

Issue Paper

# Forest Interventions with Economic Returns

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## FOREST INTERVENTIONS WITH ECONOMIC RETURNS

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### Executive Summary

Continued forest degradation confounds poverty alleviation efforts on two fronts. First, about 60 million people are almost wholly dependent on forests; some 350 million people live within or adjacent to dense forests and depend on them for subsistence and income; and forest resources directly contribute to the livelihoods of some 90 percent of the world's 1.2 billion people living in extreme poverty. And second, the world's poor are disproportionately vulnerable to the adverse effects of climate change, 15-20 percent of which is driven by deforestation. In fact, poverty and forest loss often go hand in hand; many of the world's poorest countries and regions are those that are also quickly losing their forests.

Four types of solutions can help solve both problems, achieving both economic development and forest conservation outcomes:

- **Governance and other capacity building:** Reforms, participation, and planning processes are necessary for national economic development, for ensuring that economic growth reduces poverty, and for ensuring the effectiveness of forest conservation activities.
- **Improved land management:** Sustainable management of forests and farms can provide local and national-level economic development opportunities while addressing the causes of deforestation.
- **Enhanced income streams for forest communities:** Programs to help communities generate and market sustainable products, pursue alternative livelihood opportunities, or benefit from providing environmental services can provide local- to national-scale economic benefits.
- **Forest protection and expansion:** Actions to protect forests and expand forest cover can also create win-win scenarios for local communities.

Therefore, leading international development institutions should increase their focus on, and their allocation of resources to, these forest solutions. This paper examines the growing evidence of these win-win opportunities. It shows that many forest conservation activities have a proven track record of measurably reducing poverty in rural and forest communities and creating benefits for national economic development.

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## Introduction

Forest resources directly contribute to the livelihoods of some 90 percent of the world's 1.2 billion people living in extreme poverty (World Bank, 2002); however, many of the world's poorest countries are also those losing their forests. Of the 48 least developed countries, 35 reported forest cover loss between 2005 and 2010 (UN-OHRLS<sup>2</sup> n.d.; Food and Agriculture Organization of the United Nations [FAO] 2010). Three of the top five deforesting countries (Myanmar, Democratic Republic of Congo, and Zambia) fall into this category. Even in more rapidly developing countries, though deforestation is primarily taking place in poorer rural areas, it is the large corporations—not the rural poor—that are causing this damage (Rudel et al. 2009), and generally the poor derive less income from natural resources than the wealthy (World Resources Institute [WRI] et al. 2005). In Brazil, the top deforesting country, 25% of the rural population is classified as extremely poor (International Fund for Agricultural Development [IFAD] n.d. [a]); 40% of rural households are smallholder farmers and another 46% are landless. In Indonesia, the second-highest deforesting country, 50% of the country lives below the national poverty line, and 70% of the population lives in rural areas where poverty rates average more than 16% (IFAD n.d. [b]).

With the impacts of climate change disproportionately impacting poor countries (Mendelsohn et al. 2006), and with a sizable portion of global climate emissions coming from developing country forest loss, climate change has brought renewed attention, action, funding, and urgency to tropical forest conservation globally. Climate-related forest conservation efforts to date have made it clear that success will involve far more than just compensating people and governments for keeping their forests standing. Rather, a range of forest-related actions, programs, policies, institutions and initiatives will need to be pursued simultaneously by actors in government, nonprofits, and the private sector. Many of the necessary activities are, at their core, development activities.

Synergy between poverty alleviation and the maintenance of tropical forests isn't always the natural outcome of either rural development or forest conservation activities, however. In fact, as attention on sustainable development was growing with the announcement of the Millennium Development Goals more than a decade ago, one experienced forest researcher put forth a rather pessimistic hypothesis:

*"In a landscape designed exclusively for the objective of poverty alleviation, where a flexible supply of labor, capital, and access to physical infrastructure (roads, rails, ports) and alternative land use options exist, there will be little place for natural forests." (Wunder 2001, 1878)*

This challenge to development-focused forestry, environmental, and natural resource practitioners—to either disprove Wunder's hypothesis or accept the tradeoffs—has been answered in the intervening decade by solid research into the impacts of on-the-ground forest interventions. This research evaluating the relationship between forest conservation actions and economic growth or poverty alleviation provides examples of many win-win opportunities but also confirms that, in some instances, there are tradeoffs.

In this paper, we focus on identifying the range of win-win opportunities, rather than trying to guide decision making when tradeoffs predominate. We take a brief and focused dive into a cross-section of the research in this area, asking: What evidence exists of forest conservation-related interventions that generate demonstrable and measurable improvements in economic growth and poverty alleviation, particularly in forest-dependent communities?

