CIFOR in Latin America
Celebrating 20 years of research

© 2013 Center for International Forestry Research

Content in this publication is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License
<http://creativecommons.org/licenses/by-nc-nd/3.0/>

ISBN 978-602-1504-20-8

CIFOR. 2013. *CIFOR in Latin America: celebrating 20 years of research*. Bogor, Indonesia: CIFOR.

Cover photo: Neil Palmer/CIAT
A man on the border of the Juma Reserve in the Brazilian Amazon.

CIFOR HQ	Peru office
Jl. CIFOR, Situ Gede	C/o Centro Internacional de la Papa (CIP)
Bogor Barat 16115	Av. La Molina 1895. La Molina
Indonesia	Lima, Peru

T +62 (251) 8622-622	T 51 1 349 6017
F +62 (251) 8622-100	F 51 1 317 5326
E cifor@cgiar.org	E cifor-latinoamerica@cgiar.org

cifor.org

We would like to thank all donors who supported this research through their contributions to the CGIAR Fund. For a list of Fund donors please see: <https://www.cgiarfund.org/FundDonors>

Any views expressed in this book are those of the authors. They do not necessarily represent the views of CIFOR, the editors, the authors’ institutions, the financial sponsors or the reviewers.

Contents

Introduction	4
1 - Understanding Forest Ecosystems	5
Rehabilitating degraded tropical forest ecosystems	7
Tropical silviculture	8
Promoting and increasing the value of secondary forests	9
Communities are crucial for tropical forest rehabilitation	11
Can carbon market initiatives benefit tropical forests?	12
Cash for conservation	14
Tackling climate change	17
CIFOR research influences global agenda on adaptation funding	18
Returning results to communities boosts research relationships	19
2 - Supporting people and forests	21
Knowledge is power for Amazonian forest dwellers	22
Forest loss threatens traditional medicines	24
Participatory research increases incomes in the Brazilian Amazon	26
Integrating management of timber and non-timber forest products	27
Sharing science with the people in Mexico	28
Why do forests matter to the poor?	29
Increasing women’s participation in community forest management	31
3 - Research for more effective policies	33
Decentralization and forest management	34
Extractive reserves in the Brazilian Amazon: Prospects for the future	36
Setting the standards for small-scale forestry	37
Lowering the impact of industrial logging	38
Deforesting Amazonia — the hamburger connection	42

Introduction

From Brazil nuts to game animals, medicinal plants to timber, Latin America's tropical forests provide food, shelter and livelihoods for thousands of people living in and around them. But human activities and a warming climate pose an ever-growing threat. Deforestation and degradation erode the livelihoods of the people who depend on the forest's bounty.

For the past 20 years, researchers at the Center for International Forestry Research (CIFOR) have sought to understand the natural processes that keep forests healthy and the ways in which people use and manage their resources. One of CIFOR's goals is to help people maintain productive forests and agroforestry plots, not just to increase their incomes now, but to ensure their yield for future generations.

Just as the region's forests have evolved during millennia into the tapestry of species that inhabit them today, so too has CIFOR's understanding of those forests changed over the years. Scientists now see forests as part of a larger landscape – a mosaic of protected areas, private lands and communal territories, where people live amid a patchwork of natural forests, protected areas, pastures, fields and managed timber plots.

Within that landscape, forests provide not just beneficial products for household use or for market, but also ecosystem services. They are crucial for maintaining biodiversity, protecting water sources, sheltering game animals and storing carbon as a buffer against climate change.

The vignettes in this volume are CIFOR's footsteps in the forest, retracing the journey we have shared with forest dwellers for the past two decades. We have learned from them and added to the store of knowledge of timber management, non-timber forest products, carbon storage, incentives for conservation, wildfires and many other issues. Our learnings are reflected in public policies, especially forestry laws and regulations.

The experiences recounted here also point to challenges for the future. There are many uncertainties on the path that lies ahead, but we set out on the next leg of the journey with a renewed commitment to rigorous, collaborative and innovative research that will enable both forests and people to thrive.

Aerial view of the Amazon Rainforest, near Manaus, the capital of the Brazilian state of Amazonas.

Photo by Neil Palmer/CIAT

Rehabilitating degraded tropical forest ecosystems

1996 Annual Report

Almost 17 million hectares of tropical forests are cleared for agriculture annually, while another 5 million hectares become secondary forests after timber harvesting. Nevertheless, detailed knowledge of the long-term impacts of tree harvesting on forest ecosystems, especially changes in vegetation, soil and productivity, is still lacking. For the past two decades, CIFOR's efforts to assess the impacts of logging and burning through long-term monitoring over a range of conditions (such as the time and methods of logging, transport, species removed, soil characteristics, topography and rainfall) have been designed to provide a scientific basis for practices that minimize site damage and facilitate ecological restoration.

Rehabilitation of degraded forests and lands is urgent. In logged-over forests, where former ecosystems remain more or less intact, methods to accelerate natural regeneration are needed. Where ecosystem functioning has been disturbed, plantations provide an option. The success of regeneration or reforestation, however, depends on accurate evaluation of site conditions after logging. Analyses of biological and physiological characteristics of regenerated or newly planted trees — and of the processes influencing productivity — are necessary if rehabilitation and reforestation are to succeed.

Short-rotation plantations cause changes in nutrient storage and cycling processes due to changes in

erosion, leaching and patterns of organic matter turnover. All of these affect the sustainability of plantations, but opportunities exist to manipulate them through silvicultural practices. The challenge for researchers is to provide the scientific information to devise silvicultural systems that enhance soil properties important to sustainable production, while minimizing negative effects. These practices must not only be technically feasible and economically viable but also socially acceptable.

When CIFOR was founded, a framework for research in Latin America and Asia was prepared in consultation with scientists at the Forestry and Forest Products Research Institute at Tsukuba, Japan. This research complemented and reinforced other CIFOR research on the sustainable management of natural forests and plantations, and conservation of genetic resources and the environment by addressing:

- Evaluation of the impacts of forest harvesting on forest ecosystem functions;
- Development of methods to rehabilitate logged-over forests and degraded forest lands; and
- Development of silvicultural techniques on degraded forest lands (site management and productivity in tropical forest plantations).

This collaborative research was supported by the Ministry of Foreign Affairs through the Japanese Ministry of Agriculture, Forestry and Fisheries. ■

Tropical silviculture

1996 Annual Report

Silviculture could play a critical role in sustainable forest management in the tropics, although it has seldom been applied consistently over a long period, usually because of financial constraints. Much is known about the effects of silvicultural techniques on forests, but there is a lack of data about the impact over large regions. Silvicultural research has also tended to focus on logged-over forests, ignoring the potentially important economic contribution of secondary forests that have regrown on land previously cleared for pastures and crops.

CIFOR launched a research program on tropical silviculture in the mid-1990s to help improve resource management by integrating production from secondary and logged-over forests into overall land use, especially for resource-poor people on the forest margins. The research included socio-economic, biological, silvicultural and managerial aspects, and focused on sites in the Amazon basin and Central America.

Activities in this project involved four main areas:

- Preparation of a CIFOR monograph synthesizing silvicultural research and practice for natural forest management in the American tropics.
- Initiation by CIFOR and the Tropical Agriculture Research and Higher Education Centre (CATIE) of an electronic bibliography on both published and 'grey' literature on natural forest management in the American tropics from many documentation centers throughout Latin America, plus several private collections.
- Research on silvicultural techniques to improve economic returns to farmers from secondary forests. This research focused on abandoned pastures and crop fields. Those fields, which have regrown into secondary forest, represent potentially valuable assets to farmers if their economic value can be increased through inexpensive silvicultural interventions.
- Organization of a national agricultural research services consultation on forestry for Latin America, sponsored by CIFOR and held during the first quarter of 1996 in Manaus, Brazil. ■

Promoting and increasing the value of secondary forests

1998 Annual Report

Secondary forests, the woody vegetation that grows up after an area of forest has been cleared for crops or pasture and then abandoned, are an important focus of CIFOR research because of increasing evidence that they help counter the loss of primary forest. Studies have demonstrated that secondary forests can be managed to provide many of the products that small-farmer households traditionally obtained from primary forests, while offering some of the environmental benefits of primary forests.

The findings are leading to an interest in efforts to use policy and technological interventions to augment the value of secondary forests to farmers, thereby inducing them to maintain the amount of area devoted to secondary forests and delay its reconversion to other uses.

