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Keeping track

Foresters and forest planners have always needed to know the location of timber resources, including for planning forest management and harvesting operations, for monitoring wood flows to mills and ports, and for marketing of forest products. Various systems have been developed over the years to provide this type of information. In the tropics, these have until recently been mostly based on complex paper-based forms that were often prone to error and/or corrupt practices, thereby reducing their utility and often compounding the problems they were meant to solve.

Over the past decade and a half there has been a boom in electronic and other sophisticated systems for

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ITTO

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Images: Log tracking in Guyana. *Photo: Guyana Forestry Commission* (cover); Log marking/tracking in Peru (above). *Photo: M. Torres*

... Editorial continued

tracking logs and finished wood products. This began with the adaptation of the type of barcodes used for inventory control of packaged items in supermarkets to forestry applications (see article from Peru on the following pages of this issue) and has evolved to include radio frequency identification tags, sophisticated wireless communications technologies (see *Topical and tropical* this issue), remote sensing, stable isotope analysis, DNA profiling (see *Nature's barcode*, *TFU* 22-1) and other techniques.

The prime driver behind this explosion in forestry tracking technologies has been the growing demand for demonstrably legal and sustainable forest products (as laid out, for example, in the new EU Timber Regulation, the US Lacey Act and other importing market requirements). At the same time, forestry administrations in several tropical countries, including many producer member countries of ITTO, have recognized that weak governance and other problems have resulted in significant production and trade of illegally produced timber. This illegal production puts legitimate timber businesses at a competitive disadvantage and can also mean big losses of resource rents and other government revenues.

ITTO has been a strong supporter of timber tracking as a means of strengthening forest governance in the tropics and thereby promoting sustainable forest management. Numerous projects have been funded, through the regular project cycle and more recently through the TFLET (Tropical Forest Law Enforcement, Governance and Trade) thematic program and the ITTO-CITES program. CITES, with substantial experience in tracking of animal species listed in its Appendices, was keenly interested in collaborating with ITTO to promote the adoption of timber-tracking technologies in tropical countries with CITES-listed tree species. This resulted in the 2012 joint publication *Tracking sustainability* (ITTO Technical Series 40), a review of currently available electronic and semi-electronic timber-tracking technologies.

Timber-tracking technologies are also playing an increasing role in independent forest and chain-of-custody certification, as indicated in the articles from Peru and Cameroon on the following pages of this issue. Cost issues are of course a major concern for many countries and this is part of the reason why there has been an upsurge in requests for assistance to ITTO and other partners like FAO to help to fund the acquisition and implementation of such technologies. It is important for countries to select appropriate technologies *vis-à-vis* the sophistication of their forest sectors, geographical considerations, available budgets, major markets and other relevant factors. It is also important to note that many of the evolving sophisticated (and more costly) technologies (eg stable isotope analysis, DNA profiling) are designed to support and work in tandem with existing tracking and forest management systems to focus on particular problem areas (or species) rather than being implemented on a country-wide scale.

In an ideal world, timber tracking would be once again solely the domain of foresters, who would return to using it primarily as a forest management and marketing tool rather than as proof of legality of production. However given the gaps in forest governance that still exist in many tropical countries and the desire of many consumers of wood products to be reassured that their purchases are not damaging the environment, it appears likely that these technologies will continue to play an important public role in managing forests better and in marketing products produced in them in a legal and sustainable manner. ITTO will continue to be at the forefront of promoting timber-tracking technologies in its producer member countries and informing the world of their implementation here in the *TFU*.

Steve Johnson
Editor

Electronic timber traceability

An ITTO project has piloted a technique to verify the legal origin of Peruvian timber

by Micha Torres

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In 2008, the International Tropical Timber Council approved and funded a project[1] with the aim of developing a timber traceability system in Peru based on a pilot scheme for tracking mahogany from Peru's tropical forests to the end-consumer in the United States of America.

In Peru, forest concessionaires are legally required to follow "general sustainable forest management plans" and "yearly plans of operation" to ensure the sustainability and efficiency of their operations. The need to demonstrate compliance with these instruments, and the desire to improve production efficiency and therefore competitiveness, has given rise to efforts to provide real-time, verifiable information on harvested timber by tracking it through the entire production process. A reliable, transparent forest traceability system is an essential element of sustainable forest management.

The stated objectives of the ITTO project, which was implemented by *Bosques, Sociedad y Desarrollo* (BSD), were to facilitate the traceability of Peruvian export timber, assess the status of the export chain, and identify the requirements for the implementation of a traceability system, including institutional and budgetary needs for the voluntary implementation of the system by Peruvian companies. A key output was to be a proposal for the widespread implementation of such a traceability system on a voluntary and collaborative basis in the country's forest regions. The need for such a system is summarized in Box 1. The traceability system, when fully implemented, is expected to support the consolidation of Peru's forest concession system by establishing favourable conditions in which concessionaires and communities can demonstrate to markets the legal and sustainable origins of their products.

Box 1. Reasons for a timber traceability system in Peru

- The forest-related agenda included in the Peru–United States of America Free Trade Agreement requires timber traceability in conformity with the United States' Lacey Act. The free-trade agreement between Peru and the European Union also addresses timber traceability through FLEGT rules.
- Timber traceability will lead to better performance reports for the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which requires export certificates for mahogany (*Swietenia macrophylla*) and cedar (*Cedrela odorata*).
- Major markets are increasingly demanding verifiable information demonstrating the legality of timber and the sustainable management of the forests in which it is harvested, which requires, among other things, the tracking of products from the forest to the end-consumer. Government accreditation is not considered sufficiently reliable for this purpose; internationally recognized independent certification is therefore required.
- Electronic traceability enhances and complements existing voluntary certification schemes, such as that of the Forest Stewardship Council.

The pilot exercise

Under the ITTO project, ten mahogany trees were tracked from the forest in Ucayali, Peru, through processing, to the arrival of the mahogany sawnwood at its final destination in the United States. This pilot exercise was carried out using timber harvested in the Yaminahua El Dorado native community near the Peru–Brazil border, in cooperation with the community's forest regent[2], the forest enterprise *Forestal Venao*.

The pilot electronic traceability system used radio frequency (RFID) and barcode identification technology as vehicles for the electronic product code (EPC), with the capacity to generate information at each stage of the production chain. The EPC is a globally unique international identification code that reduces the potential for duplication and copying and is a transparent and reliable way of sharing data at the global level. The EPC can provide a unique identity for any physical product and can be used to identify individual products and objects among millions of similar items. Barcodes and RFIDs are expected to remain key vehicles for EPCs for many years and will become increasingly inexpensive.