We reviewed studies that evaluated the measurable financial outcomes of forest conservation interventions, thus focusing as much as possible on those conservation activities that promote economic growth and/or help alleviate poverty. Of course, the drivers of deforestation vary dramatically in different localities, and the activities undertaken to slow and reverse forest loss will also depend to a large degree on context. We identify just a few examples of

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<sup>2</sup> UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and the Small Island Developing States



each activity that hold lessons beyond their specific geography; additional literature relevant to particular geographies is available for most interventions.

We organize these interventions with win-win potential into four broad type categories: (1) governance and other capacity building, (2) altered land management, (3) enhanced income streams for forest communities, and (4) forest protection and expansion (Box 1). We place a heavier emphasis on the interventions whose benefits do not depend on the establishment of a carbon market.

### Box 1—Forest Interventions with Win-Win Potential<sup>3</sup>

<ol style="list-style-type: none"> <li>1. Governance and Other Capacity Building               <ol style="list-style-type: none"> <li>1.1. Forest Governance Reform</li> <li>1.2. Resource Tenure Rights and Reform</li> <li>1.3. Building Processes for Effective Participation</li> <li>1.4. Spatial Planning for Rural Development</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>3. Improving, Supplementing, and Shifting Income Streams               <ol style="list-style-type: none"> <li>3.1. Payments for Environmental/Ecosystem Services</li> <li>3.2. Increasing Product Value</li> <li>3.3. Alternative Livelihoods</li> </ol> </li> </ol>
<ol style="list-style-type: none"> <li>2. Sustainable and Improved Management of Forests and Agriculture               <ol style="list-style-type: none"> <li>2.1. Community Forest Management</li> <li>2.2. Reduced-Impact Logging</li> <li>2.3. Land Swaps</li> <li>2.4. Agroforestry</li> <li>2.5. Sustainable Agricultural Intensification</li> <li>2.6. Improved Efficiency</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>4. Protecting and Expanding Forests               <ol style="list-style-type: none"> <li>4.1. Protected Areas</li> <li>4.2. Fire Prevention Programs</li> <li>4.3. Reforestation and Restoration of Degraded Lands</li> </ol> </li> </ol>

## 1 Governance and Other Capacity Building

A common theme across both poverty alleviation and forest conservation efforts is the importance of effective, efficient, and participatory governance. The widely understood development benefits of improved governance and capacity building have long been priorities in pursuit of poverty reduction and economic growth. We therefore focus Section 1 on the specific types of governance and capacity building activities that are critical to reducing forest loss and how those activities relate to poverty reduction or economic growth.

Without improvements in governance, the ability of forest conservation to alleviate poverty is challenged by the limited ability of the poor to manage land on which they have restricted access or insecure tenure (WRI et al. 2005). This subsequently limits their ability to make investments, effectively manage common areas, or create markets for their products. Furthermore, addressing governance challenges can help ensure that forest conservation activities with economic development benefits also improve community power dynamics and distribute benefits equitably. Forest-specific governance reform to alleviate poverty must address two fundamental problems. First, rights, ownership, and control of many tropical forests are not clearly granted to governments, communities, or private actors and, even if established, are often not respected. Second, it is unclear how to balance the interests of some people in removing trees against the interests of others in maintaining the environmental benefits of those trees (Chomitz et al. 2007). These problems essentially boil down to questions of who gets to decide what about forests, and how (Cotula and Mayers 2009).

Most of the forest conservation activities below attempt to address how to balance interests, using various mechanisms to reduce the conflicts among competing interests or to shift the relative economic or social value of conservation activities over land conversion. But the first problem—who gets to decide what—must also be

<sup>3</sup> Categorization adopted from Cortez and Stephen (2010) and Peskett et al. (2008)

addressed. The examples below show that, if appropriately and specifically designed, governance actions taken as part of development can have forest co-benefits, and the economic gains produced will be more effective for community poverty alleviation.

## 1.1 Forest Governance Reform

Governance reform actions in the land use and forest sectors that have the potential to benefit forests include improving law enforcement, providing transparency, defining rights, and creating benefit-sharing mechanisms. Each of these activities can address well-understood failures that work against forest conservation.

Poor forest governance can encourage deforestation, exacerbate poverty, and slow economic growth through a number of mechanisms. A lack of capacity to enforce laws can allow illegal forest activities, including large-scale and unsustainable extraction and land use conversion, to proceed with impunity. This inhibits local economic development, leaving less than 3% of total product value in local communities (Kishor and Damania 2007). A lack of transparency, participation, coordination, and accountability mechanisms, as well as a lack of systems and procedures for applying laws and regulations, can allow powerful institutions to outweigh local interests. This occurs through discretionary enforcement, corruption, and/or elite capture that deflect existing institutions and protections (Cotula and Mayers 2009). Poor governance and poorly defined resource rights can shift economic incentives away from investment, reducing the value of sustainable forest management to land holders or encouraging overutilization by local communities (Chomitz et al. 2007), rather than developing economically and environmentally sustainable forestry sectors.