Much research was done in this area in the late 1990s in several South American countries, under the direction of researchers Joyotee Smith and César Sabogal. Secondary forests cover an estimated 165 million hectares of land in Latin America. The work was supported by funding from the Inter-American Development Bank and the Spanish Agency for International Cooperation and included major involvement of the Tropical Agriculture Research and Higher Education Centre (CATIE).

In 1998, the program reported encouraging findings from a study in Amazonian Peru that contrasted with generally bleak scenarios about tropical deforestation. Results showed that substantial amounts of secondary forest existed in the area studied, even several decades

Serapio Condori Daza, Brazil nut harvester at work in Felicitas Ramirez Surco's concession, Madre de Dios, Peru.
Photo by Manuel Guarigata/CIFOR

after colonist settlement began. The implications are important, because the findings suggest that deforestation related to slash-and-burn agriculture may be considerably less than commonly believed.

The researchers found that regeneration of secondary forests on previously cleared land appeared to mitigate the impacts of residual primary forest loss. As a result of secondary forest growth, more than a third of the farms in the area studied remained under forest cover after three or four decades of frontier development.

That research and related studies in Brazil and Nicaragua were part of a broader effort to better understand the dynamics of secondary forests and how their role changes as colonist frontiers develop. The study sites in the three countries were selected to represent different stages of frontier development, allowing investigation of biophysical and socioeconomic factors. ■

Communities are crucial for tropical forest rehabilitation

2001 Annual Report

Every year around the world, more than 5 million hectares of tropical forest are converted into poorly managed secondary vegetation. Besides causing habitat loss, this degradation reduces the potential for future timber production and plays a role in many natural disasters. Beginning in the early 2000s, CIFOR and the Japanese government began collaborating to develop technically feasible, economically viable and socially acceptable techniques for reducing forest degradation and rehabilitating degraded lands.

The project focused on a real problem that is central to successful and sustainable forest management in many parts of the tropics. Pressure from human activities hinders the rehabilitation of degraded lands. To rehabilitate forests that have been degraded and conserve the remaining natural forests in the tropics, the relationship between people and the forests must be improved.

This research, funded by the Japanese development agency, provided valuable insight into ways of reducing the impact of logging on forest land. For example, eucalyptus plantations place a heavy burden on the soil in Brazil, but researchers found that removing just the trunks of the trees from the logging site leaves behind almost half the mineral nutrients the tree contains. This is highly beneficial for the soil.

In Argentina, researchers developed lower-impact methods of harvesting trees and better ways of increasing seedling regeneration and reducing the soil compaction that slows new growth. In the Peruvian Amazon, project staff determined the best conditions for establishing economically valuable native tree species on degraded areas abandoned after intensive agricultural use.

The project research also challenged some conventional wisdom. Eucalypts are generally thought to change soil quality and prevent plant growth. But in the Congo, successive rotations in managed eucalyptus plantations, when starting from a poor savannah soil, increased organic matter, undergrowth vegetation and soil fauna. Another apparently contradictory finding in Brazil was that clear cutting eucalypts at 12 years of age took fewer minerals from the soil than cutting after seven years.

The first phase of the project ran between 1996 and 2000 with partner organizations in Argentina, Brazil and Peru, as well as Congo, Indonesia, Malaysia, Papua New Guinea and Thailand. The second phase of the project, which started in 2001, continued to monitor and build on the experiments begun in the first phase. Researchers also conducted socioeconomic analysis to identify approaches with the greatest likelihood of acceptance. Community-based initiatives are crucial for decreasing pressure for forest degradation and enhancing forest rehabilitation. Rehabilitation activities should bring benefits to local communities.

The project also considered ways of integrating the rehabilitation of degraded forests into regional strategies for environmental conservation. But even more urgent, researchers said, is rehabilitation of the relationship between forests and the humans who caused the forest degradation in the first place. Building consensus is far more complex and time consuming than just planting trees. Nevertheless, if researchers and forestry experts do not reinforce and explain the local and global benefits of forest rehabilitation to build consensus about the process, people will not care for the rehabilitated forests and the replanted areas will not have the chance to become forests. ■

A Kichwa villager cuts an arenillo tree in the jungle with the help of his wife, near the Napo River in Orellana, Ecuador.

Photo by Tomas Munita/CIFOR

Can carbon market initiatives benefit tropical forests?

1998 Annual Report

There is growing appreciation of the role forests play as major repositories of carbon. The biomass of trees and vegetation in forests harbours vast reserves of carbon that help maintain the balance of the carbon cycle on which life on Earth depends. Industrial emissions are the major culprit of the atmospheric carbon build-up that contributes to 'global warming' and climate change.

The 1997 Kyoto Protocol of the U.N. Framework Convention on Climate Change paves the way for mechanisms that would allow industrial countries and major polluters to offset their carbon emissions by paying developing countries to conserve their tropical forests, thereby 'sequestering,' or storing, vast amounts of carbon.

Such projects are attractive to many people who believe that conservation of tropical forests will be difficult unless the environmental benefits they provide are properly valued through payment schemes. Much early research on this issue focused on technical aspects of making carbon markets feasible, such as methodologies for measuring carbon and evaluating the cost of emission-reduction projects. In 1998, however, CIFOR began exploring social and environmental aspects of carbon markets, which had received little attention.

CIFOR worked with the University of Maryland to lay the groundwork for an international dialogue on carbon sequestration projects to develop guidelines to ensure that they had positive social

and environmental impacts. Unlike many other policy initiatives in this area, the dialogue included representatives from a broad array of groups with a direct stake in tropical forest use.

The results of the conference provided important background information for subsequent efforts to outline mechanisms for implementing the carbon sequestration provisions of the Kyoto Protocol. The findings were also of considerable interest to the many forestry, environmental and economic development institutions involved in this important policy issue.

With funding from the U.S. Agency for International Development, CIFOR launched two studies in 1998 that provided insights from host country and investor perspectives that would be useful in efforts to design and promote adoption of carbon sequestration initiatives. In both projects, CIFOR scientists collaborated with researchers from the Tropical Agriculture Research and Higher Education Centre (CATIE) and the Centre for Social and Economic Research on the Environment (CSERGE) at University College London.

The first study investigated the effects of an innovative national program in Costa Rica that gives private landowners periodic payments for granting the government the right to 'sell' the environmental services, including carbon storage, their forested land provides. The researchers interviewed forest owners and others in the Cordillera Volcánica Central Conservation Area, which is covered by the program. A number of ecological, social and economic criteria and indicators were devised to analyze perceptions about the benefits of forest protection and regeneration, and forestry plantations in areas covered by the compensation program, compared to extensive cattle ranching, which is the most common land-use alternative.

The researchers found that the Costa Rican program offered a model that could enable host countries to take advantage of the funding opportunities provided by carbon markets without distorting their own national land-use plans. They cautioned, however, that the model might not be appropriate for poorer countries that, unlike Costa Rica, are unwilling or unable to tax their people to finance such a program, or for countries where forest conservation is not high on the list of national priorities.

The second study explored the motivations and concerns that influence decisions to participate in carbon sequestration projects. Researchers interviewed 27 major pioneers in the emerging market of carbon sequestration services, including investors, brokers, project developers, fund managers and representatives of government agencies in the United States, the United Kingdom and Europe.

Although those surveyed indicated that public relations was the main reason for participating in a carbon market program, cost effectiveness was also an important consideration. The findings suggest that an unregulated, purely market-driven approach is likely to focus on carbon efficiency and ignore social and environmental considerations, despite encouraging signs that pioneer investors give some importance to environmental and social benefits.

Based on the studies, the researchers concluded that initial assessments of carbon markets as a 'win-win' situation for all stakeholders may have been overly optimistic. Their analysis identified some conditions under which forestry carbon sequestration projects may be appropriate and highlighted aspects where safeguards may be necessary. ■

A cacao plantation near the forests, in the outskirts of Coca, Napo Province, Ecuador.
Photo by Tomas Munita/CIFOR

Cash for conservation

2005 Annual Report

Over the past decade, farmers in the lower reaches of the Los Negros River in Bolivia have noticed that the water level has been steadily decreasing, especially in the dry season. Because the local economy is based on irrigated agriculture, this represents a serious threat to their livelihoods. The farmers attributed the declining water flows to the clearance of cloud forest and an increase in irrigation higher up the valley.

Such accounts are common across the mountainous tropics. But this story doesn't end there. Negotiations that began in the early 2000s, with help from the local Natura Bolivia Foundation, led to the creation of a system in which some farmers in the lower part of the watershed would make annual payments to some of those in the upper reaches. In return, the upland farmers agreed to conservation contracts covering more than 1,000 hectares.