From the tree…

…to the log…

…to the mill. *Photos: M. Torres*

1 PPD138/07 Rev.1 (M)

2 The Forest Regent scheme was developed to allow small landowners to apply for forest certification as a group. A forest regent is responsible for the sustainable forest management of its community partners.

In the pilot system, RFID chips were placed on standing trees, stumps and logs, while barcoded labels were used on subsequent products, thus electronically upgrading the forms and codification methods used under Forest Stewardship Council forest certification. In the future, these data can be made available on the Web, thus providing transparent monitoring of the entire process for companies, certifying agencies, authorities and end-consumers. RFID chips have the benefit of being able to integrate social and environmental information in multimedia formats. In addition to the usual commercial data, they can be used to convey, to end-consumers, other information, such as the history and cultural characteristics of native communities (which own one-third of Peruvian forests).

Launching the pilot system

The pilot electronic traceability system was launched in August 2009 with the establishment of the project steering committee. A company, MAP GeoSolutions, was engaged to conduct an electronic inventory of the timber to be traced; geo-reference the location of the timber using state-of-the-art satellite technology; codify standing trees, and logs and branches after logging; apply the RFID chips and labels; take measurements; and set up a database of standing tree-to-log yield rates. In undertaking these tasks, MAP GeoSolutions worked closely with *Forestal Venao*. As a first milestone in the traceability process, timber was tracked from the log yard in the forest, through control posts and river transport, to the processing plant (a sawmill) in Pucallpa. During the exercise, the performance of control posts, waybills, forms and private-sector and public-sector entities was evaluated.

A second traceability milestone was achieved the following month at the *Forestal Venao* sawmill in Pucallpa. In addition to verifying the chain of custody, log-to-sawnwood yield monitoring data were recorded. A third traceability milestone was attained with the tracking of the timber through control posts from Pucallpa to Lima, the processing of the CITES export certificate, and shipping from the port of Callao in Lima. The final traceability milestone was the arrival of the mahogany sawnwood in New Orleans in the United States, in conformity with end-consumer requirements.

A public–private partnership

To implement the pilot electronic traceability system, a public–private partnership was established in which each of the parties (Box 2) financed their own participation, provided relevant technology and licences, and invited relevant suppliers to participate in the same way. BSD served as facilitator, overseer and coordinator. All partners participated in the steering committee that guided the initiative and discussed the findings and proposals for future action. Cooperation between participating companies facilitated the analysis of alternative approaches and made it possible to identify anomalies and errors in the system that could be rectified in the future development of a general-access forest traceability system.

Box 2. The participants

The following Peruvian public-sector stakeholders participated in the initiative:

- Ministry of Agriculture
- Ministry for the Environment
- National Agrarian University of La Molina
- Ministry for Foreign Trade and Tourism
- Ministry for Production
- Tax and Customs Authority
- Regional Government of Ucayali and its regional offices
- Ministry of the Interior – National Police Force of Peru
- Ministry of Defence – Armed Forces
- Forest Supervisory Agency

The following national and international private-sector stakeholders participated:

- Certified mahogany-logging native communities:
  - El Dorado Native Community and the forest regent, *Forestal Venao S.R.L.*
  - *Unión de Comunidades Indígenas de la Frontera*
  - The certified forest stakeholders' union
- Electronic forest census and geo-referencing agencies – MAPS GeoSolution and GTza
- Export companies and other forest service industries – *Forestal Venao* and One Tree International
- Traceability and hosting technology providers – Helveta, GS1, Trimble and Nitta
- Logistic operators – ALSA and Bertling Logistics
- Financial sector – Macroconsult, Apoyo and Arowana
- Shipping companies and customs agencies – TransOceanic
- End-consumers in the United States

The project tested a set of compatible traceability options. Suitable software was also tested to ensure compatibility between the databases and software of various forest stakeholders and the proposed additional software required to implement the timber traceability system. This cooperative approach offers the best way to establish a workable, transparent and cost-effective timber traceability system in Peru.

Scaling up

The work carried out under this pilot project is now being scaled up to the national level to allow the tracking of timber from all Peruvian forests. The USA and Peru recently agreed to a five point action plan following continuing allegations of illegal logging and illegal trade of timber between the two countries. The plan includes increasing the number and training of logging inspectors, more on-site inspections in remote concessions, continued development of systems to track the supply chain of timber, and criminal prosecutions of anyone—including public officials—involved in illegal logging.

Tracking Cameroon's FLEGT timber

Developing an appropriate timber-tracking system for community forests

by Kadiri Serge Bobo[1]*, Rodrigue Fapa Nanfack[1], Thérèse Moulende[2], Nadège Nzoyem Saha[3] and Albert Bokkestijn[3]

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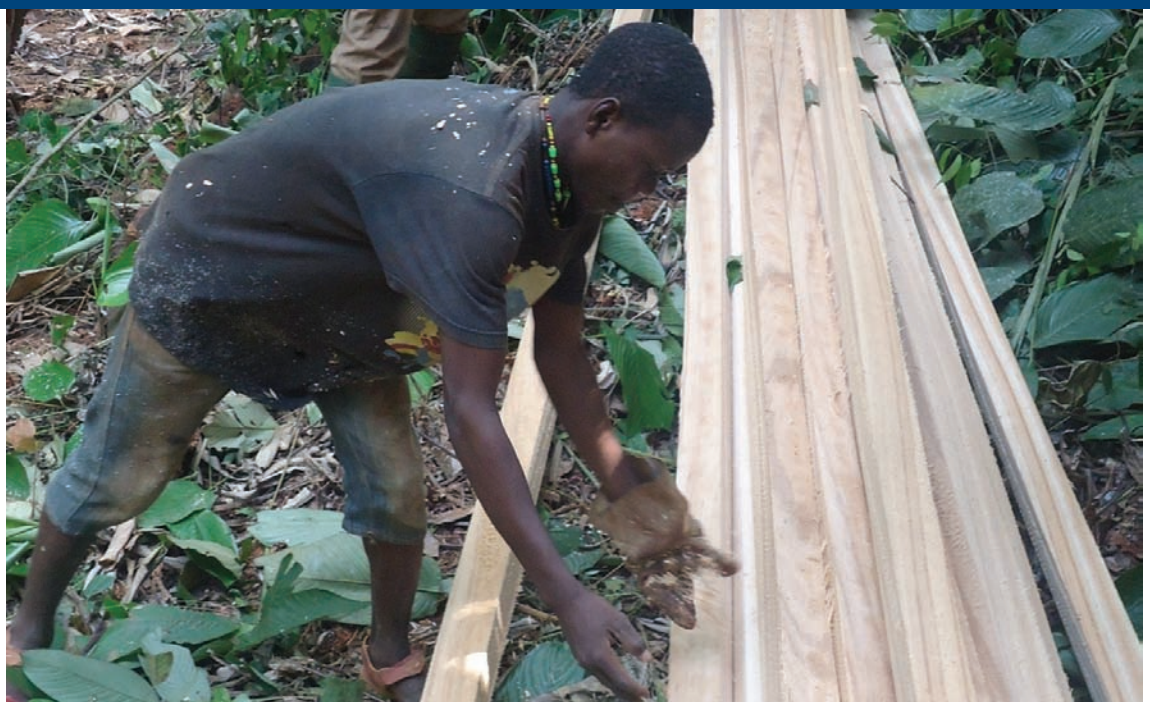
2 Regional Centre for Agriculture Specialized Education (CRESA), Yaoundé. B.P.: 8114 Yaoundé, Cameroon.

