

## 2 Executive Summary



The Pílon Lajas Biosphere Reserve and Indigenous Territory.

### Research Plan

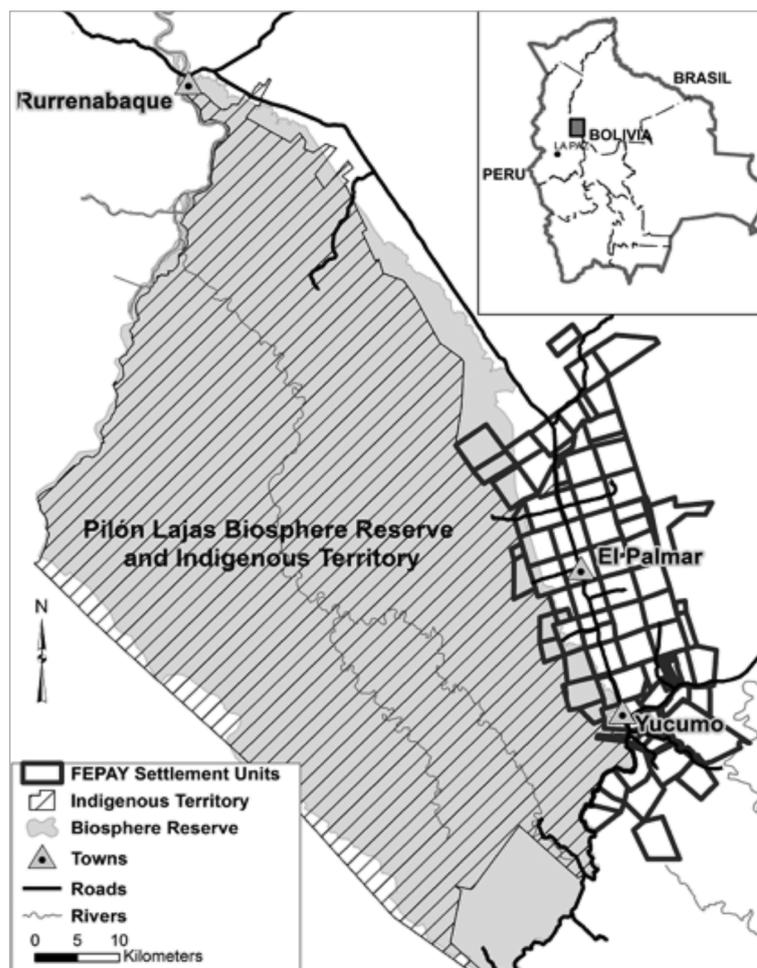
Carbon emissions from deforestation and forest degradation account for about 17% of global carbon release (Eliasch 2008). Community forests play an important role in world forestry and in carbon sequestration, especially in developing countries, where they have been expanding considerably (Sunderlin, Angelsen et al. 2005). Consequently, one aim of the UN programme for Reducing Emissions from Deforestation and Forest Degradation plus (REDD+) is to support these forests. However, implementation of REDD+ in the complex socioecological environments of community forests faces serious challenges. Previous carbon sequestration programmes in Bolivia and other Latin American countries have been very controversial (Wunder, Engel et al. 2008).

The current focus on reducing emissions from forest carbon tends to overlook the compatibility of such programmes with other livelihood-relevant outcomes of community forests, such as non-timber products, agriculture, or livestock (Tacconi 2009). Very little attention has been given to the complexity and site-specific dynamics of local institutions and specific livelihood strategies that define resource use by local actors. Consequently, research has not answered the question of how the institutional arrangements of local forest stakeholders shape multiple forest outcomes and trade-offs between livelihoods, biodiversity conservation, and carbon sequestration.

The present project aimed to:

- create understanding of how institutional arrangements are linked to site-specific patterns of land use, land cover, and forestry changes;
- assess livelihood outcomes related to different forms of forest and agricultural practices, considering their implications for biodiversity conservation and carbon sequestration; and
- assess and compare potentials, limitations, and emerging alternatives for introducing REDD+ mechanisms into existing institutional frameworks for governing forest commons, considering their impacts on livelihoods and biodiversity conservation. Our hypothesis is that more sustainable trade-offs between livelihoods, biodiversity

Study area. Source: (Bottazzi and Dao 2013).