The deal, designed to help ensure a steady water supply in the future, is a classic example of 'payment for environmental services,' or PES. As natural ecosystems come under increasing human pressures and the services they have provided 'for free' — such as clean water and biodiversity — become scarcer, schemes such as this are likely to become more widespread.

'If you want to conserve forests and maintain the environmental services they provide, you need to work out ways of compensating landowners for the loss of income they incur,' CIFOR economist Sven Wunder said. 'One way of doing this is through payments for environmental services.'

These two women in Nueva America, Pimampino, Bolivia, are benefiting from a Payments for Environmental Services (PES) scheme. Water consumers downstream are paying farmers upstream to protect forests in the headwaters.

Photo by Sven Wunder/CIFOR

That is not simple, however, as research by CIFOR and its partners has shown. In *Payments for Environmental Services: Some Nuts and Bolts*, an Occasional Paper, Wunder defines a PES scheme as a voluntary transaction with at least one seller, one buyer and a well-defined environmental service. Payment should be conditional on delivery of the service. Most schemes focus on four services: carbon sequestration, watershed protection, biodiversity conservation, and tourism based on fine landscapes and wildlife.

Experience around the world suggests that payment schemes related to the provision of water have a relatively good chance of success. People who depend on water for drinking or irrigation are unlikely to balk at having to pay a higher rate for water if it guarantees them a secure, high-quality supply. For poor farmers in the uplands and households or farmers in the lowlands, the benefits are easily understood: cash for the former, and reduced risk of water shortages for the latter.

Biodiversity conservation, however, can be much more difficult to finance. 'It's not a question of making a one-off payment or setting up a conservation project that takes a certain amount of time, after which the problem will be solved,' Wunder said. In most cases, the buyers must keep paying year after year, which means they must set up something like a trust fund, which will yield continuous returns. Conservation can also be expensive in terms of opportunity costs.

Studies in the Brazilian Amazon suggest that the payments necessary to encourage a farmer not to clear forest to grow a crop such as soybeans would be prohibitively high. On marginal lands, however, where the opportunity costs of forsaking agricultural activities are modest, PES schemes may offer a

▲ Conditionality — the 'business-like principle' only to pay if the service is actually delivered — is the most innovative feature of PES vis-à-vis traditional conservation tools.

Photo by Brian Belcher, Christian Cossalter and Sven Wunder/CIFOR

feasible conservation strategy. There, a relatively small annual payment could tip the balance in favour of conservation.

Eco-tourism schemes have proven particularly successful in Bolivia. The Chalalán Ecolodge in the Bolivian Amazon significantly improved local incomes by providing rotational employment opportunities for some 60 people. It also helped stem the migration of young people to distant cities. The program strengthened community organization and encouraged villagers to protect an area that is outstanding in its scenic beauty and wildlife. It also spurred others to set up small eco-tourism operations in the area.

Using market forces to achieve environmental goals is attractive, but will PES schemes take off in a big way? 'I think it will take time to demonstrate that this is a workable proposition, and that's not going to happen until there are more schemes, which means getting more buyers involved,' Wunder said. ■

Tackling climate change

2005 Annual Report

In the mid-2000s, CIFOR expanded the scale of its research on climate change, focusing on two main areas. One is devoted to exploring the ways governments and communities can adapt to climate change. The other centers on how forests and trees can be used to reduce the levels of atmospheric carbon while improving the livelihoods of the rural poor.

Climate change may benefit some people — for example, farmers in temperate regions could see longer growing seasons — but prove disastrous for others. The poor in tropical countries are likely to be among the worst affected, according to Markku Kanninen, director of CIFOR's Environmental Services program and co-editor of *Tropical Forests and Adaptation to Climate Change*. 'One of the clear messages to come out of the book is that climate change is already happening, it's going to cause severe disruption, and the poor in developing countries are going to suffer most.'

CIFOR scientists are developing a set of robust, innovative methodologies to assess vulnerability to climate change and to mainstream adaptation to climate change into development agendas. When assessing vulnerability to change, there is a strong focus on patches of forest within the wider landscape. Adaptation strategies consider ways in which diverse landscapes provide many environmental goods and services and satisfy the needs of a wide range of stakeholders.

The poor frequently make their living on steep hillsides, on low-lying land and beside the sea — in areas prone to droughts, landslides, floods and tidal waves. Climate change increases the vulnerability of the poor in two ways: first, by exposing them to more frequent climate-related natural events, such as droughts and floods; and second, by affecting

the long-term productivity of the land on which they depend, because of gradual changes in precipitation patterns, for example.

Tropical Forests and Adaptation to Climate Change, a collection of papers from a workshop organized in 2004 by CIFOR, the Tropical Agricultural Research and Higher Education Centre (CATIE) and Intercooperation, provides a series of case studies showing that adapting to climate change will require an interdisciplinary approach involving policy makers, scientists and natural resource managers. This strategy should combine advances in science as well as systematization of local and traditional knowledge and the promotion of institutional development.

In some situations, Kanninen said, there are 'no-regrets' steps that can be taken immediately. For example, better recovery of wood waste in sawmills and its use as a substitute for fossil fuels when drying wood not only reduces global warming, but also saves money. But adaptation to climate change will often be complex and contentious. For example, it might make sense for governments to prevent the development of flood-prone areas, but those areas might also be highly productive for agriculture. Keeping people out of flood plains will be no simple matter.

Adaptation to climate change was the central theme of a four-year research program launched by CIFOR and CATIE in 2005 and funded by the European Commission. The precise focus of the research varied from place to place. In Costa Rica, where forests play an important role in regulating the hydrological cycle, researchers analyzed the impact of climate change on forests and water supply. The research was aimed at enabling governments to develop policies to help them adapt to climate change. ■

Aerial view of the Amazon Rainforest, near Manaus, the capital of the Brazilian state of Amazonas.

Photo by Neil Palmer/CIAT

CIFOR research influences global agenda on adaptation funding

2010 Annual Report

A decision by the UN Framework Convention on Climate Change's Adaptation Fund to finance a major project in Honduras — one of the first to be approved by the Fund — demonstrated the way in which CIFOR has influenced the allocation of resources for climate change adaptation. A study by CIFOR and CATIE was cited in a successful proposal to the Adaptation Fund on climate change risks for water resources in Honduras. The USD 5.6 million project was implemented by the UN Development Programme and the Secretariat for Natural Resources and Environment in Honduras.

The earlier study was carried out under the Tropical Forests and Climate Change Adaptation project (TroFCCA), a four-year initiative by CIFOR and CATIE aimed at defining the impacts of climate change on tropical forests and the role forests play in helping societies adapt. The project covered seven countries, including Honduras.

According to the Global Climate Risk Index 2010, Honduras has been hit harder by extreme weather events than almost any other country. Adaptation to climate change, however, has not been mainstreamed into development actions and related policies. The TroFCCA project emphasized improving institutional capacity to support local activities on climate change. In Honduras, this included training programs for graduate students and scientists, project workshops, field days and policy dialogues with government officials.

Although the goal of the project financed by the Adaptation Fund was to decrease the threat of water shortages for the poor in Tegucigalpa, it paid significant attention to the role of forests, including how they capture mist from the atmosphere and the negative impacts of deforestation in water catchment areas. ■

Researcher Kaline Rossi do Nascimento leading a community discussion on REDD, Sao Felix, Brazilian Amazon.

Photo by Neil Palmer/CIAT

Returning results to communities boosts research relationships

2012 Annual Report

Researchers often work closely with forest communities when undertaking studies on livelihoods, natural resource management and conservation. Unfortunately, many researchers do not take their findings back to the source. CIFOR researchers participating in a global comparative study (GCS) on reducing emissions from deforestation and forest degradation (REDD+) are helping to change that tendency. GCS-REDD is one of the world's first comparative studies of pilot projects around the world in the UN-backed REDD+ scheme. The study aims to identify what works in REDD+ initiatives at national and sub-national levels across 11 countries.

In Latin America, results from surveys on sub-national REDD+ pilot initiatives had been returned to five sites in Brazil and Peru by 2012. The villagers found quantified information about household cash and subsistence income particularly interesting. Returning survey results has benefits for both communities and researchers, according to CIFOR scientist Amy Duchelle.

'It highlighted for people . . . where and from which activities they're gaining the majority of their income,' Duchelle said. 'Village leaders were carefully compiling the information and [stating] they wanted to have [the survey] for their own planning and knowledge.'