3 Netherlands Organization for Development (SNV), B.P. 1239, Yaoundé, Cameroon.



Legal?: Timber sawn in the Cameroon forest. *Photo: K.S. Bobo*

One of the major innovations of the January 20 1994 N° 94/01 law establishing the forest, wildlife and fisheries system in Cameroon is the involvement of local communities in the sustainable management of natural resources through the promotion and development of community forestry. Although eighteen years have passed since the introduction of community forestry in Cameroon, uncontrolled logging is still common, leading to further increases in deforestation and the impoverishment of local communities. Due to the illegal logging of community forests (CFs), Cameroon lost 1.25 billion CFA Francs in 2008 (Cuny, 2011). With the aim of controlling the entry of illegal timber into Europe, an action plan for Forest Law Enforcement, Governance and Trade, widely known as FLEGT, was developed by the European Union in 2003. As a timber producing country, where 60% of timber was exported to the European market between 2005 and 2008 (Bayol *et al.*, 2012), the State of Cameroon signed a FLEGT-Voluntary Partnership Agreement (VPA) in October 2010. Through the agreement, Cameroon showed its determination to track timber logged under all forest permits, including timber from CFs, and to control the flow of illegal timber throughout its territory.

As part of its VPA, a tracking system based on plastic tags with barcodes to be attached to all timber at every step of the chain of custody, starting from the inventory phase, was developed by Cameroon (TECSULT, 2007a,b). The tracking system yielded positive results in forest concessions and CFs where barcodes were used for export logs (Aubé and Ngomin, 2012). However, the system proved inappropriate in CFs where sawing of logs takes place where the tree is felled in the forest. Deficiencies also include issues regarding the technical, financial and human resources necessary to implement the system within CFs. Due to the abovementioned weaknesses, it has proven difficult to cross-check data, leading to delays in the processing and uploading of data collected across CFs in Cameroon's SIGIF 2 (Second Generation Forest Management and Information) system. This paper reports research undertaken to determine which tracking system would be most appropriate for Cameroon's CFs prior to the enforcement of its FLEGT-VPA.

Poor data leads to illegality

The logging system currently in place in Cameroon's CFs cannot ensure the reliable tracking of timber. Over 95% of logging occurs outside approved plots (Nkodo, 2011) since pre-logging inventories are generally not conducted in the CFs due to their high cost relative to the available incomes of the local people (Julve *et al.*, 2007). Even in the few CFs which benefit from financial and technical capacity building via support from NGOs and others, inventories are rare and may be unreliable since the Ministry of Forestry and Fauna (MINFOF) lacks the necessary resources for ensuring efficient monitoring. Therefore, most of the Annual Logging Permits (ALP) granted to CFs throughout Cameroon are obsolete (Beauquin, 2011). This lack of reliable inventory data leads to many problems such as forest managers logging trees below the authorized diameter to be able to satisfy client orders. At the time of felling, CF managers in general do not fill in the N°10 Forest Document (FD, the field document officially required by the Forestry Administration). In other words, the tree-felling date and the number of trees logged in a plot are usually unknown. Furthermore, forest managers are not usually provided with reliable documents for

tracking lumber, some of which may be stolen or diverted at the time of skidding, which entails a decrease in revenue for the communities.

A timber-tracking system for Cameroon's CFs

The proposed system is based on paper documents, in compliance with SIGIF 2 specifications, and follows the usual steps involved in CF logging operations (Figure 1). The system is based on the assumption that SIGIF 2 is operationalized, which means that: Divisional Delegations of the Ministry of Forestry and Wildlife (MINFOF) are provided with workstations for operators and a working Internet connection; and SIGIF 2 is able to deliver logging permits, to record lumber produced in the CFs, and to deliver waybills (transportation documents). The key elements of the proposed system follow.

Prior to logging

CFs are allocated upon the signature of a provisional or final management agreement, and divided into 25 plots, with a pre-established annual logging plan for each plot. When the officer in charge of the CF (FOR) receives a client order, tree trackers are dispatched to locate the required species. Trees to be logged are geo-referenced and marked, and a Tree Tracking Record is filled in and sent to the Divisional Officer (DO) in charge of local forests. The information recorded in the Tree Tracking Record is entered into SIGIF 2. The DO is then able to register the client order and to give his/her approval for validating the Logging Permit produced by SIGIF 2. The number of Logging Permits produced by SIGIF 2 varies according to the number of annual orders and the annual allowable cut for a given species.

Felling and cross-cutting

After the Logging Permit is validated by the DO, the felling and cross-cutting team is dispatched to the forest and targeted trees are felled. The N°10 FD, as well as the felling and cross-cutting records, are filled in by the assistant-feller, who is also responsible for marking stumps with universal chalk (see first photo).

Sawing and timber scaling

The sawing and timber scaling team is then dispatched to the forest, provided with sawing and timber scaling records, as well as a numbering device (see second photo) and paint for marking timber. Boards are numbered by the assistant-sawyer as they are produced.

Timber skidding or hauling

An assistant is responsible for ensuring that timber to be hauled from the forest has been duly marked by the assistant-sawyer and approved on the basis of the client order. Using the Lumber Hauling Record, the skidding team leader ensures that hauled lumber is actually transported to the roadside.