This is not to say that better governance will by itself slow deforestation, but rather that it is an essential prerequisite for socially and environmentally sustainable solutions. For example, community forest management programs can slow and reverse forest loss while generating income for local communities (see Section 2.1 below), but can fail without legal tenure and strong law enforcement that together can allow the community to actually control the forest area under better management. As a second example, consider a system of payments to communities for maintaining the health of their ecosystems (see Section 3.1 below). Strong governance is a prerequisite to the success of such a program, as clear land tenure is needed to link payments to people, transparency is needed to avoid cheating, and law enforcement is again necessary to ensure that individuals and communities can actually control their land. Developing and improving governance goes hand in hand with forest conservation activities.

## 1.2 Resource Tenure Rights and Reform

Rights and tenure reform are necessary for both poverty reduction and forest conservation efforts (Fisher et al. 2005). These reforms allow the poor to derive income from ecosystems (WRI et al. 2005) and provide market access for poor communities and individuals in developing nations (Institute for Liberty and Democracy n.d.). For example, in Bolivia, rights devolution to communities directly provided improved income from Brazil nut harvests (Larson et al. 2010). Other experiences from Nepal, the Philippines, India, and Burkina Faso also show the potential improvements in economic condition for communities given tenure rights and local access to fuel wood, nontimber forest products (NTFPs), and/or timber (Larson et al. 2010).

Improvements in rights and land tenure are needed to ensure benefit sharing from those forest conservation activities that generate financial returns flowing to local communities. For example, the benefits of protected areas or payments for environmental services (PES) systems are more likely to flow to local communities if those communities have clearly defined rights to the land and carbon (Sunderlin 2010). Globally, policies have acknowledged that successful forest conservation is dependent on resource tenure rights and reforms. Laws providing indigenous people with rights to forest access and management have increased dramatically since the Rio Earth Summit in 1992. Of 59 key countries for forest conservation examined in a recent study, 51 have enacted their rights laws since 1992 (Rights and Resources Initiative 2012).



In addition to providing economic benefits, investments in land tenure and rights reform can help achieve forest conservation co-benefits. Many examples in this document (most notably community forestry in Section 2.1, agroforestry in Section 2.4, PES in Section 3.1, alternative livelihoods in Section 3.3, and protected areas in Section 4.1) illustrate how providing local people with land tenure and resource rights can generate forest conservation.

### 1.3 Building Processes for Effective Participation

All development projects, including forest conservation, can introduce both risks and opportunities for indigenous peoples and local communities (Peskett et al. 2008). Effective participation in projects is a right of communities and, for forest interventions, this guarantee of procedural rights and community participation can mitigate project risks to forests and investors. Effective participation requires procedures in both policymaking and policy implementation that encourage public involvement.

In particular, the participation of women in forest conservation is critical for project efficiency, efficacy, and sustainability. For example, in India, increased participation by women in community forestry has increased women's income, reduced the probability of illicit activities, reduced the time needed for women to collect forest produce, augmented the involvement of women in other tasks such as forest produce processing, and reduced the time needed for forest regeneration (UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries [UN-REDD] 2011). Gender-specific considerations for effective participation must acknowledge that women are primary users and stakeholders of forests and must ensure they are part of the consultation and decision-making process.

Effective participation processes can generate communal benefits. For example, the scoping process in environmental assessments can yield information from the indigenous population that is more familiar with the environment, improving local or regional knowledge. Proper consultation and stakeholder input can help identify and prioritize those forest conservation measures likely to achieve economic outcomes that are acceptable to local communities.

### 1.4 Spatial Planning for Rural Development

Numerous studies show the spatial relationships between deforestation and major rural infrastructure development projects, such as roads and dams. For example, the Trans-Amazonian Highway in Brazil, which was designed to facilitate the transportation of goods and services between distant points, also became a major driver of deforestation in the areas between (Butler 2011). With appropriate infrastructure planning and management, this type of large project can provide economic development and growth benefits without concomitant forest loss (Gregersen et al. 1994). Careful planning is needed to promote national development that does not occur at the expense of local communities or forests. Practices to mitigate social and environmental impacts of infrastructure projects can include the use of environmental assessments, law enforcement, appropriate incentives, and regional planning.

Explicit spatial planning also has an important role in reducing the advance of deforestation absent major infrastructure projects. Spatial mapping is a critical step in resource rights and tenure reform, discussed above. Mapping can bring conflicts or potential conflicts over claims into clear and immediate view and can strengthen the institutions and regulations to settle such conflicts. The use of spatial technology in the Congo Basin, for example, has provided indigenous communities with the opportunity to delineate and protect key forest resources prior to entry from a logging company (Wilson 2009).