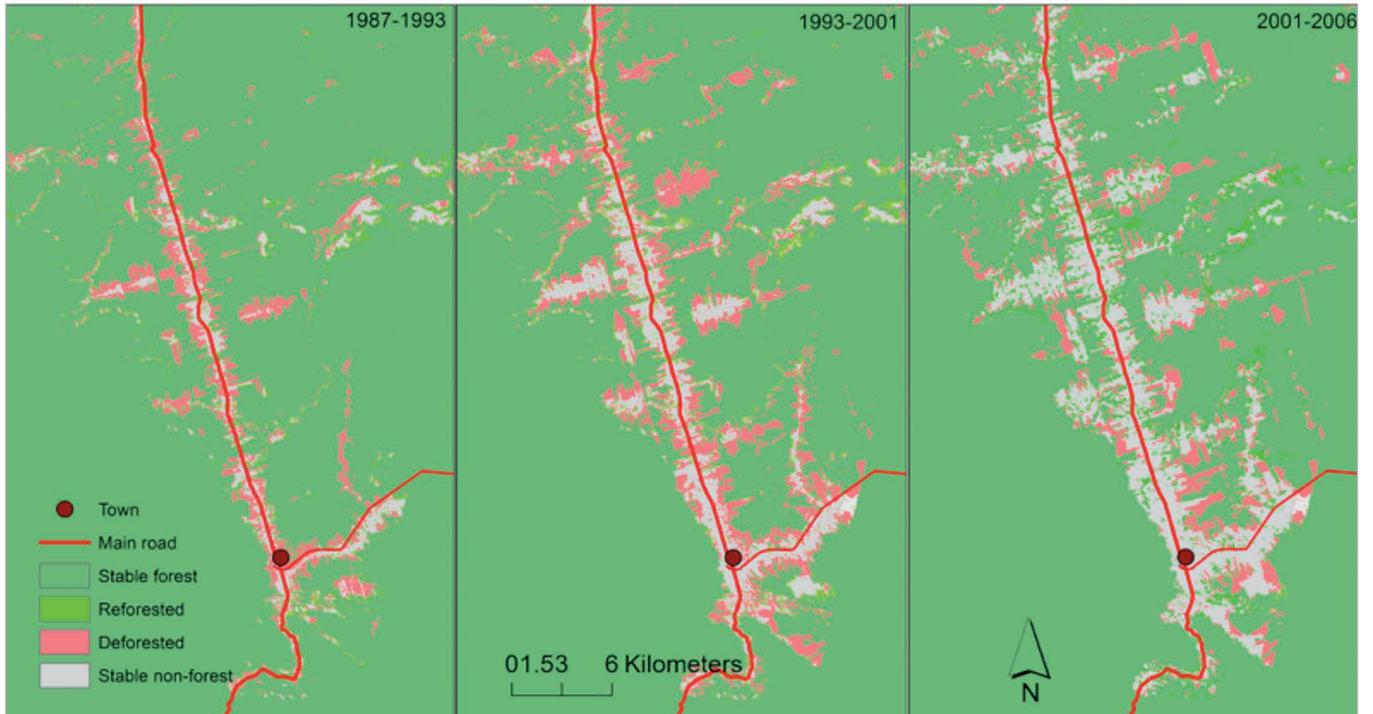


conservation, and carbon sequestration can be expected when the corresponding institutional arrangements support forest user groups in diversifying their productive and extractive practices.

Fieldwork was carried out for six months by an interdisciplinary team in 12 indigenous Tsimane' and Andean migrant communities in the buffer zone of the Pilon Lajas biosphere reserve located in the department of Beni in the Bolivian lowlands. Data collected included 250 household surveys, 12 institutional and historical analyses, a map of land cover changes, and 350 forest measurements. Data were analysed with the following quantitative and qualitative methods:

- Institutional analysis based on the methods of the International Forestry Resources and Institutions (IFRI) network
- Biodiversity, biomass, soil, and forest carbon assessment using plot sampling and remote sensing
- Household surveys of livelihood assets and outcomes
- Assessment of land use, land cover, and forestry change by remote sensing

The project featured cooperation between several long-term research partnerships involving six institutions in three countries: the University of Bern, the University of Geneva, and the United Nations Environment Programme's Global Resource Information Database (UNEP/GRID) in Switzerland, the University of Michigan's International Forestry Resources and Institutions (IFRI) Network in the United States, and the Agroecology Program of the University of Cochabamba (AGRUCO) and the Centre for Economic and Social Research (CERES) in Bolivia.