Transportation and loading

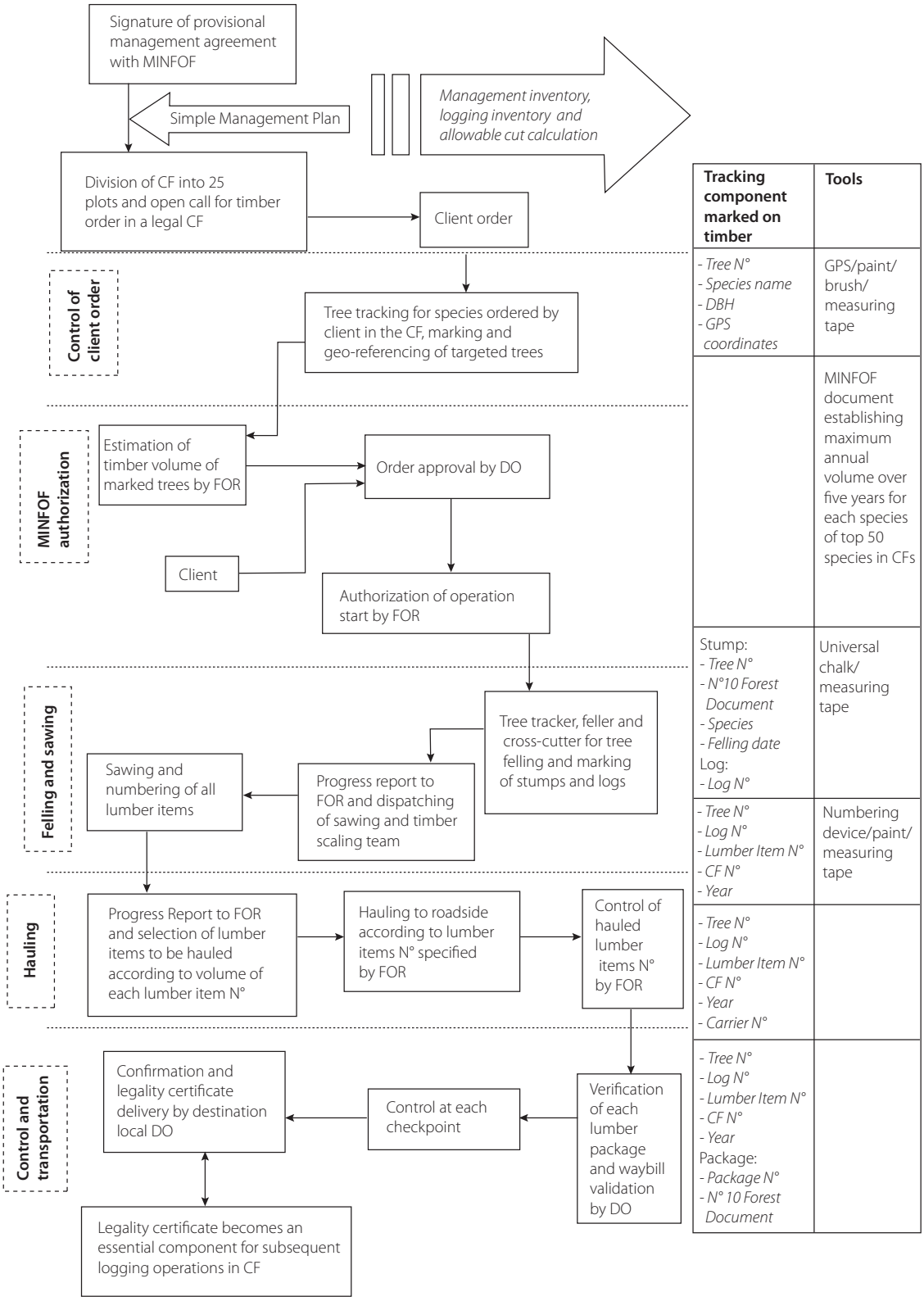
The FOR returns to the local Forestry Divisional Agency and enters the Lumber Hauling Record data into SIGIF 2, which will deliver the relevant waybill, provided everything is in order. The FOR and the DO or representative will return to the site to check whether the information entered in SIGIF 2 prior to logging matches the data included in the waybill. If everything is in order, the DO or representative will stamp and sign the waybill prior to the loading of the lumber package at the roadside.

Marked: Identifying a stump using universal chalk.

…and numbered: Device for numbering sawn timber. *Photos: K.S. Bobo*

At checkpoints, MINFOF officers check compliance between the load and the relevant waybill. If no irregularities are identified, officers record their approval, sign and stamp the waybill with the official seal, and transportation may proceed. Upon reaching its destination, the local DO receives the load. If everything is in order,

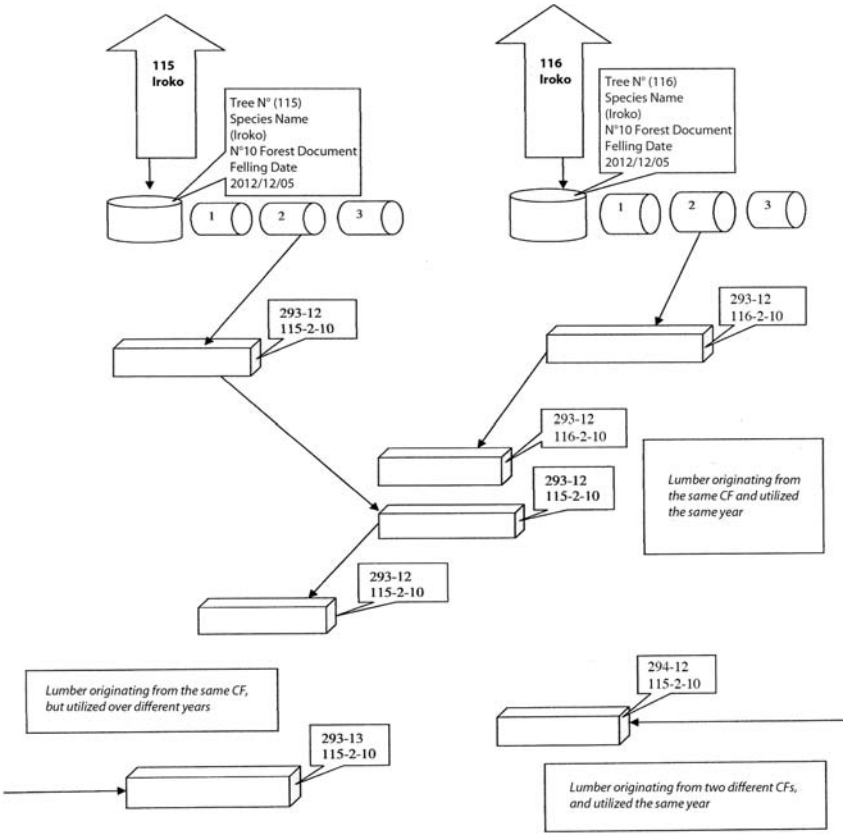
Figure 1. Tracking system proposed for community forests in Cameroon



the DO signs the waybill and retains one copy for entering information in SIGIF 2 and crosschecking. If everything is in order, SIGIF 2 delivers a legality certificate to the owner of the lumber package.