The villagers were also grateful to see the researchers return, and the feedback helped build trust and encouraged cooperation for future monitoring and research. 'I can't tell you how many times we heard, "Researchers never come back — you're the first group that's come back, so thank you so much",' Duchelle said. ■

Local villager boating on the river at the border
of the Juma Reserve in the Brazilian Amazon.
Photo by Neil Palmer/CIAT

2 - Supporting people and forests

Collecting the fruit from the forest, Brazil.
Photo by Patricia Shanley/CIFOR

Knowledge is power for Amazonian forest dwellers

2000, 2002 and 2004 Annual Reports

In the early 1990s, waves of loggers began to move through the forests along the Rio Capim, a tributary of the Amazon in the Brazilian state of Pará. The local forest dwellers, known as *caboclos*, saw logging as a main source of much-needed cash. But they lacked adequate information to weigh the costs and benefits of selling wood instead of conserving the trees for their non-timber uses. Concerned about what was happening, the Rural Workers' Union in Paragominas contacted the Massachusetts-based Woods Hole Research Center, which was already working in Pará. 'What they wanted to know,' said Patricia Shanley, who was then a Woods Hole researcher and is now

with CIFOR, 'was how valuable the forests were.' They also wanted to know whether they would be better off selling wild fruits and other forest products than selling their timber.

Shanley headed upriver and began collecting data in a research program that would last most of the decade. She found that the 15 most highly valued medicinal oil and game-attracting species in the study area were being cut down by the timber industry. As part of her long-term research on the management of non-timber forest products in a frontier area along the Capim River, Shanley helped local communities understand

what the loss of certain species would mean for their health and nutrition.

Shanley's work pointed to many 'hidden' benefits that were not fully recognized. In particular, she focused on three trees that were widely used for their fruit, oil and resin, but poorly known to science.

Take, for example, the *bacuri* (*Platonia insignis*) tree. If the *caboclos* sell a tree to the loggers, they will get the equivalent of one or two US dollars, but they will lose the tree. They can earn the same amount by selling just 10 *bacuri* fruit — used for ice cream, juices and jams — on the riverbank, and each tree produces on average 300 fruit a year. The *piquiá* (*Caryocar villosum*) attracts game animals weighing a combined total of hundreds of kilograms during the tree's flowering season, providing local families with a major source of protein. And oil from the copaiba tree (*Copaifera* spp.), which sells for about USD 15 a litre, is used to prevent infection in wounds.

The research provided important information about these trees' fruiting behaviour and much else. It also convinced many of the *caboclos* that there were certain trees they should not sell to the loggers: they were more valuable left standing. This sort of information, however, can only make a real difference if it is widely disseminated. Alerting *caboclos* and others to the significance of non-timber forest products, especially for their subsistence value, became a priority for Shanley and her Brazilian research team, and in 1998 they published *Fruitíferas da Mata na Vida Amazônica* — *Fruit Trees of the Forest in the Lives of Amazonians*. The book was remarkably influential. It does not tell *caboclos* what to do, but it does provide them with a better understanding of which trees to sell to loggers and which to protect.

Informational materials that the researchers and their partners developed to convey forest values were

requested by researchers and conservation programs in other areas of the Brazilian Amazon and in Ecuador, Mexico, Peru, Greece, Sri Lanka, Indonesia and Malaysia. In February 2000, Shanley was invited to describe the work at a workshop sponsored by the International Service for National Agricultural Research (ISNAR) in The Hague, which highlighted innovative methods for improving the ability of local communities to manage resources.

In 2004, Brazil's Land Titlement Bureau (INCRA) began using the book in its rural literacy program. 'This was a major breakthrough,' the book's co-author, Gabriel Medina, said. 'By using the book, the literacy educators are not only teaching people to read, they're providing them with the information they need to negotiate their timber rights.' By the end of 2004, more than 1,000 educators had been trained by PRONERA to use the 'fruit book.' Their initial target audience was estimated at more than 14,000 rural adults. At the same time, more than 300 rural leaders working for community organizations, forest reserves and the influential National Council of Rubber Tappers, received training on how to use the book.

Caboclos who have used the 'fruit book' now have a much better understanding of which trees to sell to the loggers, and which to protect. Villagers have introduced regulations governing the placement of swidden fields, and many communities have improved their negotiations with loggers, limiting them to specific areas and certain species. They have shown greater interest in processing fruits and medicinal plants for personal use and income, and some have even created community forestry reserves, largely as a result of the work by Shanley and her colleagues. 'Now I know much more about the value of different species,' said João Fernando Moreira Brito, a *caboclo* on whose land Shanley conducted some of her research, 'and I won't be selling my trees to the loggers.' ■

Most of the 1.7 million people who live in the Amazonian town of Belém use traditional medicinal remedies to treat a wide range of ailments. Many come from trees and plants in the Amazon. 'Because of intensive logging, some medicinal products are much harder to get now,' says medicine seller João Alexandre da Silva, pictured here.

Photo by Charlie Pye-Smith/CIFOR

Forest loss threatens traditional medicines

2001 and 2003 Annual Reports

If you live in rural Amazonia, you don't reach for the nearest packet of penicillin when you have a septic wound. Like your parents and grandparents, you put your trust in *copaiba*, a tree oil that you either harvested yourself or bought in the local market. Approximately one-third of the world's population relies on traditional medicines, many of which come from tropical forests. The trade in

medicinal plants often provides significant income for large numbers of people, and it can be especially important for rural households. Unfortunately, forest loss from logging and over-zealous harvesting practices means that many medicinal plants are becoming rarer. This may pose a very real threat to the health — and sometimes the livelihoods — of the poor.

As part of the research on the impact of logging on non-timber forest products in the Brazilian Amazon, which began in the 1990s, ethnobotanist Patricia Shanley and ecologists Leda Luz and Margaret Cymerys collected information over six years from 23 establishments in the long-established open-air river market, Ver-o-Peso, in Belém in eastern Amazonia. In the market, 100 tightly crammed booths display fresh plant material, tonics, roots, oils, tree barks and animal parts. 'You can buy treatments for virtually every ailment imaginable,' Luz said. The market sells products made from more than 200 medicinal herbs, shrubs and trees. But nine of the 12 most popular products sold come from trees that are native to Amazonia; eight of those occur in primary forests, and five are often cut for timber.

Of the five leading medicinals from primary forest trees, three are exported for timber. *Carapa guianensis*, of the mahogany family, and *Tabebuia* spp. are especially prized. The eastern Amazon is emerging as Brazil's dominant source of sawn timber. This rapid expansion of the timber industry has brought about a decline in the availability of some medicinal species. Particularly vulnerable are species that occur in low densities and those whose roots are harvested. Fire, ranching and shifting agriculture are also threats.

One consequence of the high biodiversity characteristic of Amazonia is the low density of any one species. Many popular medicinal tree species grow in densities of less than one individual per hectare. The *copaiba* oil sold in one of Belém's largest medicinal plant establishments is harvested from the neighboring state of Amazonas, 1,200 kilometres away, because of local logging and destructive harvesting. 'Some of the oils are so valued that rural residents guard stands of the medicinal oil tree, *Carapa guianensis*, plant it in their home gardens, and tend it when it sprouts spontaneously,' Luz said.

▲ In Quiandeva, a village along a tributary of the Brazilian Amazon, women use oils, barks and leaves collected from forest species to prepare medicines for use against the common ailments.

Photo by Patricia Shanley/CIFOR

The decline in some of the most popular medicinal species will drive prices up, affecting those least able to afford them. In addition, few substitutes for many medicinal plants exist. The pharmaceutical industry has manufactured some active compounds, but none of the 45 plant drugs known to have been developed from tropical rain forest species worldwide is presently synthesized.

'If we want to protect medicinal biodiversity In the Amazon,' Shanley said, 'research agendas must be developed that focus on the significance of traditionally used, valuable primary and secondary forest medicinal species. Some of these essential species occur in low densities, are slow to reach reproductive age, and are particularly vulnerable to logging, fire and land use change. Transformation of forests can signify not only loss of potential pharmaceutical drugs for people in the developed world, but erosion of the sole health care option for many urban and rural poor today.' ■

Participatory research increases incomes in the Brazilian Amazon

2001 Annual Report

Although they are surrounded by a huge variety of valuable timber and forest products such as latex, fruits, fibers, medicines, oils and tinctures, most communities in the eastern Amazon region that depend on natural resources live in poor conditions. Food is sometimes scarce. There is no telephone, electricity or good-quality water. Health care and education are precarious. A few products — such as timber, palm heart, Brazil nut or rubber latex — are marketed, but many others are used mainly for subsistence. ‘We wanted to find out why local communities do not commercialize forest products more intensively,’ said Benno Pokorny, an associate researcher with the Brazilian Agricultural Research Corporation working in CIFOR’s Regional Office in Belém, Brazil. ‘So we started a pilot project with three rural communities on the riversides of Marajó Island. We also wanted to help the communities to use their forest resources to earn additional income to improve their very poor living conditions.’