## 2 Sustainable and Improved Management of Forests and Agriculture

### 2.1 Community Forest Management

Establishing community forest management programs based on sustainable extraction practices has shown high rates of return in a number of different settings. These programs often include land tenure and rights reform work (Section 1); the implementation of sustainable management approaches, such as reduced-impact logging (RIL) or agroforestry (Section 2.2. and 2.4); and perhaps efforts to construct new or enhanced income streams (Section 3.3). Though the specifics of community forest management programs vary among locations, they are similar in leading small forest communities toward increased welfare through participatory management.

Well-documented case studies show strong economic returns from ejido programs in Mexico, community forestry user groups (CFUGs) in Nepal, and community forest management programs in Central and West Africa. More than two-thirds of Mexico's forestland is now under collective ownership by more than 10,000 communities (ejidos; Molnar et al. 2010). These community forests have resulted in significant gains in equity and have created local jobs; the income has been used for community assets like potable-water networks, schools, clinics, public building, medical care, and pensions (Bray et al. 2003). Two large-scale World Bank programs supported the development of ejidos through community development, income diversification into NTFPs, education of forestry professionals, and improved project management. These were recently found to have exceeded almost all program objectives, improving both forest management and local income generating opportunities and therefore reducing poverty among communities (Heath 2010).

A program evaluation of a UK Department for International Development program in Nepal shows strong evidence that CFUGs have emerged as effective vehicles for local development, with some showing income increases of 61–93% from 2003 to 2008 after the establishment of local groups (Luintel et al. 2009). Finally, in Central and West Africa, community forests provide 10 times more employment than in the formal forest sector (Molnar et al. 2010).

### 2.2 Reduced-Impact Logging

Compared to conventional logging (CL), RIL presents clear environmental benefits and competitive economic benefits (Boltz 2003; Tay 1999; Tropical Forest Foundation [TFF] n.d.). RIL aims to lessen the damaging impacts of timber harvest while improving the production efficiency of logging operations. A compilation of case studies from Brazil, Ecuador, and Guyana showed that, beyond the ecological benefits, RIL cost less than or was equivalent to CL if the financial costs of wasted wood in CL practices were considered (Boltz 2003). TFF also conducted several cost-benefit analyses, showing the effectiveness of RIL in delivering economic benefits to tropical regions, timber organizations, and trade communities. In partnership with the US Department of Agriculture Forest Service, TFF revealed that the cost of RIL in the eastern Amazon was 12% less than CL methods; in addition, RIL reduced the land disturbed by half while also reducing injuries to workers (Holmes et al. 2000). RIL could, therefore, provide an opportunity for development of a local forestry sector that is economically and environmentally sustainable.

### 2.3 Land Swaps

In many tropical forest areas, deforestation is soon followed by unsustainable intensive use, leaving severely degraded and low-productivity landscapes behind. In the Brazilian Amazon, for example, many forested lands cleared for cattle grazing have poor soils and only produce sufficient forage for a few years. In Indonesia, many previously forested areas are now covered with *alang-alang* grasses—with low carbon storage, low productivity, and low potential for natural forest regeneration (Gingold 2010). While reforestation may be possible for many of these lands, they also may provide a low-carbon option for agricultural expansion. This has led to the concept of land swaps, whereby holders of logging or clearing concessions in primary forests are incentivized (i.e., through product certification or carbon credits) to restore and develop available degraded land instead. As an important tool in the land use planning process, land swaps can be instrumental in stimulating economic growth in previously unproductive areas while protecting biodiversity in standing forests and reducing emissions from forest loss.



Estimates of degraded land availability in Indonesia range widely from 12 to 74 million hectares (Wicke et al. 2008), clearly overlapping in magnitude national palm oil expansion goals of approximately 20 million hectares by 2050 (Colchester et al. 2006). Land use modeling studies have shown that shifting palm oil production primarily to these degraded areas can allow Indonesia to maximize palm oil, timber, and food production simultaneously while minimizing carbon emissions (Koh and Ghazoul 2010). Not only can this shift meet overall production targets, but also, palm oil plantations established on grasslands may even generate higher economic returns than those established on forested lands (Fairhurst and McLaughlin 2010). The opportunity to increase production through a low-carbon development pathway holds clear opportunities for economic growth (Fairhurst et al. 2010).

## 2.4 Agroforestry

Agroforestry—the practice of combining trees with crop production—has the potential to promote economic growth while increasing ecosystem services. Evidence suggests that where farmers have incentives to plant trees and have access to information and planting material, they depend less on neighboring forests and are less likely to damage them (FAO 2005). Therefore, agroforestry can reduce both forest degradation and the social costs of transporting fuelwood. Of 56 agroforestry practices in 21 Central American and Caribbean projects, 75% had positive financial benefits to farmers, in addition to environmental and social co-benefits (Current and Scherr 1995). Forty percent of the studied sites were over 25% more profitable than the alternative, and another 35% were between 1% and 25% more profitable than the alternative. These benefits were realized through tree products for household use and for sale, protection and improvement in soil quality, improvement in environmental conditions, and employment and income-generating activities.