Figure 2 shows the tracking methodology to be used for sawn timber by MINFOF's control officers. For instance, lumber item N°10 from log N° 2 and tree N°115, logged in 2012 in n°293 CF will bear the code (293-12; 115-2-10). It will be easy to distinguish from another piece of timber bearing the code (293-12; 116-2-10), which refers to lumber item N° 10, log N° 2, tree N° 116, logged the same year and in the same plot.

Figure 2. Tracking methodology used for sawn timber originating from community forests



Recommendations

While it is feasible for the CFs to implement the proposed tracking system, implementation would require a law amendment prior to the enforcement of the FLEGT-VPA. It is therefore recommended that the following be implemented by MINFOF, in collaboration with other partners:

1. revise and simplify the procedure for securing and logging CFs in Cameroon, as well as the method for developing Simple Management Plans (SMP) through a participatory process (as specified in the manual of allocation procedures and management standards for community forests);
2. ensure that CF managers can implement a simple and efficient tracking system;
3. simplify management inventory, logging inventory and other procedures which are often difficult to comply with for communities;
4. decentralize Logging Permit delivery at the level of the Divisional offices through SIGIF 2 for ensuring process decentralization and cost reduction; and
5. test the tracking system in Cameroon, and promote system ownership by the communities.

Acknowledgments

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Private forest management in Indonesia

ITTO projects show clear land tenure and a culture of tree use are essential to success

by Don Gilmour[1]*, Baharuddin Ghazalli[1] and Subarudi[2]

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2 FORDA (project coordinator, PD 271/04 Rev.3 (F) and PD 394/06 Rev. 1 (F))

Cash crop: Mahogany logs from private forest in Ciamis. *Photo: D. Gilmour*

Recent ex-post evaluations of two ITTO projects in Indonesia, one in West Java and the other in Sumatra, have investigated the factors that hinder and help forest restoration and management. In one district in West Java, clear private landownership, a strong culture of integrating trees and agriculture, supportive government policies and other factors have resulted in well-managed private forests and substantial timber production. In Sumatra, on the other hand, a lack of clarity on land tenure, a lack of a culture of integrating trees and agriculture, and local suspicion of government are hindering the restoration of a degraded catchment. Both projects provide lessons on promoting private initiatives in forest rehabilitation that could be applied more widely in Indonesia.

Private forestry in Ciamis district, West Java

There is a long tradition of integrating trees into farming systems in West Java, and 'people's forests' have been an integral part of landscapes in the province for generations. Governments have supported this tradition with a series of policy initiatives since the 1970s aimed at encouraging tree-planting on private land (Box 1). Local and national interests have both contributed to the evolving practice of planting trees on private land for commercial purposes, which is now widespread in the province. The provincial government has a long-term target of 45% forest cover in West Java.

An ITTO project[1] operated in the district of Ciamis in the eastern part of West Java from 2006 to 2008 to provide support to private forest-growers to improve their forest management. The contemporary landscape in Ciamis is essentially a forested one, consisting of a mosaic of relatively small patches of agricultural land integrated into areas of private forest managed under both agroforestry and pure forestry regimes. The upland, steeper areas of the district tend to be state-owned forest of various categories, much of which is degraded, particularly those areas that were used for estate crops but are now abandoned. The private forest estate is in a mature state, with tree age varying from recently planted seedlings to greater than

Box 1. The evolving farming and tree-planting culture of West Java

The traditional subsistence culture of the people in West Java was to have a piece of land near their homes and to work that land to achieve self-sufficiency. Livelihoods were based on growing fruit trees and vegetables and, in some cases, rearing cattle (buffalos for the rice fields) or raising chickens. The system of mixed annual crops and fruit trees, with a minimum of land-clearing, maintained soil fertility and enabled the people to farm their lands sustainably.

With an increasing population and the advent of a market economy, however, the traditional subsistence culture has had to change and adapt. Land shortages have arisen, and government forests have been cleared for cultivation or converted to other forms of land use. Over the years, the national and provincial governments have responded to these pressures in numerous ways, including:

- 1952—government began a program of encouraging the planting of fruit trees on abandoned land to improve soil protection and raise soil fertility.
- 1956—the departments of agriculture and forestry ran joint national greening campaigns.
- 1972—the Governor of West Java initiated an agroforestry drive in Bogor.
- 1975–1976—the greening project of land outside government forest land was in full swing, particularly in West Java.
- 1990—the Forestry Department pursued national greening activities with the large-scale planting of *Albizzia*, targeting critical areas.

Source: Adapted from Department of Forestry (2008).

1 PD 271/04 Rev.3 (F)

30 years. Much of the area is managed as agroforests, with underplanting of crops such as cardamom. Overall, the private forests are extremely well-managed and produce a mix of timber and non-timber products. This impressive process of afforesting private land has been underway in the district for many decades.

The success of private forestry

Private forests now cover 32 000 hectares in Ciamis (about 13% of the district's land area) and produce an average of 360 000 m^3 of logs per year. These are processed in more than 500 sawmills in the district (FORDA 2008) and by mills outside the district[2]. Logs sourced from government forests contribute a further 49 000 m^3 to the local industry (FORDA 2008). By and large, there are no land-use or land-tenure conflicts over private forests in the district, and this contributes to the ability of farmers to manage their land for tree crops, which require long-term investment and thus tenure security.

Private forestry has received strong support from the district government. In 2004, for example, the tax on logs harvested in private forests was removed, thus providing an added stimulus to tree-planting. This is an excellent example of government creating an enabling regulatory environment (as opposed to an enforcing one) to achieve its policy objectives.

Under a national government initiative, farmers are encouraged to form groups to provide an interface between farmers and district extension staff. These farmers' groups are legal entities, with bank accounts and the ability to raise loans for collective activities. In Ciamis, farmers' groups (typically with 50–150 members) tend to operate collectively for activities such as seedling production, while farmers work individually on almost everything else, including the management of their agroforests (e.g. planting seedlings and applying silvicultural techniques) and the sale of their timber and non-timber products. An average farmer might own less than one hectare of forest land; for example, the 150 members of the Lumbung farmers' group own about 100 hectares of forest land between them.

Lessons learned

A number of lessons emerged from the implementation of the ITTO project, and from general experience with successful private forestry in Ciamis, that could help further encourage private forestry, both in the district and beyond. They include the following:

- Providing support to motivated local community leaders is an effective mechanism for demonstrating and spreading knowledge and information to improve the productivity of private forests. Local community leaders can act as unofficial (but highly effective) extension agents in spreading information in their communities and beyond.
- The major impediment to improving livelihoods based on private forest management under the prevailing conditions in Ciamis relates to poor market conditions for the timber produced in private forests.
- An enabling regulatory framework that encourages farmers to invest in private forestry is more effective in achieving government policy objectives than an enforcing one that requires farmers to plant tree seedlings and protect forests.