Working together and with the researchers, the communities developed a local research strategy. ‘They identified the oil from the fruits of the palm *pataúá* (*Jessenia bataua*) and the timber species *andiroba* (*Carapa guianensis*) as forest products with potential commercial value,’ said Guilhermina Cayres, a local CIFOR social development expert. ‘Then they identified the lack of an attractive market as the main constraint.’

By collaborating closely and working locally, a small number of community representatives, who formed a local researchers group, defined a two-phase research plan. First they decided on fair prices for the

products, based on production costs. Then they explored the possibilities for commercializing those products in local and regional markets.

They encountered some major difficulties. Offering competitive products demands a high degree of organization, standardization of product quality and large quantities of the product. In addition, high transport costs, limited demand and low prices made commercialization of non-timber forest products less attractive. Another problem was restricted access to resources. Many families did not have rights to the resources and therefore depended on the good will of the landowner for access. Despite those obstacles, the local researchers group identified specific markets for *pataúá* oil, with attractive prices and reasonable demand.

The communities quickly realized the importance of information in planning research. They organized activities such as commercializing *pataúá* oil more widely and managing stands of *açaí* palm (*Euterpe oleracea*). Then they formed women’s groups to produce local handicrafts and assist in day-to-day agriculture. Their dynamism and success attracted the attention of other communities, the district government and local non-governmental organizations, which became interested in expanding the local research approach.

A research strategy that focuses on helping communities identify solutions, based on local knowledge and skills, is probably the most successful approach. ‘This is an interesting new way to start a process of sustainable development,’ Pokorny said. ‘We hope to intensify our activities in this area to have a direct effect on raising people’s incomes.’ ■

Integrating management of timber and non-timber forest products

2011 Annual Report

Rural communities in the Amazon often rely on forest products, such as valuable Brazil nuts, for a significant proportion of their income. Unfortunately, timber companies’ heavy machinery tends to harvest indiscriminately, failing to differentiate between timber species and those that provide livelihoods for the local people.

In recent years, CIFOR scientists have investigated how best to integrate and balance the management of timber and non-timber forest products. In 2011, researchers focused on timber and Brazil nuts — the region’s most valuable non-timber forest product — in Peru and Bolivia.

‘The two countries present very different situations,’ said CIFOR principal scientist Manuel Guariguata. ‘The good news is that an integrated resource management system will benefit both.’ In both Bolivia and Peru, timber and Brazil nuts grow together in the forest. In Peru, forestry laws created separate timber and Brazil nut concessions. Because logging regulations in the Brazil nut concessions are less stringent than in the timber concessions, loggers moved their operations there, threatening the Brazil nut trees and promoting unsustainable harvesting of timber.

In Bolivia, communities hold broad rights over their forests and there is no separation of Brazil nut and timber production. CIFOR research raised awareness about the need to harmonize rules and regulations to better integrate the harvesting of both timber and Brazil nuts in small-scale forest management units, with stronger community participation.

CIFOR research aims to contribute to new policies and norms to integrate the management of timber and Brazil nuts, including the promotion of methods such as low-impact extraction techniques and locally developed silviculture, for the benefit of different stakeholders. ■

Leopoldo Vaca Chuquipera shows a handfull of Brazil nuts that he collects on his piece of jungle in the Bolivian Amazon. Brazil nuts, or Para nuts grow in coconut like husks in the highest tree of the jungle, the impressive Castana tree. The nuts fall down and are then collected by the locals. The Castana tree can only survive with the surrounding jungle intact. That’s why the exploitation of this nut is a sustainable way to preserve the forest and make it profitable for its inhabitants.

Photo by Ronald de Hommel/BABEL

Sharing science with the people in Mexico

2005 Annual Report

All too often, scientists rely heavily on rural communities to gather information for their research, but fail to share their findings with them. This may be because they have gathered the data they need and feel no strong obligations to those who assisted them. But just as frequently, it is because they simply don't know how to make their research accessible to a non-scientific audience. As a result, plenty of good — and potentially useful — scientific research never reaches the public domain.

The Non-Timber Forest Products (NTFP) Case Comparison project produced three books under the title *Riches of the Forest* — one for Asia, one for Africa and one for Latin America. Attractively illustrated and written in non-scientific language, the books tell the stories of some 60 different non-timber forest products, from edible invertebrates in West Africa to fibres and resins in Asia and fruits and waxes in Latin America. 'We wanted to make the knowledge about the commercial potential and cultural significance of NTFPs as widely available as possible,' said CIFOR ethnobotanist Citlalli López, one of the co-editors.

The success of the Latin American book prompted two government departments in Mexico — the Programme for the Conservation and Sustainable Management of Forest Resources (PROCYMAF) and the Centre for Environmental Education and Capacity Building for Sustainable Development (CECADESU) — to suggest to CIFOR that a new edition, specially tailored to Mexico, should be produced with their support. 'These departments publish lots of technical and educational materials,' López said, 'but they had rarely produced anything with such broad appeal as *Riches of the Forest*. They decided this would be the ideal way to inspire people across the country.'

CIFOR and its government partners, which paid for the printing and distribution of 10,000 copies, hoped that

La riqueza de los bosques mexicanos: más allá de la madera — 'Riches of the Mexican Forests' — would spread the NTFP message far and wide. Mexico is a large country, and people in one region may not hear about initiatives under way in another.

The book includes the stories of eight Mexican NTFPs that were featured in the Latin American version of *Riches of the Forest*, but there are 11 new cases as well. The stories are told not just by experts, as they were in the first series of books, but by local people involved in the harvesting, cultivation and processing of NTFPs.

Take, for example, mescal, the strong liquor produced in the drier regions of Mexico from several species of the maguey plant. The book describes the cultivation and harvesting of the plant, how it is baked in underground pits, and how it is bottled and blended. It describes the status of the plants, the growing demand for mescal and the significance of the trade for local livelihoods and local culture. The chapter was a collaborative effort, written by a researcher from a Mexican non-profit organization and members of a farmers' group. It thus blends hard science with local knowledge. ■

Painting wooden figures in Oaxaca, Mexico. Wood carving has provided a dramatic boost in income for many families.

Photo by Silvia Purata

Why do forests matter to the poor?

2006 and 2011 Annual Reports

Forests that provide hundreds of millions of people with food, medicinal plants, fuel wood and other products are crucial for the livelihoods of the forest-dwelling poor, but can they help lift people out of poverty? And if so, what forest products and what management systems and policies contribute most to poverty alleviation?

A seven-year global landmark study by CIFOR, which set out to answer some of those questions, found that income from forests contributes more than one-fifth of total household earnings for people living in or near forests, scientifically demonstrating for the first time on such a scale the key role that the environment plays in poverty alleviation.

The size of 'environmental incomes' — from wood, game, plants and other resources harvested from the wild — has until now been poorly documented, and is not obvious to most policy makers. Many existing tools for assessing poverty and income, such as the World Bank's Living Standard Measurement Survey, fail to adequately capture income from natural resources. The true value of forests in the livelihoods of the world's rural poor remains largely invisible.

In 2004, CIFOR and the International Foundation for Science (IFS) established the Poverty and Environment Network (PEN). PhD students working with the network gathered information and in return received guidance from CIFOR scientists and other experts, as well as modest financial assistance.

By 2006, 24 PEN partners were collecting household and village data on topics such as the harvesting of forest products, household incomes, market access and village

institutions. 'We expect to have data from some 6,000 households which have been interviewed every quarter during the course of a year,' Arild Angelsen, a senior research associate at CIFOR and PEN coordinator, said at the time. 'This will eventually constitute the most comprehensive database on the subject.'

The database sheds new light on the relationship between forests and poverty. Angelsen said the studies contribute to research and policy formulation in three ways. First, they provide better and more representative figures about how important forests are, in what ways and to whom. Second, the data offer new insights into 'hot' policy issues, such as the relationship between community-based forest management and poverty alleviation and the impact of market liberalization on forest use and poverty. Third, the data set is very rich and will permit analysis of a number of specific issues.