A more recent review of Global Environment Facility agroforestry projects in Central America and Colombia found project internal rates of return in the 7–13% range without any consideration of environmental benefits, with higher returns if linked PES were included (Platais 2008). Site-specific studies can be impressive. A study in the Philippines showed that agroforestry can improve income and food security of farming households by increasing crop and garden yield, providing another food source, and generating income—up to 137% more income was generated by farmers practicing agroforestry than those who were not (Magcale-Macandog et al. 2010).

## 2.5 Sustainable Agricultural Intensification

There is little need to rehash the evidence that investments in agricultural intensification can provide large and measurable economic returns in a broad range of contexts, driving substantial development and poverty alleviation outcomes. Extensive research continues to examine the impact of agricultural intensification broadly on forest loss<sup>4</sup> as it is undeniable that, in most areas undergoing rapid deforestation, agricultural pressures are the primary driver of forest loss (Boucher et al. 2011). Agricultural intensification offers the opportunity to shift the land use impacts of economic development from extensive agriculture, which uses large areas of low-productivity land, to intensive agriculture, which produces more food with the same amount of land.

Sustainable agricultural intensification is a component of forest protection efforts that can provide sustainable economic growth outcomes that are easy to socialize. Sustainable intensification in countries that are currently underproducing on their agricultural land can be an essential tool for meeting the expected increase in food demand over the next few decades (Tilman et al. 2011). Such practices also provide an opportunity to build local community support and shift decision making from an “agriculture versus forests” frame to an “agriculture and forests” win-win opportunity. It is this outcome that has made the combination of agricultural intensification and forest preservation incentives a core strategy in conservation efforts.

<sup>4</sup> See, for example, Ewers et al. (2009) and the November 2010 Proceedings of the National Academy of Sciences special feature on the topic, including Angelsen (2010).

As in the above discussion of land swaps (another example of redirecting agricultural land use impacts), the Indonesian palm oil industry provides a good case study. While industrial-scale palm oil operations are already optimizing inputs—and are, to a large degree, producing at quite high efficiencies—smallholder palm operations, which make up more than 40% of palm oil area, are underperforming (Molenaar et al. 2010). Modeling of improved inputs and management practices by smallholders shows high expected rates of return on investment and income increases of up to 637% in some circumstances (Molenaar et al. 2010). If accompanied by forest protection policies, the increases in yield through smallholder intensification could contribute to reduced deforestation.

Importantly, without complementary intensification and forest conservation strategies, changes in agricultural land management can threaten forests by making land clearing for grazing and planting more financially attractive (Chomitz et al. 2007). Specifically, the economic gains from production efficiency and/or intensification will increase the opportunity cost of land conversion (Fisher et al. 2011). Therefore, conservation efforts will need to overcome this new opportunity cost to prevent leakage of deforestation activities.

## 2.6 Improved Efficiency

Improving wood use efficiency and reducing food waste directly address two drivers of deforestation while also generating human health and infrastructure benefits. The human health impacts of traditional cookstoves are concerning. In places where deforestation and degradation are driven by fuel wood demand, most notably Africa (Boucher et al. 2011), improving wood use efficiency can reduce pressure on forests. Nontraditional cookstoves that provide economic benefits (i.e., reduced operating costs)—in addition to reducing pollution and increasing wood use efficiency—may improve the adoption of this new technology (Mobarak et al. 2012).

In developing countries, 30–40% of food is wasted, mainly because of a lack of infrastructure and investment in transportation or storage as well as a lack of knowledge (Godfray et al. 2010). Investments in infrastructure and efforts to improve farmers' access to capital (to avoid the need to sell at peak supply simply for cash) can reduce waste and help address a major driver of deforestation.

## 3 Improving, Supplementing, and Shifting Income Streams

### 3.1 Payments for Environmental/Ecosystem Services

The growth of PES systems can be attributed to a number of features, including a strong grounding in economic theory, market-driven results rather than government regulation, the potential to generate new sources of finance for conservation, and the ability to alleviate poverty if directed toward the rural poor, who often live in and around intact ecosystems (Pattanayak et al. 2010). PES programs attempt to resolve market failures through voluntary transactions, through which a buyer makes payments to a seller conditioned on maintaining the environment in a state that provides well-defined environmental services, such as clean water or biodiversity habitat (Wunder 2007). While grounded in decades-old economic theory, most results are garnered from case studies, which have found some beneficial results for community welfare (Wunder et al. 2008). With the recent expansion of PES implementation in large numbers and at large scales (e.g., a national system in Costa Rica, or systems in China covering tens of millions of hectares), evaluations beyond case studies will be possible (Pattanayak et al. 2010).