Forest cover change in the study area (Bottazzi and Dao 2013).

## Results

Findings substantially advance existing theoretical work on the linkage between natural and human systems and identify some economic and institutional options for addressing deforestation, with the aim of better articulating the needs of local people's livelihoods, biodiversity conservation, and the possible contributions of mechanisms of carbon sequestration through REDD+. Results have been articulated in four main dimensions:

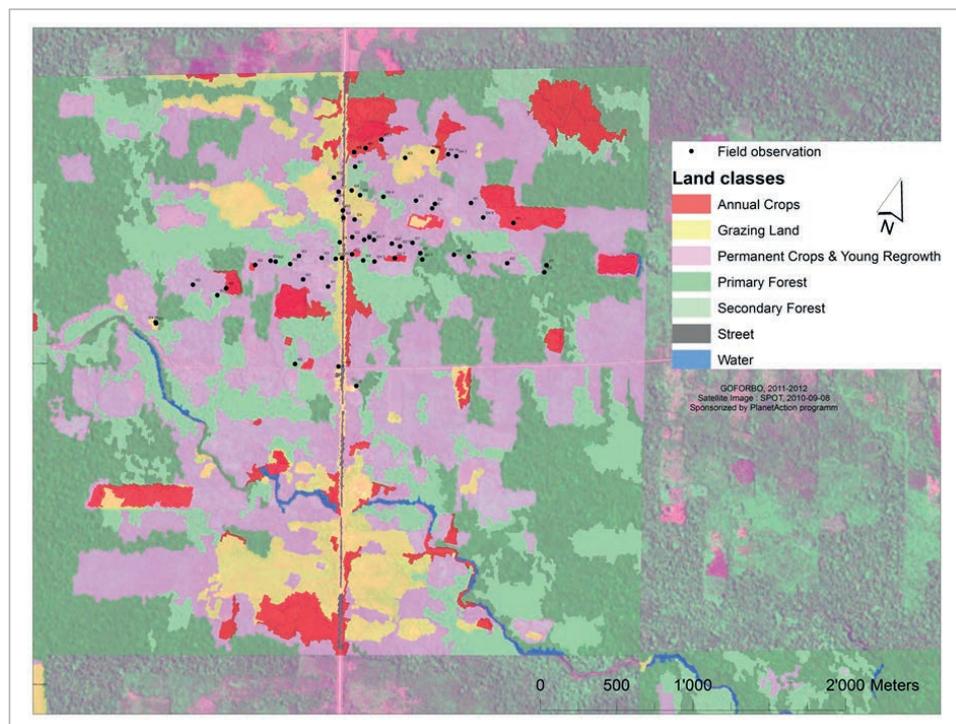
- A multi-level analysis of land governance and deforestation
- Trade-offs and synergies between multiple outcomes and institutional diversity
- Productive diversity and sustainable use of complex social-ecological systems
- Sustainable forest management as an alternative way of implementing the REDD+ mechanism: assessment of two scenarios, including from a farmers' labour perspective

### A multi-level analysis of land governance and deforestation

The current carbon sequestration debate addresses the question of land rights as a core problem during REDD+ implementation. Bolivia's agrarian structure has changed considerably during the last 20 years, which has had important consequences for local institutions of natural resource management (Bottazzi and Rist 2012).<sup>1</sup> Property rights that clearly concern carbon producers are difficult to establish, and some new institutional arrangements can pose significant threats to traditional resource systems. Previous studies have shown that collective property rights offer more flexibility than individual property rights and improve sustainable community-based forest management. Our case study does not contradict this assertion, but shows that collective rights have been granted in areas where ecological contexts and market facilities are less favourable to intensive land use.

<sup>1</sup> For a full discussion, see Annex 1.

Map of land use in one of the 12 studied communities.