Funding from the UK Department for International Development (DFID) in 2007 allowed researchers to expand the study to more than 9,000 households in 350 to 400 villages or communities. By 2013, the project was in the analysis and writing phase. The global data set, the first of its kind, is providing new insights into the relationship between forests and poverty in 26 developing countries.

'Earlier studies have emphasized the special importance of forest incomes to the poorest households,' Angelsen said. 'One surprising finding of this project is that, overall, forest reliance, defined as the share of forest income in total household income, apparently varies little with income levels. Hence, forest income is not just for the poor, but for everyone at these sites.' ■

Increasing women's participation in community forest management

2012 Annual Report

Local control over natural resources is a key issue for autonomous and inclusive development, especially in indigenous territories. Relatively little attention, however, has been given to the local and gender dynamics that determine who looks after, uses and shares the resources of the forest.

The three-year Gender, Tenure and Community Forest project addresses this by promoting the inclusion of women in forest decision making and improving their tenure rights. In Nicaragua, the project is being implemented in an autonomous region where indigenous peoples are claiming formal title to their ancestral territories.

The first working paper from the project, released in October 2012, identified a number of areas where women's involvement could be improved. 'Women have a harder time attending meetings and speaking up in public and only rarely assume leadership roles at the community level. And even in communities where women believe they have influence over many important decisions, they do not have similar influence over forest-related decisions,' said CIFOR senior scientist Anne Larson.

In its first year, the project focused on research, but in the second phase, adaptive collaborative management techniques have been used to help generate clear community norms for the use of forest resources. Some communities have started reforestation projects as part of their work plans, while others have clarified traditional rules to enable leaders to better manage forest resources and settle disputes.

'One year ago, we would mostly only see men speaking up and participating. Women would attend the workshops,

but they wouldn't speak as much as the men,' researcher Xochilt Hernández said. '[Now] we have seen that more women are becoming involved in community meetings and more women are demanding spaces to learn about the forest.'

In Bolivia in the mid-1990s, the government devolved rights to large areas of territory to indigenous people. This meant that the Guarayo Indians of Salvatierra, in eastern Bolivia, had to work out a communal plan for managing thousands of hectares of forest, whose produce they could now exploit and sell. They received assistance from the USAID-funded Bolivian Sustainable Forestry Project (BOLFOR), which helped develop and implement the country's new forest policies.

Peter Cronkleton, a CIFOR anthropologist who helped BOLFOR establish a gender action plan, found that many foresters were reluctant to involve women. Like the local men, they saw forestry as a man's business. The word 'gender' also had negative connotations. So Cronkleton and his team stopped using that word. 'Instead we talked about how communal projects need broad participation, male and female, both to develop local institutions and to prevent conflicts arising because some people feel excluded,' he said. Gradually, the foresters came round to the idea of involving women.

'In the early days, a few women would shyly peep through windows during meetings,' Cronkleton said. By the project's end, however, 'We could count on a vocal contingent of women at management meetings.' That is not just a matter of equity. 'Including women is crucial for project stability and for promoting local control over the forests,' he said. ■

A Kichwa woman takes a rest as she cuts down the forest to clear an area for farming corn to feed her animals, Napo Province, Ecuador.

Photo by Tomas Munita/CIFOR

CIFOR scientists talking with local community members.
Photo by Kate Evans/CIFOR

3 - Research for more effective policies

Decentralization and forest management

2002 Annual Report

During the past decade, almost every country in the developing world has given local and provincial governments greater scope to manage their own affairs, and at least 60 countries have decentralized some aspects of natural resource management. The motives for decentralization — which generally involves a transfer of both power and financial resources — vary, but most governments hope that the process will help reduce bureaucracy, make decision-making more democratic, distribute the benefits derived from exploiting resources more fairly, and make their use and exploitation more efficient. In some countries the decision to decentralize has emanated from government itself; elsewhere, pressure from local governments, international donors and natural resource managers has encouraged national governments to relinquish some of their powers.

The results, so far, have been mixed. In some places decentralization has helped local governments protect their forests against excessive logging by companies and others who would overexploit them. It has also increased the level of public participation in decision-making processes and has brought marginal groups into the political loop. Decentralization has also furthered the interests of elite groups, however, and has sometimes led to increased destruction of forests. Decentralization is clearly here to stay, and it is important to establish why it has brought benefits to some places, but not to others.

In many places, decentralisation is creating new opportunities for indigenous people and local communities to become more involved in managing natural resources. Community logging cooperative in St. Zapnagio, Bolivia.

Photo by Carol J.P. Colfer/CIFOR

One of the main aims of CIFOR's research on decentralization was to identify both effective and less-successful initiatives and feed the results back to the municipalities, government departments, non-governmental organizations and others involved in the decentralization process. The overall objective was to help local governments and others manage natural resources more effectively, while improving the mechanisms that enable local people to participate more fully in forest management.

Beginning in the late 1990s, CIFOR and its partners worked on decentralization in Honduras, Nicaragua, Guatemala, Costa Rica, Bolivia and Brazil. The researchers found that the decentralization process varied greatly from one country to another, and often from one municipality to the next. 'This means that we simply can't come up with a magic bullet for decentralization,' said Fabiano Toni, a professor at the Federal University of Rio Grande do Norte and leader of the team that studied decentralization in Brazil.

The researchers created a range of products and processes to feed information back to the various stakeholders involved in decentralization. In Brazil, workshops in municipalities helped communicate research findings to the people who needed them, and the researchers produced a series of case studies and journal articles. Their research was greeted enthusiastically in the municipalities chosen for the case studies.

Workshops proved particularly useful for disseminating information to a wide range of people in Central America. Ninety people attended feedback workshops in Guatemala, 80 in Honduras and 45 in Nicaragua. The workshops provided an opportunity for a range of groups with different perspectives and aspirations — community leaders, academics, local government officials, policy makers from forestry

▲ CIFOR and its research partners in Latin America are conducting fieldwork and consulting communities about forest management. Feedback to local government can greatly improve the process of decentralisation.

Photo by Carol J.P. Colfer/CIFOR

ministries and non-governmental organizations — to engage with one another and debate the pros and cons of decentralization.

The results from the six Latin American countries enabled researchers to develop a working model of decentralized forest management. The model defines the main factors that affect local forest management and highlights the areas of intervention which could make decentralization work better. The greater the ability of local people to become involved in decision making, and make their demands known to local government through fair elections, the greater the chance of successful decentralization. ■

Extractive reserves in the Brazilian Amazon: Prospects for the future

1996 Annual Report

Brazil's extractive reserves are collective, long-term land-use rights given by the government to whole communities of forest-based people. They were proposed by the National Council of Rubber Tappers (*Conselho Nacional de Seringueiros*, CNS) in 1985 to defend their rights against pressure from logging and cattle ranching. This combination of land reform and conservation gained international momentum after the murder of Chico Mendes, leader of the rubber tappers' organization.

The first extractive reserve created in Brazil was Alto Juruá (REAJ), in the western part of the state of Acre. With half a million hectares and about 5,500 inhabitants, REAJ has been a pioneer in social organization, design and implementation of forest management.

In late 1995, CIFOR began supporting a long-term research effort led by Mauro Almeida of Campinas University, which had accumulated 15 years' worth of detailed information. With CIFOR's support, Almeida's team prepared a database to better understand the dynamic processes and their causal relationships, and to develop models to explore possible future scenarios. The findings revealed the great resilience of the rubber tapper communities, which have remained in Alto Juruá despite a four-fold decline between 1982 and 1992 in the price paid for their rubber.

That resilience was reinforced by large movements of people inside the reserve, who abandoned the headwaters (which are rich in rubber trees) to settle near the main rivers. They survived by changing their mix of activities and drastically reducing the production of rubber in response to low prices. Rubber became more marginal in the economy of the REAJ, overtaken by small-scale agriculture and by income from salaries earned as teachers, health assistants or government employees or from pensions. Rubber tappers and farmers

began accumulating a few head of cattle. Those new trends in the REAJ began to affect its conservation status, shifting pressure to the river banks.

The population density of some heavily hunted species began increasing in the hinterlands as fewer people went to those areas to tap rubber trees. The deforestation rate remained very low, estimated at 3 percent for the entire REAJ, well below the upper limit of 5 percent foreseen in the management plan.