Although its specific rules are currently under negotiation in the UN Framework Convention on Climate Change, reducing emissions from deforestation and forest degradation (REDD+<sup>5</sup>) is a form of international PES whereby countries are compensated for the forest carbon emissions reductions or sequestration services they provide to the global community. Because it is uncertain if, when, or how a global climate deal would establish a market for such forest carbon services, and because we seek to investigate the economic returns to forest conservation activities absent continued international subsidies, we do not include in this paper the expected value of REDD+ payments as

<sup>5</sup> REDD+ refers to “reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries”. FCCC/CP/2007/6/Add.1, Decision 1/CP.13.



an economic benefit to forest conservation. However, a number of established PES systems generate returns to forest conservation without external subsidies by identifying local users of forest ecosystem services and creating the conditions that encourage payments to the suppliers of those services—often local communities living in and around forests.

PES systems can simultaneously provide environmental and community benefits. For example, providing direct payments to women can improve the intra-household allocation of resources, lessen the risk of household negative coping mechanisms, improve women's bargaining power, and improve women's domestic status (UN-REDD 2011). Case studies from Zambia, where communities are compensated for managing forest ecosystems to provide game habitat to increase tourism revenue, and programs in Tanzania that have connected downstream water users to upstream forested watershed protection efforts, are useful for a closer examination of community benefits from PES systems.

In Zambia, game management areas (GMAs) have contributed to poverty alleviation, economic growth, and sustainable management of forests (Bandyopadhyay and Tembo 2010). Encompassing the buffer zones around national parks, GMAs permit licensed safari and subsistence hunting. As native populations often live in these areas, the Community Based Natural Resource Management Program allows the Zambia Wildlife Authority to share hunting license revenue and wildlife management responsibilities with these communities. The communities are able to allocate the revenue resources among the employment of village scouts, local infrastructure, and other development projects. In 2010, the households located in GMAs recorded a 66% higher per capita consumption expenditure than their counterparts in non-GMAs. This was accompanied by a 17% growth in household income. A subsequent study that modeled the findings from Bandyopadhyay and Tembo (2010) found that the level and variety of wildlife positively influences the income levels of households (Fernández 2010). These two studies confirm the potential of GMAs to generate increased income for households living within their boundaries, providing the framework for a payment scheme that encourages environmental preservation and combats poverty.

Compared with GMA-like approaches, forested watershed protection PES systems have been established in a broader range of geographies, including the three major regions experiencing mass deforestation (Southeast Asia, Central and South America, and the Congo basin). Watershed PES systems can lead to ecological and economic resilience, greater income, the development of community services, greater biodiversity, and improved ecosystem functioning. A review of watershed services payments in Costa Rica and Ecuador found that payments averaged 16% and 30%, respectively, of household incomes (Bond 2009). In Tanzania, a PES system was established to alleviate poverty and protect the Saadani National Park (Coastal Resources Center 2010). To preserve the watersheds that flow through the Saadani National Park, donors invested in national government efforts to promote the sustainable management of water and watershed resources in the river basins, improve community access to safe and sustainable water, and increase sanitation services and hygiene education to local communities. The PES program has contributed to a significant reduction of wastewater discharges from agriculture and industry and helped improve efforts in community sanitation.

The benefits and risks of PES systems are strongly dependent on governance and resource rights (Corbera and Schroeder 2011). PES systems like REDD+ are likely to increase the value of standing forests and forested land. A lack of governance and resource rights may allow powerful actors to capture this additional value to the detriment of local communities through violation of customary rights, abusive long-term contracts, or investor land speculation (Sunderlin 2010).

### 3.2 Increasing Product Value

In many tropical areas, forest loss occurs through progressive degradation as communities extract trees and NTFPs more rapidly than nature replaces them. One approach to reducing this degradation is to help communities increase the value per unit of forest-based raw material extracted, replacing income previously generated through an unsustainable volume extraction with additional income from further processing of raw materials, premium-generating certification programs, and/or niche marketing opportunities.

For example, in addition to the benefits of community forestry described above, these enterprises can generate a range of forest-related jobs. Community forests in Mexico have provided materials for small-scale carpenters to upgrade and renovate houses with long-fiber pine and hardwoods (Molnar et al. 2010). Even some of the smallest enterprises can provide employment—a 560-hectare community forest in Veracruz, Mexico, employs almost all of the 24 community members year-round (Bray et al. 2003). Furthermore, some of these smallholder communities have also become major suppliers of finished products and furniture in domestic and international markets (Bray et al. 2003; Molnar et al. 2010). In Guatemala and Honduras, communities export sawn wood and finished wood products to Europe and ornamental nonwood forest products to the United States. These communities are able to receive greater returns on their resources—exporting higher-priced finished products as opposed to raw materials—while also maintaining sustainable production by implementing long-term forest management plans.