Private forestry in Ciamis is well accepted and widely practised by farmers and supported by the district government. Under these conditions, the project demonstrated various approaches to support and improve private forestry and make it even more productive, with an emphasis on the production and distribution of high-quality seedlings and the introduction of improved silvicultural techniques. The project also showed ways in which the internal management of farmers' groups could be strengthened to make them more effective, and it provided individual farmers with negotiating skills to give them more power in the sale of their logs to sawmillers and middle-men. Techniques for the production of high-quality seedlings have been taught at local schools, thus influencing the next generation of farmers. The work done by the project has been disseminated widely through the preparation and distribution of publications and especially through the convening of numerous stakeholder workshops.

A national model?

The project began the task of identifying the building blocks of a model for the sustainable management of private forests. This endeavour has assumed strategic importance because of the changes taking place in the timber industry countrywide. As the log supply from natural state-owned forests declines, more logs are being sourced from private forests. There seems little doubt that this trend will continue; for this reason, the refinement and testing of private forestry models is of increasing importance. The experiences of the project could be applicable in districts where private forestry has not yet reached the maturity that it has in Ciamis.

Rehabilitation of degraded forest land in Northern Sumatra

The Lake Toba Catchment Area in northern Sumatra is an area of outstanding natural beauty and a popular tourist destination. However, much of the forest in the catchment area has become degraded, and this has contributed to the deterioration of the catchment's ecosystem functions. In the 12 years between 1985 and 1997 it was estimated that about 16 000 hectares of forest were either degraded or converted to agriculture, a rate of about 1300 hectares per year. Most of this degradation and clearing occurred on

2 Provincial Forestry Office data (quoted in FORDA 2008) indicate there were 538 sawmills in Ciamis in 2006.

Degraded beauty: Lake Toba landscape. *Photo: D. Gilmour.*

government-owned forest land of various categories, and the indications are that substantial areas of forest are still being lost. It is estimated that around 142 000 hectares of forest land are degraded in the Lake Toba Catchment Area (ITTO 2010).

The national government has designated the Lake Toba Catchment Area as one of the country's 12 priority catchments to be rehabilitated, and the North Sumatra provincial government set a target of about 25 000 hectares of degraded forest land to be rehabilitated by 2009. The strategic importance of rehabilitation in the Lake Toba area is well-recognized at all levels of government.

Failure of past rehabilitation efforts

Analysis has shown that past rehabilitation efforts in the Lake Toba Catchment Area have had little success, for the following reasons (among others):

- Local communities have often been treated as 'objects' rather than 'subjects' in rehabilitation programs, and this resulted in very low local community participation in activities and a lack of ownership of outcomes.
- Fires regularly burn the rehabilitated areas and destroy previously planted seedlings.
- In many areas, unclear land tenure, and conflicts over tenure constrain rehabilitation efforts.
- Ineffective coordination among local stakeholders reduces the potential for optimal outcomes.

While past rehabilitation efforts were also affected by technical constraints, the major issues to be addressed in the area are social and institutional in nature, particularly unclear land tenure, tenure conflicts, and a lack of local participation and community empowerment to undertake and sustain rehabilitation activities. An ITTO project[3] was implemented in the Lake Toba Catchment Area from 2007 to 2010, and the analysis referred to above provided the rationale for the project's design and implementation. An evaluation of the project's achievements carried out in July 2012 summarized the current status of rehabilitation in the Lake Toba Catchment Area and the contribution made by the project.

Clan land

One of the major constraints on rehabilitation efforts in the Lake Toba Catchment Area is unclear and conflicting land tenure. However, it became clear during the project evaluation mission that this was not universal and indeed varied widely between districts and, in some cases, within districts. In the district of Samosir, for example, a large proportion of non-government land is held under clan ownership, although for various reasons some of this has been privatized in the past several decades (a process that continues, although slowly). Tenure uncertainties on clan land limit attempts to introduce tree and agroforestry systems because of difficulties associated with obtaining agreement from all clan members (many are absentee landowners but still have the right to participate in decision-making). In the district of Karo, by contrast, the process of privatizing clan land was completed in the 1970s and there are now no land-use or tenure conflicts. The situation in other districts lies between these two extremes. The distribution of degraded forest between government and private and clan land is unclear, but most degradation is probably on government land of various categories.

3 PD 394/06 Rev. 1 (F)

Tree culture: A farmer in a tree nursery developed under the Ciamis project. *Photo: D. Gilmour*

This simplified characterization of a complex land-tenure situation is sufficient to indicate that no single approach will be suitable in all situations. Any approach to rehabilitating degraded land will need to be tailored to site-specific conditions, including the land-tenure situation.

Lack of a tree culture

Unlike in West Java, the Batak and other local communities who live in the Lake Toba Catchment Area do not place a high value on integrating trees into local farming systems. The project approach, therefore, had three threads: demonstrating how agroforestry can be integrated into private farmland to improve environmental and economic outcomes; collecting material that can be used in the planning and implementation of rehabilitation activities; and raising awareness among stakeholders of issues associated with rehabilitation in the Lake Toba Catchment Area.

Demonstration, and some uptake

With the support of the project, about 330 hectares of demonstration plots were established on private and clan land in the area. There is some evidence that several farmers not involved directly with the project have taken up tree-planting as a result. It cannot be said, however, that a tree-planting movement is underway, and some of the additional plantings have been destroyed by fire. The few hundred hectares of land devoted to demonstration plots, and the modest spill-over effect to other farmers, make an insignificant dent in the overall land degradation problem, but they could point the way for the future.

Lessons learned

Several lessons have been learned from the implementation of the project that are worthy of documentation for future work. These include the following:

- The lack of a culture among farmers in the Lake Toba Catchment Area of integrating trees into the farming systems will take a long time to overcome. Farmers need to see real and obvious benefits before they commit resources to modifying their existing farming practices.
- Visionary and innovative farmers can play an important catalytic role in encouraging their neighbours to adopt agroforestry systems.
- Attempts at increasing tree cover on clan lands are more difficult than on lands with clear private tenure rights.
- Increasing tree cover on clan lands should be approached by interfacing with the customary institutional systems and facilitating a social process, leading to partnerships between clan members and intermediary organizations such as non-governmental organizations.
- A three-year project cannot be expected to overcome the entrenched social and institutional issues associated with tenure uncertainty and conflicts on clan lands. It can do little more than identify the issues and chart a possible way ahead.
- Iterative approaches to implementation, such as action research, can usefully be employed in situations such as those faced by the project, where there is a high

degree of social and institutional uncertainty in the operational context.

