB. In addition, the State Development and Reform Committee of the Government sponsored the international “Workshop on Poverty and Environment Dynamics: Challenges and Opportunities for the PRC” in Beijing in January 2004. Participants included the State Development and Reform Committee, the State Agricultural Administration, the Developmental Research Center of the State Council, the State Forestry Administration, the Chinese Academy of Social Science, the Chinese Agricultural University, representatives from eight central and western provincial governments, members of mass media, and representatives of international organizations.

Through dialogues and other forms of communication, some common grounds were found, including (i) the Government should encourage and support independent teams to assess and evaluate the performance and impact of major poverty and environment policies that have been, or are being, implemented; and (ii) methodologies for the assessment and valuation of environmental services, as well as for the valuation of resource utilization, need to be developed.

COOPERATION WITH NONCONSERVATION GOVERNMENT AGENCIES TO BUILD CAPACITY AND LEVERAGE GOVERNMENT INPUTS ON CONSERVATION

Assessment and research work was initiated on the Village Plan project, exploring particularly its treatment of the poverty–environment links. The project helped produce a guidebook and a checklist for planners at county and provincial levels to help them integrate environmental considerations into poverty reduction planning more effectively. To increase its impact, the guidebook and the checklist were designed for use when advising on village plans and as a guide to future poverty project planning. These documents also incorporated environment and ecology concepts and explanations to be used as a training manual by the staff of poverty reduction offices at the county and provincial levels.

In the PRC, international conservation organizations generally do not work with development agencies. WWF China initiated the assessment of a government poverty reduction project, which can be seen as a beginning. This step shows that conservation and development organizations should work more closely to achieve win-win solutions for sustainable development. During the assessment of the Village Plan project, government officers from development agencies, such as the Yunnan Poverty Alleviation Office, participated in all phases of the project, including the preliminary study, assessment and research work in the field, development of practical tools, and so forth. This participation helped put into practice the outcome of the research, while the process served as an excellent advocacy process for meso-level decision makers. The World Bank's Beijing Office also participated in the project, which helped expand activities from Yunnan Province to Sichuan Province. This established the project as a regional action. The World Bank's input also added value to the impact of the project.

LEGITIMIZING AND INSTITUTIONALIZING LOCAL RIGHTS IN NATURAL RESOURCE MANAGEMENT AT THE NATIONAL LEVEL

At the local level, comanagement is based on traditional knowledge, customs, and practices in preserving forests and local agro-ecosystems. Rules, guidelines, and social organizations are established and reestablished in response to the ever-changing socioeconomic and political situations and conflicts affecting local control of forest resources.

At the meso and macro levels, comanagement brings us to an expanded concept of responsibility, an ideal that is superior to the concept of participation. Responsibility necessarily implies the institutionalization of local and traditional stakeholder systems (knowledge, statutory and organizational context, local expertise). Through this comes recognition by the legal system.

The challenge is how to establish an equitable benefit-sharing system that supports sustainable natural resource management. Minimum legal preconditions required for comanagement, and the decentralization it demands, must be created. The true mastery of natural resource management can be reached only if legal conditions for the separation of power, as well as the clarification of roles and responsibilities for each actor, are fulfilled.

Comanagement, as an alternative initiative-based approach and a new paradigm, can help achieve an equitable decision-making and benefit-sharing regime. The guiding principles of comanagement actions, therefore, should include (i) acceptance of traditional customs and community rights in managing resources, (ii) equity and social justice, (iii) sustainable production and ecosystem equilibrium, and (iv) participation by all stakeholders and community members.

In late 2004, WWF China held an international conference in Beijing, entitled, "Comanagement of Natural Resources in the PRC: Experiences and Policy Implications." The aim of the conference was to summarize comanagement experiences and project results as a means to promote the understanding and adoption of comanagement institutions at the national level. Unlike previous policy advocacy work, this conference focused on the prospects for national legislation that recognizes community rights. The policy and legal framework recommendations emphasized

- recognizing local rights and social capital for resource management;

- increasing the flexibility of the definition of nature reserves;
- creating new institutional arrangements to help meet reserve objectives;
- involving local participants in reserve conflict resolution; and
- advocating comanagement as a principle, mechanism, and conflict resolution process in reserve management.

Stakeholders at all levels participated in the conference. At the national level, participants included officials from the National People's Congress, the State Environmental Protection Administration, and the State Forestry Administration. Representatives from local governments in charge of reserve and resource management were also present, along with local reserve authorities, local comanagement practitioners, villagers, local NGOs, and other interested parties. International organizations that were invited included the Conservation International the PRC Office, DFID Beijing Office, World Bank Beijing Office, and others. Mr. Mao Rubai, director of the Environment and Resource Committee of the National People's Congress, mentioned that the PRC's first Reserve Law will be developed in 2006. He also proposed comments on behalf of the National People's Congress. The discussion on comanagement issues related to local rights on resource management inspired valuable ideas for future legislation.

Conclusions

The project shows that local demonstrations in pilot sites are insufficient for regional adoption and, thus, for sustainability. Even if a concept can be proven to work effectively in one pilot site, greater and institutionalized forces are often at play that control the fate of isolated initiatives. Consequently, the Poverty and Environment Project aims to pay more attention to shifts in legitimacy, collaboration, responsibility, and incentives to cultivate the latent conditions necessary for widespread sustainability. By addressing this social and political framework, the project hopes to achieve the strategic goal of sustainable participatory management of critical natural resources.