Sales of NTFPs—including oils, medicinal plants, gum Arabic, rattan, bamboo, honey, nuts, mushrooms, fiber, and skin-care products—are critical sources of income for many forest-dependent communities (Shanley et al. 2008). Currently, 150 NTFPs are traded at the international level. Continued and expanded access to international markets for these goods can provide community income, including for indigenous peoples. If appropriately developed, these markets can also target female NTFP producers, who are often major players in informal economies (IFAD 2008). A range of certification schemes aim to simultaneously improve forest outcomes and increase income by linking product value directly to management approaches. The increased information provided by a product certification gives access to niche markets and higher prices. For example, the Forestry Stewardship Council and other certification programs can help producers increase their access to export markets and charge a premium for certified wood and NTFPs. However, careful design is necessary to help overcome the obstacles to increasing value, ensure that this additional value flows to producers, and allow small-scale and community producers to remain competitive in the market (Bennett 2009; Nebel et al. 2005; Scherr et al. 2003).

One example is The Nature Conservancy's Community Forestry Program in Papua New Guinea, which has been working to develop partnerships with local communities to establish community-based integrated land use management plans that promote economic growth and forest conservation. These communities benefitted from the application of sustainable forestry methods within their fields and became certified to produce "Organic Fair Trade Certification Cocoa," whose value on the market is 50-75% higher than conventional cocoa (The Nature Conservancy 2012). This initiative ensures that a large portion of proceeds is returned to the community to promote long-term sustainability and a steady supply of cocoa. However, in other case studies, the evidence for environmental and socioeconomic improvements is limited. A recent review of ex post program evaluations across a narrow range of certification programs and products that met strict evaluation criteria found only 14, of which only 6 showed both economic and environmental benefits (Blackman and Rivera 2010). Therefore, the design and implementation of international, national, or local certification programs must take into consideration social, economic, and environmental impacts.

### 3.3 Alternative Livelihoods

The prior two categories in this section—and the entire section above on improved management—address strategies for conserving forests and decreasing poverty while maintaining a reliance on forestry and agricultural production. Of course, some opportunities have the potential to shift the entire income base away from these activities. Such alternative livelihoods approaches encompass far too broad a range of opportunities to cover in this review; many of these approaches are well understood and are independently pursued by development agencies. One example, however, deserves particular attention. As a conservation and development strategy, ecotourism offers the chance to create not only alternative income streams, but income streams that rely on intact forests, thus shifting the economic incentives of local communities toward forest protection. A model of the global potential for tourism markets in developing countries found that, by 2030, between 5 and 8 million low-income households could benefit from payments related to ecotourism (Milder et al. 2010).



In the Cuyabeno Wildlife Reserve in the Ecuadorian Amazon, three indigenous groups have developed various means for tourists to visit the area. Analysis of these enterprises showed that they all contribute to additional income in the communities (Wunder 2000). Another example of indigenous populations participating in ecotourism is aborigines in the rainforests of Queensland, Australia, who have benefited from employment opportunities generated by ecotourism (Wearing 2001). Hence, ecotourism allows for the generation of indigenous entrepreneurship and small business development and provides an economic base from which to reduce poverty. The poverty-reduction outcomes of ecotourism-based conservation projects are highly place-specific, with reviews showing that, overall, ecotourism can provide a modest supplement for local livelihoods within communities (Kiss 2004).

## 4 Protecting and Expanding Forests

### 4.1 Protected Areas

There is growing agreement among conservation scientists that many types of protected areas, ranging from areas managed with strict preservation goals to managed extractive reserves, are needed for an effective global strategy to preserve tropical forests. Several recent studies have shown that forested protected areas can lead to socioeconomic returns that increase local average consumption and reduce poverty while protecting the environment. A study of protected area management in Costa Rica found that such areas contributed to a 10% reduction in poverty (Andam et al. 2010). Though this study looked only at long-term economic gains, the authors speculate that increased tourism, business opportunities, capital investments, and maintenance of ecosystem services could have contributed to poverty reduction. Similarly, in Thailand, the creation of protected areas increased monthly household consumption by 5% and led to a 10% decrease in the poverty headcount ratio (Sims 2010). Indigenous lands in particular are often correlated with lower rates of deforestation and degradation compared to uninhabited protected areas (Nelson and Chomitz 2009; Nepstad et al. 2006; Nepstad et al. 2009). Since the justification for designating indigenous lands is mainly based on collective rights and conservation, little published research has looked for a link between indigenous land designations and economic growth. However, Ricketts et al. (2010) call for REDD to fund indigenous lands and other protected areas (ILPAs), with payments going for example toward community benefit programs, partial compensation of opportunity costs, and enhanced law enforcement.