- Community empowerment is a social process that needs careful nurturing and support—participation in training courses is insufficient to empower farmers and farmers' groups to be independent decision-makers.

Not all the Lake Toba Catchment Area is degraded and not all categories of land in the catchment need intensive rehabilitation. It is worth considering a strategic approach to future rehabilitation activities that disaggregates the landscape and identifies a spectrum of needs and the likelihood of success. Table 1 provides a framework for starting such an exercise. Such a framework could assist in making strategic decisions about the allocation of resources and the focus of rehabilitation efforts in the Lake Toba Catchment Area and elsewhere.

Table 1. Framework for a rehabilitation strategy based on need and likelihood of success

Land category	Need for rehabilitation	Rehabilitation strategy	Likelihood of short-term success
Gently sloping, productive agricultural land; private tenure; intensively managed for cash crops (e.g. much of Karo district)	Low	Little/no rehabilitation necessary—don't waste resources	Low (farmers probably not interested in incorporating trees into their farming system)
Steeply undulating deforested land, with agricultural crops in valley bottoms; private tenure (e.g. the southern edges of Karo district)	Medium	Work with motivated farmers and farmers' groups to establish demonstration plots and encourage expansion	High (farmers interested or could be easily motivated)
Steeply undulating deforested land, with agriculture in valley bottoms; subsistence/cash cropping; clan tenure (e.g. much of Samosir district)	Medium/high	Interface with traditional clan institutions using a trusted intermediary; establish demonstration plots where interest is high	Medium (some individual farmers may be keen, but some may undermine efforts, at least initially)
Steep government land; substantial loss or degradation of forests (e.g. many of the steeper parts of most districts)	High	Direct government rehabilitation following extensive awareness-raising campaigns; and/or the establishment of trials of some form of community-based forest management	Low (because of fire and other problems)

Tree-planting on private and clan lands is not widely practised and will probably require some sort of social movement for it to become widespread. A complicating factor is the widespread and vocally expressed lack of trust in government among local communities in the Lake Toba Catchment Area. In the long term, this will probably only be overcome by building some sort of partnership between government and private and clan landowners, possibly facilitated by mutually trusted neutral facilitators. Attempts to achieve government policy objectives, such as integrating tree crops into farming systems or rehabilitating degraded government land, are best approached by developing enabling regulatory frameworks that encourage positive actions rather than through regulatory enforcement.

The ITTO project's results provide guidance for the future. In particular, the demonstration of tree-planting systems on private land, the spreading of ideas (socialising the process), and the provision of information for regional planning are valuable contributions. In the future, more emphasis could be placed on strengthening nascent farmers' groups (which remain weak) and encouraging the integration of tree crops into farming systems by improving regulatory incentives, and these could contribute to the reforestation of private and clan lands. Rehabilitating degraded government forest lands (which is where the majority of the degraded lands occur) is a complex issue and will require radical changes in government policy and practice.

Conclusion

The two projects described in this article show some of the heterogeneity in private forestry in Indonesia and the need to tailor approaches to local circumstances. At the same time, they provide lessons that could prove valuable as Indonesia moves towards greater private and community forestry—with the aims of empowering local people to improve their livelihoods and meeting the needs of the timber industry.

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Portable sawmills and SFM in the Amazon

An ITTO project's innovative financing mechanism had a major impact on the uptake of new technologies

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Saw ready: Log harvested for portable sawmilling in Ucayali forest concession. *Photo: R. Carrillo*

Between 2004 and 2010, an ITTO project (PD 233/03 Rev. 2 (I)) implemented in Peru investigated the application of intermediate technologies for sustainable forest harvesting. This article summarizes an ex-post evaluation of this project carried out in 2012. The evaluation included visits to forest operations and mills impacted by the project and interviews with forest regulators, project beneficiaries, forest and mill technicians and credit agents in the Peruvian Amazonian regions of Loreto, Madre de Dios and Ucayali, as well as project executives and policymakers in Lima.

Forests under pressure

Peru has 79 million hectares of natural forest, making it the second-most forested country in South America after Brazil. The majority of these natural forests are tropical lowland forests east of the Andes mountain range. About 19 million hectares are allocated as protected areas such as national parks and conservation reserves and another 24 million hectares are zoned as permanent production forests in the Amazon. As of 2011, only about 1% (260 000 hectares) of these production forests had been independently certified as under sustainable forest management (SFM).

Seventy-seven percent of Peru's 29.5 million people live in urban areas. This urban population is growing at 1.6% per year, generating enormous social pressure and a steady flow of internal migration to rural areas. Because arable land comprises less than 6% of Peru's total land area and permanent pasture lands comprise less than 14%, natural forests continue to be encroached on by agriculture, as well as by formal and informal mining operations.

For the last two decades, Peru's forest sector has been shifting from a destructive extractive activity to an industry based on the sustainable use of a range of products and ecosystem services under management regimes that aim to conserve the forests. Progress towards this kind of industry has been uneven between regions, however, and sustainability suffered a major setback when political leaders enacted laws and regulations that encouraged small-scale logging concessions and short-term timber harvest permits, sometimes overlaid on mining concessions.

Peru's forest sector is working to have these laws and regulations changed and to apply the relevant lessons learned by forest management practitioners elsewhere, including in neighboring Amazonian countries, to encourage SFM. For example, the national forestry agency, *Dirección General Forestal y Fauna Silvestre* (DGFFS), has introduced longer (40 year) renewable concessions that provide a certain level of security for investment. In the Madre de Dios region, smaller concessionaires have consolidated into larger tracts that are more likely to be economically viable.

The ITTO project

The objective of PD 233/03 Rev.2 (I) was to contribute to the sustainable technical and environmental development of Peru by introducing intermediate technologies for forest harvesting and timber use. Specifically, it aimed to improve the productivity of small and medium-sized concessionaires and other forest producers operating in the Peruvian Amazon by giving them access to a low-capital technical option that would enable them to use more of the available timber resource.

A typical timber-harvesting operation in the Peruvian Amazon uses only 2–3 species and extracts only 2–3 m^3 of timber per hectare on a 20–30 year cutting cycle. The forests could sustain a harvest at least five times greater than this, but tree growth is distributed between 30 species or more, most of which are ignored by operators because of their low value or the difficulty in milling them. For example, the very hard and dense timber of shihuahuaco (*Dipteryx* spp.), known in the flooring trade as cumarú, cannot be sawn with the 16 horse-power portable circular sawmills traditionally used in the Peruvian Amazon. Because shihuahuaco logs do not float, transport by river is either not possible or very costly. An important part of the ITTO-funded project was to introduce a low-cost, portable sawmill technology suitable for sawing these very hard woods, thus increasing the range of species that can profitably be harvested. Increasing the level of timber use also requires a more developed wood products industry cluster that is closer to the forests but well linked to downstream value chains in construction, millwork and furniture. A range of investments in manufacturing, road infrastructure and equipment is required, and small and medium-sized forest enterprises need greater access to commercial credit.