That process of change implied re-thinking the role and potential of extractive reserves in Brazil. Through its work, CIFOR aimed to help decision makers reconcile development and conservation objectives by contributing to the better understanding of these changes and modelling the likely results. ■

A smallholders farm along the BR-364 highway in Acre, Brazil.
Photo by Kate Evans/CIFOR

A carpenter at work at the border of the Juma Reserve in the Brazilian Amazon.
Photo by Neil Palmer/CIAT

Setting the standards for small-scale forestry

2009 Annual Report

Some 117 million hectares of the world's forests, 15 percent of them tropical forests, are currently certified as sustainably managed by organizations like the Forest Stewardship Council (FSC). Companies, communities and individuals managing small blocks of forest or engaged in low-intensity production, however, have found it hard to join certification schemes. That is set to change. A research project funded by the Global Environment Facility and managed by CIFOR has devised tools and incentives that will enable forest managers and local communities to identify and manage biodiversity on small-scale forestry operations, or where the intensity of management is low. The research tested these tools and incentives at six sites in Brazil, Mexico and Cameroon.

New standards for small-scale and low-intensity operations were submitted for approval to the Forest Stewardship Council in late 2009. Frank Katto, who manages the accreditation program, said they would make a significant difference. 'The standards will reduce many of the barriers which prevented small operators from joining certification schemes in the past,' he said. 'They are relatively simple to use and less costly than the standards they replace, without reducing any of the rigour required by FSC certification.' The project enabled CIFOR to have an impact both locally and globally and to build on previous research findings. 'It was a good example of collaboration between a research center, a global forest certification organization and various national initiatives,' said CIFOR scientist Robert Nasi. ■

CIFOR has devoted considerable research energy to reducing the impact of industrial logging and exploring more sustainable forest management practices.

Photo by Plínio Sist

Lowering the impact of industrial logging

2002 Annual Report

Take the highway south from Belém, in the Amazon delta, and you will see what has happened to a significant chunk of Brazil's tropical rainforest. You drive through endless swathes of pasture, where cattle graze among the stumps of charred trees — remnants of the once-dense forest that covered this region just a decade ago. Eventually, you reach Tailandia, a small town on the forest frontier. Its wealth is based on the timber industry, and the main highway is punctuated with sawmills, many wreathed in acrid smoke that rises from burning piles of sawdust.

But industrial logging does not have to be so destructive. Head up a dirt road near Tailandia, and

you come to a forest that is being logged in a way that is good for the bottom line, good for the people who live and work there, and good for the forest. A few years ago, the forests here were being plundered. Now, Juruá Florestal Ltda., one of the many medium-sized enterprises operating in the Amazon, is ensuring that both the company and the forests have a future. To an untutored eye, much of it looks untouched, but Juruá is producing large quantities of high value timber for the European market.

The conversion of logging companies from plunderers to stewards would never have happened were it not for the pressure exerted on the logging

industry. For many years, environmental groups railed against the destruction of Amazonian rainforest, both by loggers and by farmers clearing land for crops and cattle pasture. Then, in the late 1980s and early 1990s, a coalition of conservation groups and timber retailers began to explore the possibilities of encouraging good practice through a system of certification. Many retailers and some governments, especially in Europe, now insist that their tropical timber come from forests certified by the Forest Stewardship Council (FSC), or similar organizations, as sustainably managed. The message is: if you want to sell to us, prove that you are managing the forests as well as you possibly can.

A couple of hours' drive south of Tailandia, another company has also transformed its operations. 'A few years ago we were predatory loggers,' said Manoel Pereira Dias, managing director of CIKEL, the largest logging company operating in the Amazon. 'We were destroying the forests. But all that's changed. Now we harvest timber in a way that means that the forest will survive.' Dias readily admits that his company's transformation would not have happened were it not for the help and advice it received from three research and training organizations: the Brazilian Corporation for Agricultural Research (EMBRAPA), Fundação Floresta Tropical (FFT), the Brazilian subsidiary of the Tropical Forest Foundation, and CIFOR, which has a regional office in Belém.

Throughout the 1990s and into the early 2000s, CIFOR devoted considerable research energy to exploring how to increase the proportion of tropical forests under sustainable management. Its research efforts fell into three distinct categories. First, it conducted a series of silvicultural experiments to determine which practices worked best to sustain productivity in particular situations. In Mexico and

Belize, research into the regeneration of mahogany provided new guidelines for forest managers.

Second, CIFOR sought to understand the constraints and opportunities that determined whether companies adopted sustainable forest management practices. And third, under a project funded by the International Tropical Timber Organization (ITTO) — Sustainable Management of Productive Forests on a Commercial Scale in the Brazilian Amazon — CIFOR assisted timber companies like Juruá and CIKEL to overcome some of these constraints and achieve certification, in part by establishing the precise costs of good — as opposed to business-as-usual — forest management.

Reduced-impact logging

Conventional logging, at its worst, is unplanned pillage. Chainsaw crews wander haphazardly through the forest felling the most valuable trees, followed by huge skidders, which drag out the logs. A few years later the crews return, and before long the forests are wrecked. This has happened over much of Pará, with forests being swiftly transformed into scrubland and cattle pasture. Similar patterns of harvesting, leading to degradation and the conversion of forest land, have occurred throughout the tropics.

Reduced-impact logging seeks to lessen the negative effects of logging and involves a range of activities. Roads and skid trails are meticulously planned to ensure they do the least damage possible and provide the most effective means of gaining access to trees earmarked for harvesting. When necessary, forest workers cut vines from the trees well in advance. This helps chainsaw crews to direct falling timber in a way that minimizes damage caused to other trees. Stumps are cut close to the ground to avoid unnecessary

waste, and there is an emphasis on using the felled trunks as efficiently as possible. Logs are winched to the skid trails, and the log landings are carefully planned to cause minimal disturbance.

Although some activities carried out under reduced-impact logging add to operating costs, others reduce costs. For example, before reduced-impact logging was introduced, CIKEL had six skidders working full time. Under the new regime, which is far more efficient, it has just four — which saves money. In its analysis of reduced-impact logging, the Fundação Floresta Tropical found that the average cost of harvesting for conventional logging was USD 15.66 per cubic metre of timber, compared to USD 13.64 for reduced-impact logging. Net revenues worked out to USD 9.84 per cubic metre for conventional logging and USD 11.66 for reduced-impact logging — even though reduced-impact logging provides more jobs and better employment conditions than conventional logging.

In 2000, CIFOR, Fundação Floresta Tropical and the Instituto do Homem e Meio Ambiente da Amazônia (IMAZON) published a set of technical guidelines for reduced-impact logging in forests in the Brazilian Amazon. Juruá Florestal and CIKEL have put these guidelines to the test on their estates in Pará. Both companies found that reduced-impact logging not only improved the quality of their harvesting operations, but also saved them money. The researchers found a high degree of acceptance for many, though not all, of the guidelines. Companies were happy to adopt some of the technical guidelines, such as those on road construction and tree-felling. They ignored other recommendations, however, especially those relating to harvest planning and skidding techniques. Among the reasons identified for partial compliance with some of the guidelines were a lack of monitoring and supervision. This resulted in

poor or non-existent quality control of the operations. Forest managers and operators also mentioned lack of training and adequate equipment.

Adopting good practice

Surprisingly little is known about the degree to which sustainable forest management practices are applied in the tropics, which practices are applied and what factors encourage or impede the adoption of sustainable forest management practices. CIFOR's 'adoption project' — Understanding the Constraints and Opportunities for the Adoption of Sustainable Forest Management Practices — investigated those issues in Brazil, Bolivia and Peru, with funding from the US Agency for International Development (USAID), and undertook similar work in Indonesia. The research was based on questionnaires used to gather information from the owners and managers of timber enterprises and forests, as well as on detailed field assessments.

The first phase of the research project was completed by early 2002, and the findings were already having an impact by the end of that year, especially in Peru, which was implementing a new forestry regime. Under the new system, logging would be confined to authorized areas and loggers would have to use certain techniques designed to sustain the productivity of the forests. Long-term logging concessions would be granted to increase concession holders' interest in maintaining the productivity of the forests for future cuts. All of this made good sense on paper. Nevertheless, CIFOR's research suggested that if the new regime was to work effectively, the draft forest law needed to be amended.