A series of gaps hampers further progress in the modern PRC's poverty-environment nexus. Combining ground action with training and policy advocacy, the project has shown that in nature reserves and government agencies across the Yunnan Province and the southwest region, chasms exist between the

valuable lessons learned through ground demonstrations and policy implementation; between successes in one pilot reserve and implementation in other regional reserves facing similar issues; between research activities of one institution or NGO and the actions of another; between local governments and nature reserves; and between the recognition of needs-based and rights-based initiatives.

Much has been said and done about the livelihood and ecological issues faced by residents in areas, such as the Baimaxueshan Nature Reserve. Through demonstrated comanagement techniques, concrete and repeatable steps have been taken to alleviate many of these problems, and the people whose lives are affected are continuing these. However, to ensure that such pilot programs are sustainable, the lessons learned must be enshrined in policy. Although progress has been made, particularly at local government levels within the Baimaxueshan Reserve, the gains in such pilot programs are fragile without continued legislative and representative support from the higher levels of county, provincial, and central governments.

Another lesson emphasized over the course of the project is the need for greater focus on the implementation of successful practices. A pilot site is, in essence, an island for experimentation. It remains just that unless its successes are repeated in similar areas. This problem is acute in the Yunnan Province. The achievements in villages within the Baimaxueshan Reserve are commendable. However, Yunnan Province now has more than 166 nature reserves, with more being established every year. Although many officials (e.g., in the Yunnan Forestry Office) now understand the issues created for local peoples when a nature reserve is established around them, this knowledge does not always translate into the implementation of comanagement. As a result, despite the knowledge and requisite channels being in place to help alleviate these issues, the same problems are being encountered. As long as this gap between understanding and implementation remains, any hope of spreading the lessons learned in one site to others across the province is limited.

A third issue involves responsibility. The project found that local governments whose jurisdictions include nature reserves tend to withhold funding earmarked for communities within the reserve, and spend the money elsewhere in the county. Although these officials recognize their responsibility toward the reserve's communities, they still tend to transfer this responsibility to the reserve's management

bureau. Since the latter lacks the funds and ability to carry out social development issues, local communities often go unsupported.

Finally, a persistent gap in understanding remains among high-level government agencies. The State Forestry Administration, for example, recognizes the concept of comanagement, but ignores local rights to natural resource management. As another example, under the current policy framework, NTFP management is considered an alternative resource use that shifts the pressure from timber to other forest products. This view, however, does not take into account local villagers' social and cultural capital, and hinders community empowerment in resource management. These are disincentives for local people to practice sustainable resource use, resulting in persistent ecological pressure.

Such is the intractable context of the southwest PRC's poverty–environment nexus. However, through 4 years of research and action experience, the project has identified some tools that are exceptionally effective in negotiating these obstacles. In particular, these include the NAC, group advocacy, on-the-ground demonstrations, and capacity building.

NAC's involvement in the project from the early stages proved particularly valuable in terms of advocacy and consultation. The group was well-informed and updated on project details, which gave NAC a good understanding of project issues. This understanding, coupled with the diverse makeup and broad expertise of the group, encouraged NAC to make valuable suggestions on project implementation. Moreover, because these suggestions came from within NAC, group representatives are now set to continue considering poverty and environmental issues in a sustainable way under their own motivation and interest.

Group advocacy, as opposed to an isolated approach, was also important in achieving program goals. As the local presence of an international conservation NGO, WWF China can function only as a marginal player in domestic activities, particularly those meant to address poverty issues. To make a strong impact in policy advocacy, the participation of groups with established government ties—ADB,

Conservation International, DFID, IUCN, and the World Bank—had to be ensured to bring weight to the discussions. Such an approach effectively combined strength with know-how to deepen the effectiveness of advocacy, particularly at the national level. The experience of this cooperation also will contribute to future collaborative efforts on policy advocacy.

The project also found on-the-ground demonstrations to be a crucial tool in changing policy. Experience has shown that advice based on principles or theories alone is ineffective for policy advocacy. In the PRC, officials demand hard evidence of successful implementation in addition to academic-based support, before considering the benefits of a policy proposal. Continued pilot demonstrations at Baimaxueshan, therefore, allowed local and national authorities to grasp tangible achievements that could be codified at higher levels. For example, while the concept of comanagement has long been supported in the PRC government circles, it no longer is an unproven idea offering the possibility of benefit. It is now an actively sought tool following concrete demonstrations.

Finally, the importance of two-way capacity building has been evident throughout the project. Training and educating local staff and local communities in comanagement techniques, for example, is important. However, the policy makers who influence the sustainability of local projects through legislation and support must be involved also. Creating a sense of mutual understanding and empathy among stakeholders at different levels is important in contextualizing the framework within which parties operate. Local staff and villagers, through cross-visits and field trips, need the chance to meet with high-level administrators so that they might witness local realities and problems. This process gives the reports a face, which helps personalize poverty and environmental issues.

More importantly, local enthusiasm and awareness are strong. From within and without nature reserves in the Yunnan Province, citizens and local officials are interested in the possibilities of rural development and ecological conservation working hand in hand.