Previous experiences suggest investigating political processes in order to understand the criteria according to which access rights were distributed. The first phase of our research confirms that land placed under collective rather than individual rights is less affected by deforestation in Andean settlements. However, analysis of the historical process of land distribution in the area shows that the distribution of property rights is the result of a political process based on economic, spatial, and environmental strategies that are defined by multiple stakeholders. Collective titles were established in the more remote areas and distributed to communities with lower productive potential. Land rights are thus a secondary factor of forest cover change, which results from diverse political compromises based on population distribution, accessibility, environmental perceptions, and expected production or extraction incomes (Bottazzi and Dao 2013).<sup>2</sup>

### Trade-offs and synergies between multiple outcomes and institutional diversity

At the local scale, institutional arrangements between forest users are prominent drivers of land use change, carbon sequestration, and biodiversity conservation. The empirical study showed that Tsimane' ecological knowledge and non-timber forest diversification allow a variety of collecting practices and reduce the risk of market dependency and monoculture. For the Andean migrants, the situation is almost the opposite and underlines the importance of adapting REDD+ strategy to each case. Because of Andean settlers' robust syndicate-like institutions, the implementation of a payment for environmental services (PES) project would be easier in their case and would probably incur lower transaction costs. However, their high institutional capacity has little positive impact on the sustainability of their agro-ecological system.

The increasing deforestation in the Andean settlements can be explained by a combination of the land category (private property rights with collectively self-imposed restrictions), the robustness of their institutions, and the productive system, which all are oriented towards gaining monetary income in the relatively short term. The combina-

<sup>2</sup> For a full discussion, see Annex 2.



Tsimane' women making mat from non-timber forest product.

tion of national and regional market influences (including national policies to support meat or monocrop production) and short-term local strategies to maximise land productivity (focusing on highly tradable crops, mainly rice) using an extensive model of spatial settlement is a core explanation of deforestation within Andean settlements. Farmers prefer to produce rice and maize for a season and then convert the land to pasture rather than investing substantial labour in complex agroforestry systems for which they would have to struggle to find adequate markets.

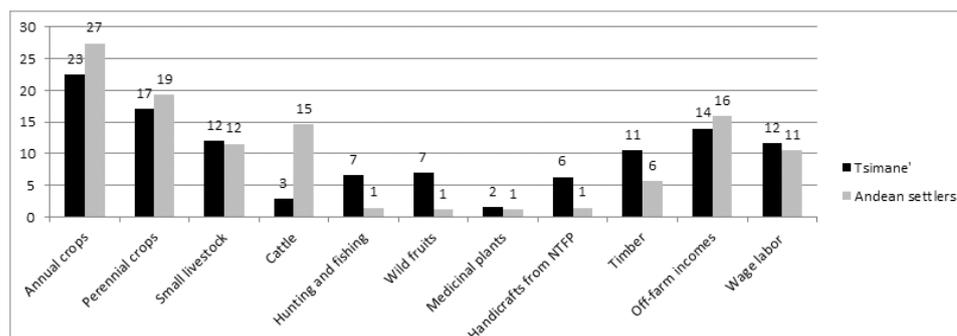
In the long run, the Andean productive system is not sustainable, and most agricultural land is eventually abandoned, leading to clearances of pristine forest. In such a context, implementing a REDD+ mechanism would be an option for the farmers themselves, who could benefit from external funding to help them transition to more diversified production, such as cocoa farming and harvesting of other perennial agroforestry products. Such an option for a REDD+ programme would need support from the government to help farmer cooperatives find appropriate markets (Bottazzi, Crespo et al. in review).

### **Biocultural analysis of the link between productive diversification and deforestation**

Our major hypothesis was that productive diversification is a core condition for an adequate reconciliation of local livelihoods, biodiversity conservation, and carbon sequestration. Agricultural and forest productive diversification are often presented as a way to improve local livelihoods and prevent ecosystem degradation and deforestation. Productive diversification also depends on multiple socioeconomic drivers – like cultural knowledge, household migration, productive capacity, and market access – that shape agriculture and forest productive strategies and influence their ecological impacts.

Our empirical comparison of indigenous Amerindians and settlers in the Bolivian Amazon allows a better understanding of how different rural societies develop different productive diversification strategies

Perceived importance of agriculture, forestry, and other activities to household income (in per cent of total household incomes).



in similar ecological contexts and how the related economic and sociocultural aspects of diversification are associated with land cover changes. The results demonstrate that although the indigenous Tsimane', compared to Andean settlers, cause less deforestation and diversify more, there is no direct correlation between individual household diversification and deforestation. Productive diversification helps households improve their socio-economic resilience – for example, through saving or cattle breeding – but, as shown in our study, this does not directly influence deforestation.