The new regime, as it stood, would discriminate against the small-scale, itinerant loggers who had

dominated the supply of timber in the past. CIFOR's research suggested that unless the government addressed the possible loss of livelihoods, the new regime could significantly increase the amount of illegal logging by small operators. The researchers also suggested that the area-based tax proposed under the new law would encourage logging enterprises to switch to mechanized operations, thus intensifying their activities and increasing the impact on forests.

The researchers offered a number of suggestions about how the new law could be revised to take those issues into account. In February 2003, César Sabogal, CIFOR's regional coordinator for Latin America, was invited to a meeting of the National Forestry Working Group (*Mesa de Concertation Forestal Nacional*), whose members included officials from the Peruvian Natural Resource Management Agency and the Ministry of Agriculture, along with representatives of indigenous organizations, conservation groups, development agencies and the private sector. Many key players from the forestry sector were involved in the working group, and the research was designed to lead to revisions of the new forest law.

Fostering sustainable management

CIFOR's investigation into the adoption of sustainable forest management practices is helping to determine which factors favour their implementation. Timber certification clearly provides an incentive for some companies to adopt reduced-impact logging techniques and other practices that foster more sustainable management. But a lack of trained forest workers means many companies are unlikely to adopt reduced-impact logging techniques, which require a range of skills that are not required in conventional logging operations. In the case of CIKEL and Juruá, the attraction of timber certification and the

availability of good training programs provided by the Fundação Floresta Tropical played a crucial role in reforming the companies' behaviour. 'There is no doubt in my mind that certification encouraged them to change their ways,' said Natalino Silva, an EMBRAPA forest researcher who has done much to promote sustainable harvesting in Amazonia.

Timber certification has recently taken off in a big way. Most certified forests are to be found in temperate regions, however, and the certified trade in tropical countries is still relatively modest in size. According to César Sabogal, the prospect of certification alone will not be enough to influence most companies operating in the Amazon. For one thing, the market for certified timber is limited, with Europe and the United States leading. For another, certification is costly, and small companies, which are responsible for at least half the timber felled in Brazil, are unlikely to participate in such schemes. Furthermore, 85 percent of the logs harvested in the Amazon are destined for the cities of southern Brazil, where certification has not been an issue until recently. 'What this means,' Sabogal said, 'is that companies must make the transition from destructive logging to reduced-impact logging because the reduced-impact route is more profitable in its own right.'

More research is required if we are to work out how to encourage a critical mass of forestry companies to adopt sustainable forest management practices, but we now know much more about the factors that determine whether companies behave well, or badly, than we did in the past. Five years ago, CIKEL was logging in such a way that the forest would not recover for 200 years or so. Now the company will be able to go back for another harvest in just 25 or 30 years in the areas where it has practised reduced-impact logging. That is what sustainable forest management means. ■

Deforesting Amazonia — the hamburger connection

2004 Annual Report

If you were to stop someone in the street in Cairo, Moscow or virtually any European city and ask them whether they or their country had any influence over what happens in the Brazilian Amazon, they would probably be bemused. And if they gave you an answer, it would probably be ‘no’. But they would be wrong. Egypt, Russia and the European Union are among the many destinations for Brazil’s beef exports, which increased five-fold between 1997 and 2003.

An analysis by CIFOR scientists David Kaimowitz, Benoit Mertens, Sven Wunder and Pablo Pacheco established that the burgeoning export market for Brazilian beef was responsible for a rapid increase in deforestation in Amazonia in the first half of the 2000s.

CIFOR published the report, *Hamburger Connection Fuels Amazon Destruction*, in April 2004, shortly before the Brazilian government’s National Institute of Space Research (INPE) issued its deforestation figures for the 12 months up to mid-2003. ‘The previous year’s figure had been incredibly high, at 2.5 million hectares,’ Pacheco said. ‘We had a real sense from our fieldwork that deforestation had continued at a very rapid rate, and we wanted to show precisely what the causes were.’ Pacheco and his colleagues were right: the new INPE figures, released just after the CIFOR report, showed that the pace of destruction had barely faltered.

Cattle were largely to blame. In 1990, there were 26 million head of cattle in the Brazilian Legal Amazon, which embraces the states of Acre, Amapá, Roraima, Rondônia, Pará, Mato Grosso, Amazonas, Tocantins and Maranhão. That represented 17 percent of Brazil’s herd.

Twelve years later, that region had 57 million head of cattle, or a third of the country’s herd. Before 1998, the increase in the number of cattle in the Amazon could be largely attributed to the steady rise in domestic consumption, with much of the beef heading south to feed city dwellers in São Paulo and Rio de Janeiro. In 1998, however, the beef export boom began, sparked by two unrelated events: the devaluation of Brazil’s currency, and the eradication of foot-and-mouth disease.

‘Devaluation of the *real* in 1998 had the effect of doubling the price of exported beef, which created a major incentive for ranchers to expand the area under pasture,’ Kaimowitz said. The same year, two southern states were declared free of foot-and-mouth disease. Others soon followed, giving them access to new markets in Europe, Russia and the Middle East.

In 1995, Brazil exported 28,000 tonnes of beef to the European Union. Exports rose to 125,000 tonnes by 2002. In 1995, Egypt imported no beef from Brazil; in 2002, it imported 47,000 tonnes. Russia, Chile, Israel and the Philippines also became major buyers of Brazilian beef. The researchers found that most of the exported beef was raised in Brazil’s southern states, where cattle ranchers in the Amazon rapidly expanded their herds, converting forests to pasture.

The report put paid to the popular belief that logging and the conversion of forest to make way for soya beans were the major causes of deforestation. Logging seldom leads directly to deforestation in the Amazon, although logging operations often damage the forests and the construction of logging roads makes it easier for farmers and settlers to open up new areas. In contrast, by 2002, soya beans, occupied 4.9 million hectares of land in Amazonia, about a tenth of the area converted from forest to cattle pasture.

Official concern about the scale of Amazonian deforestation — an area of forest the size of Portugal was

lost during the 1990s — encouraged then-President Lula de Silva to announce a major new Action Plan to Prevent and Control Deforestation in the Legal Amazon in March 2004. CIFOR welcomed the government’s approach, but argued that additional funding and attention were required if the rate of deforestation was to be significantly curbed. ‘There is little that Brazil can do to influence international markets,’ Pacheco said, ‘but there is a series of policies which could help to reduce the conversion of forests into cattle pasture.’

The government, the researchers said, must put an end to land grabbing. There should also be restrictions on some road projects outside areas that have already been developed. The report also recommended that government-owned land be formally registered as national forests to prevent the spread of ranching into those areas. Finally, the government should consider providing economic incentives to maintain land under forests. For that to happen, however, Brazil would need financial assistance from the international community.

The Hamburger Connection made the role of beef exports in promoting deforestation in the Amazon an international issue, and stimulated media coverage around the world. Articles appeared in São Paulo’s two largest newspapers, as well as the *International Herald Tribune*, *Toronto Star*, *The Guardian*, the *Daily Telegraph*, Reuters and dozens of other newspapers inside and outside Brazil.

‘CIFOR’s report highlighted the importance of currency devaluation and the international beef markets, and showed that they were the main factors driving cattle expansion in the Amazon,’ said Oriana Almeida, director of the Institute for Environmental Research in Amazonia (IPAM). ‘By making explicit the causes of cattle expansion, the report provides the information required to define the policies needed to achieve a sustainable future for Amazonia’s forests.’ ■

Brazil’s rapidly expanding beef export market has been a major cause of deforestation in recent years.

Photo by Pablo Pacheco/CIFOR

For the past 20 years, researchers at the Center for International Forestry Research (CIFOR) have sought to understand the natural processes that keep forests healthy and the ways in which people use and manage their resources. The vignettes in this volume are CIFOR's footsteps in the forest, retracing the journey we have shared with forest dwellers in Latin America for the past two decades.

RESEARCH
PROGRAM ON
Forests, Trees and
Agroforestry

This research was carried out by CIFOR as part of the CGIAR Research Program on Forests, Trees and Agroforestry (CRP-FTA). This collaborative program aims to enhance the management and use of forests, agroforestry and tree genetic resources across the landscape from forests to farms. CIFOR leads CRP-FTA in partnership with Bioversity International, CATIE, CIRAD, the International Center for Tropical Agriculture and the World Agroforestry Centre.

cifor.org

blog.cifor.org

Center for International Forestry Research (CIFOR)

CIFOR advances human well-being, environmental conservation and equity by conducting research to help shape policies and practices that affect forests in developing countries. CIFOR is a member of the CGIAR Consortium. Our headquarters are in Bogor, Indonesia, with offices in Asia, Africa and Latin America.