### 4.2 Fire Prevention Programs

Fire plays an important role in deforestation. It is used intentionally to clear land for pasture or other agricultural uses; this sometimes spreads unintentional fires that degrade the forest and damage its economic and environmental value. Growing evidence suggests that forest fire prevention programs can be effective at achieving forest conservation goals. With new management techniques, such as fire-free land management, fire incidence can be reduced by as much as 69% (Aragao and Shimabukuro 2010). Zero-burning land-clearing techniques may ultimately prove to be more cost-effective than fire use because of the longer-term costs associated with the use of fertilizers to increase soil fertility after burning (Simorangkir 2007). Fire losses in managed forests and plantations can be significantly reduced if greater efforts are made to assess fire risk and implement fire prevention planning measures. While this requires upfront costs, the investment required to institute an effective fire reduction strategy is usually justified by quickly reducing annual losses (Cottle 2007).

### 4.3 Reforestation and Restoration of Degraded Lands

Studies show that reforestation and restoration of degraded lands can, in a broad range of landscapes, lead to greater biodiversity and improve ecosystem functioning, ecological and economic resilience, and human livelihoods (Lamb 2005). For example, an extensive review of reforestation and land rehabilitation programs in Indonesia

showed that community-based projects generated income for local people, mainly by creating a second rotation of harvestable trees (Nawir et al. 2007). The same study found that reforestation and rehabilitation activities within state-owned forests did not provide communities with increased income since they do not have rights to harvest or otherwise benefit from those areas.

Replanting coastal mangrove forests in Southeast Asia can create large direct economic benefits. In the Philippines, for example, the fisheries, tourism, and timber directly generated from mangroves can provide communities with US\$315 per hectare each year (Walton et al. 2006). Experiences from farm-level diversification in tropical forest areas of Central America, with a heavy emphasis on reforestation of degraded areas, reduced deforestation by 45% while increasing farm-level profits by 65% (Knoke et al. 2009). In Tanzania, conservation and restoration of grazing and fodder reserves in the Shinyanga region has provided local people with a source of dry-season forage for livestock, fuel and poles (small trees for structural use) within a reasonable walking distance, medicinal plants, wild fruits and other foods, shade, and drought resilience (Barrow and Mlenge 2005). Furthermore, these improvements provide families with an average of US\$1,000 per year.

## Gaps in Experience

The examples of governance reform, improved land management, enhanced income streams, and better forest protection identified above provide concrete evidence of win-win opportunities to achieve both economic development and forest conservation. Despite these excellent examples, some gaps in knowledge and experience still exist. Major gaps relate to communities and people. For example, though most practitioners expect a beneficial link between land tenure for women and improved forest management, too few studies have evaluated this relationship to reach this conclusion (UN-REDD 2011). Furthermore, as previously identified, the justification for granting indigenous people legal rights over their territories has mostly been a moral one; research is needed on how land tenure reform for these communities can also improve livelihoods. Finally, most studies do not evaluate how improvements to governance mechanisms for decision-making processes will affect both the financial and conservation results of activities; therefore, more holistic research is needed.

At this time, so few scientific studies have examined the effectiveness of alternative livelihoods efforts that general approaches spanning a range of site- and community-specific requirements are difficult to identify. Additional experiences and case studies that evaluate the social, economic, and environmental impacts of such development activities could improve practices that lead to win-win results. Finally, though win-win opportunities clearly exist and have been the focus of this paper, tradeoffs should not be ignored; gaps remain in our understanding of where the tradeoffs lie and how they could be balanced. For example, academics are still grappling with the potential conflict between food security and forest conservation (e.g., Fisher et al. 2011).

## Conclusion

While forest conservation and forest management have long been a priority for development organizations, the climate impacts of deforestation and forest degradation have brought renewed attention, activity, funding, and urgency to the improved management of tropical forests. Those countries and local communities that are rapidly losing forest cover are often the home to some of the world's poorest people, and those who will be disproportionately affected by climate change impacts. This confluence suggests that there may be opportunities for development activities to alleviate poverty and/or build sustainable economies and also achieve forest conservation. Indeed, many such opportunities should be actively and urgently pursued.

This review identifies a set of forest conservation activities in governance, sustainable land management, alternative income streams, and forest production that have a proven track record of measurably reducing poverty and/or achieving economic growth. Governance actions that improve transparency, participation, and rights are necessary prerequisites to successful forest conservation and development programs, and are critical to ensuring that poor



communities benefit from forest-friendly economic growth. Community forest management and sustainable land use activities like agroforestry and agricultural intensification can provide a range of economic benefits while reducing the threat to forests. Local income streams can also be supplemented or improved by setting up PES systems, increasing the value of locally created products, or establishing ecotourism.

The urgency of climate change—including the severe impacts it will have on the world’s poor—should encourage the world’s leading development institutions to contribute to the global mitigation effort by focusing the resources they invest in tropical forest countries on the win-win activities that achieve both forest conservation and poverty reduction outcomes. Furthermore, the scope of the deforestation problem will require a wide range of institutions to holistically pursue the environmental, social, and economic approaches necessary for success.

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