Tsimane' use a greater diversity of forest products, are less dependent on cash income from agriculture, and have not yet started to invest in cattle ranching. Andean settlers more recently established in the area have significantly different forest values. Their reliance on annual crops for cash income, and their limited knowledge of and cultural interest in forest products, result in a lower capacity for productive diversification, which is associated with larger areas cleared for agriculture (Bottazzi, Reyes-Garcia et al. in review).

### Ecological-economic analysis and modelling of labour opportunity cost in payment for environmental services

Since the Cancun and Durban conferences of the United Nations Framework Convention on Climate Change, the REDD+ mechanism has taken into account avoidance of deforestation as well as economic support for the conservation or increase of existing forest carbon stocks. This policy choice at the international level has important implications for the possibility of switching from a classic approach (commonly called a compensated reduction model) based on carbon offsets, to a sustainable forest management approach, based on behavioural change, knowledge exchange, and innovation and institutional capacity for forest management. The last part of our research proposed to explore the theoretical and methodological implications of implementing REDD+ as part of sustainable forest management, compared to a compensated reduction model, taking into consideration the centrality of community-based labour requirements for that purpose. In order to do this, we evaluated the trade-off between agriculture, forestry, carbon emission, and local users' labour investments in the concrete case of 11 community forests in the lowlands of Bolivia. Two scenarios were considered: (1) an output-oriented approach, based on calculating compensated reduction of opportunity cost for mitigating emissions from old-growth forest clearing, and (2) an input-oriented approach, consisting of payment for labour inputs required for more sustainable forest management accompanied by a commitment not to clear old-growth forest.

The results of this study show that the sustainable forest management scenario (including the commitment to refrain from clearing old-growth forest) presents greater opportunity for efficiently reconciling



Woman farmer clearing the forest for annual crops production.

carbon sequestration, forest conservation, and household incomes at lower PES costs. Our results therefore show that combining more than one REDD+ mechanism to focus on both compensated reduction and sustainable forest management is a viable and promising alternative in terms of its socioecological outcomes. The results also stress the importance of having flexible mechanisms that allow context-specific responses to different situations that do not on principle exclude the use of compensated reduction schemes. The choice of mechanism depends on multiple factors

First, our data show higher opportunity costs for agriculture practiced on fallow land, compared to old-growth forest. This suggests that PES should focus on avoiding emissions in old-growth forests while maintaining agriculture on fallow land. This measure is important given that the maintenance of agriculture in most rural areas is of crucial importance for food security, self-employment, and income generation. In both scenarios, refraining from clearing old-growth forest for agriculture represents the most significant and cost-effective emission reduction (around 60% compared to existing practices).

Second, the size and structure of remaining old-growth forests makes a difference. Compensated reduction presents advantages in communities that have little remaining forest (for example, most Andean migrant settlements) and that traditionally base their livelihoods on agriculture. In these cases, the main degradation happens on agricultural land (erosion and soil fertility depletion due to cattle grazing and intensive agricultural practices), creating pressure on remaining old-growth forests. In order to reduce this pressure, compensated reduction could be gradually combined with an approach that splits PES into compensated reduction (for old growth-forests) and input-oriented payments allowing recipients to sustainably intensify their agroecological systems. On the other hand, in settlements with more extended forest resources (for example, some Tsimane' communities), sustainable forest management has a better chance to be successfully implemented but would require increasing social and institutional capacities. These settlements are the most likely to be targeted by

Land cover in the study area.



REDD+ programmes. Our model suggests that in this case, compensation for the labour required to achieve more sustainable forest management would provide better household incomes while maintaining low carbon emissions, at lower PES costs, than compensated reduction schemes (Bottazzi, Crespo et al. in review).

Third, the availability of ethno-ecological knowledge about forests and wildlife (both timber and non-timber-related), and the inclination to maintain and expand it, appeared to be a paramount factor in successful implementation of both sustainable forest management and compensated reduction schemes. Andean settlers traditionally have strong agricultural skills but are not highly knowledgeable about the uses of forest plants and animals – while Tsimane’ have strong knowledge of timber, non-timber products, fisheries, and the like, but little knowledge of or interest in ways to improve their agricultural practices. Building knowledge bridges between the two groups and other knowledgeable local stakeholders like NGOs (nongovernmental organisations) would help fill the gaps and give better values to non-timber forest products and sustainable forest and soil management.

## Policy implications

Given local forest user groups' relatively high poverty rates, implementation of a REDD+ programme can certainly be considered an opportunity, but it could also generate a number of significant threats. Detailed and accurate knowledge of the conditions under which REDD+ mechanisms are implemented, produced by comprehensive baseline studies, is therefore a fundamental prerequisite. Important considerations include the following:

- *The risk of furthering asymmetries in complex local socioecological systems by insufficiently assessing the current institutional regimes and their trade-offs with livelihood requirements, biodiversity conservation, and inclination and capacities for sustainable forest management* has to be considered before the implementation of any PES programme like REDD+. Such an intervention might generate new external dependencies that could easily influence power relations and livelihood strategies in local communities.
- *Differences between local governance structures* require adapting PES mechanisms to each situation. A participatory process would facilitate the integration of each programme in different strata of the population and would avoid the risk of benefit capturing by local elites, as showed in previous PES projects (Wunder et al., 2008).
- *The gap between multiple categories of land tenure* has significant implications for forest degradation and deforestation patterns and challenges the type of arrangements between users. The dichotomy between individual and collective land titles leads to highly differentiated strategies of resource appropriation by local stakeholders.
- *REDD+ eligibility requirements can create inequalities between groups who are not eligible in the same way for PES.* The principle of additionality requires that a project demonstrate real, measurable, and long-term reductions in carbon emissions compared to existing practices. It is impossible, however, to prove that REDD+ can improve forest management by indigenous people who have conserved their forest up to the present. Hence for people who have deforested their land, such as the Andean migrants, the principle of additionality represents an advantage. REDD+ mechanisms should be adapted to each specific group of forest users in order to balance these inequalities.
- *Mitigating the knowledge gap between indigenous people and settlers would require regional and local policies encouraging exchanges and cooperation between the groups and promoting a social learning process.* An appropriate learning and exchange process would help the transfer of knowledge and values between the groups, improve local livelihoods, and protect biodiversity. Further studies are needed to assess the commercial and livelihood potential of multiple forest and agricultural products in the highly biodiverse context of the Bolivian lowlands.
- *National and regional or local baselines that include locally contextualised criteria need to be defined.* A local contextualised baseline could take into consideration property size, population density, the opportunity costs of the main reductions in activities affecting carbon sequestration, and the history of land occupation in the area.
- *The dependence of beneficiaries on external or market funding* poses challenges to the permanency of project aims as well as the local benefits of a compensated reduction scheme. Most assessments of opportunity cost for carbon sequestration are based on the uncertain assumption that in the absence of agricultural activ-

ity, farmers will automatically find a substitute activity in a nearby area in which compensated labour in forests can be invested. We found an average of US\$1.87 per ton of carbon dioxide emitted, which is probably lower than the carbon market price, but this is only true once the opportunity cost for farmers' labour investments in their parcels can be compensated by other income-producing activities. Other economic sectors that depend on agriculture would also be affected by a reduction in food production. Moreover, in the case of a radical change in carbon prices or suspension of payment by donors, local communities would be considerably affected if they relied entirely on PES for their income.

REDD+ thus needs to be considered as a transitional and complementary solution to integrated sustainable forest and soil management. It is thus important that PES funds are used to support sustainable rural activities co-benefiting REDD+ aims, particularly in valuating the labour invested by local stakeholders in sustainable forest management (Bottazzi, Crespo et al. in review).

### **Future challenges for research and development**

The main finding of our study is that labour should be placed at the centre of any analysis of REDD+ and other PES interventions. Each ecological service is related to a certain kind of human activity; whether it is recognised and valued or not, it is always the result of co-producing the service through a direct labour input. Local community involvement in PES schemes, through different stages of conception, implementation, monitoring, and production, needs to be encouraged by multiple incentives. Recent developments in REDD+ programmes have also stressed the importance of developing this perspective in several other approaches, mainly related to sustainable forest management. Such approaches target different aspects of labour involvement to address the following needs:

- Improving mechanisms of forest certification using community expertise
- Restoring harvested areas to encourage natural enhancement of carbon stocks endangered by illegal logging
- Promoting reduced-impact logging techniques
- Developing and promoting non-timber forest products and less valuable forest species

In that sense, REDD+ funds could be extremely useful in improving sustainable forest management approaches that consider the systemic effect of community-based capacity building and labour valuation.

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