Inputs

The ITTO project was executed by FONDEBOSQUE, a unit of the DGFFS created in 2002 to promote forest investment. The project featured regional technical units based at Iquitos, Pucallpa and Puerto Maldonado under a national technical coordinator.

The project created a financial mechanism that enabled selected beneficiaries (small and medium-sized concessionaires and timber producers) to access commercial credit so they could purchase a pre-defined technological package that included a portable sawmill, saw-filing accessories, simple log and lumber transport carts, and a winch powered by a chainsaw engine. The financial mechanism had three components:

- *a dissemination program and beneficiary selection system* to promote and implement forest management and annual harvest plans, as legally required;
- *a guarantee fund* to back a new commercial credit line by Caja Municipal de Ahorro y Crédito Maynas, an established microcredit savings and loan bank with branches throughout Peru, including in Pucallpa and Iquitos; and
- *technical assistance and training* for sawmill operation and maintenance and the provision of assistance to develop business plans and monitor economic performance to facilitate loan repayments.

Results

Under the project, 14 portable sawmills were purchased in 2004–2009 through commercial loans made by Caja Maynas. Eleven of the 14 loans had been repaid in full by 2010, and the final cost of the guarantee fund (US$96 470), was leveraged into loans at a 15-to-1 ratio.

Efforts to disseminate technology through videos and demonstrations reached a total of 258 people. Six simple technical manuals were produced, and 1500 sets of these were printed and disseminated. Forty-two operators were trained in sawmill use and maintenance in ten field courses held in various places in the region. The project's quantitative targets were met, although gaining legal approval and permits from the regional forestry agency regulators often caused long and costly delays.

Impacts

The project had the following impacts:

- *Rapid adoption.* About 15 new portable sawmills have been sold to producers in the region since December 2010 without the credit facility guaranteed by the project. This suggests that portable sawmills are an economically viable technical option for sawing very hard species and for improving the harvesting logistics and cash-flows of smaller producers. The project undoubtedly played an important catalytic role in bringing the technology to the region and demonstrating its feasibility.
- *Local adaptation.* Over 50 portable sawmills have been built at small mechanical workshops in Peru since the beginning of the project. These are local adaptations of the introduced technologies, built with heavier materials and costing less than imported versions. They are designed to work on a semi-stationary basis and are powered by electricity.
- *Increased use, production and export of hard species.* Portable sawmills and their local adaptations are now used at forest sorting yards to saw very hard species and to break down defective over-mature logs, reducing transport costs from distant forests. The value of Peru's sawnwood exports of very hard species trebled between 2005 and 2011, to US$68 million.

Of even greater importance, perhaps, was the innovative financial mechanism demonstrated by the project to the financial industry, which has traditionally avoided lending to the forest sector in Peru. The project may help smooth the way for small and medium-sized forest enterprises to gain greater access to much needed resources to finance more efficient and sustainable operations.

Lessons

The main lessons learned from this 5-year project were:

- Innovative financial mechanisms that provide forest enterprises with access to credit can have a major impact on the adoption of new technologies.
- Product and market developments must be better integrated with technological improvements so that

investors in new technologies can sell their products into new markets, reducing the need to compete with traditional products and informal operators.

- Projects of this nature should partner with training entities to provide for continued and growing demand for qualified workers.
- The high transaction costs of complying with present forest regulatory practices can be counterproductive to the goals of SFM.

Peru's forestry potential

Peru's trade in traditional forest and wood products has a net deficit of about US$600 million per year, mainly due to the country's significant imports of paper and paperboard products. There are major opportunities to increase forest-based income and employment from natural production forests in Peru by using them wisely—that is, sustainably. These opportunities need to be demonstrated to politicians, who often see natural forests as either impediments to growth or as untouchable natural monuments.

In Peru's diverse Amazon forests, the viability of timber harvesting requires relatively large concession areas (in the author's experience, 60 000 hectares or more). The multi-product and mixed-species timber harvests available in the Amazon demand a diverse cluster of specialized and complementary enterprises, where each can use a portion of the harvest to its highest potential.

Before the needed investments in private manufacturing and infrastructure can be made, forest management concessions must be part of a comprehensive strategy for regional land-use planning, zoning and human settlements, backed by the effective government enforcement of tenure rights. The Madre de Dios region illustrates this potential well, with about 260 000 hectares of natural production forests under certified sustainable management and the potential for this area to be expanded. The region is also a possible stop-over on an airline route from Lima to Cuzco (and nearby Machu Picchu), so its potential for nature-based and adventure-oriented tourism is sizable. However, a gold rush and agricultural encroachment are destroying landscapes, ecosystems and the social fabric.

Peru's tasks

The DGFFS should put in motion a process of 'learning by doing' that will strengthen bottom-up policy design processes based on the well-balanced and effective participation of the various regional interest groups. This should be done to:

- shape policies and laws;
- enable the decentralized implementation of policies; and
- streamline regulations and help enforce their compliance.

Bush saw: Portable sawmill at a sorting yard in Madre de Dios. *Photo: Maderyja*

The DGFFS should engage experienced international specialists to help design and implement a multi-year, phased strategy to promote the forest and natural resource sector in selected regions, as follows:

- Phase I—develop multi-sectoral visions;
- Phase II—identify investment projects; and
- Phase III—create a national sustainable forest-based development fund.

The proposed national sustainable forest-based development fund should be developed with a privately managed, second-tier development bank that specializes in the forest sector. It would be steered by a high-level public–private board and managed transparently under criteria of public and open competition. It would have an initial endowment and recurrent earmarked funds.

A role for ITTO

ITTO could design and implement a follow-up 2-phase project linked to forest concessionaires in a given region. Such a project could facilitate use of the proposed national sustainable forest-based development fund to expand timber use and develop key products and markets, including value-added manufacturing of lesser used species.

In addition, ITTO could include stakeholder groups in technical cooperation projects in ways that strengthen their organizations and their capacities to cooperate with each other. These groups could include:

- regional associations of forest producers and industries;
- local communities;
- regional training entities;
- regional regulatory entities; and
- regional non-governmental organizations.

The project ex-post evaluation report and project training videos are available in Spanish at www.itto.int or on request from the ITTO Secretariat (carrillo@itto.int). The author acknowledges the data and logistical support provided by companies that participated in the project as well as by the DGFFS and its regional offices.

SFM in the Iwokrama Forest

Implementing a sustainable timber-harvesting regime in Guyana's natural tropical rainforest

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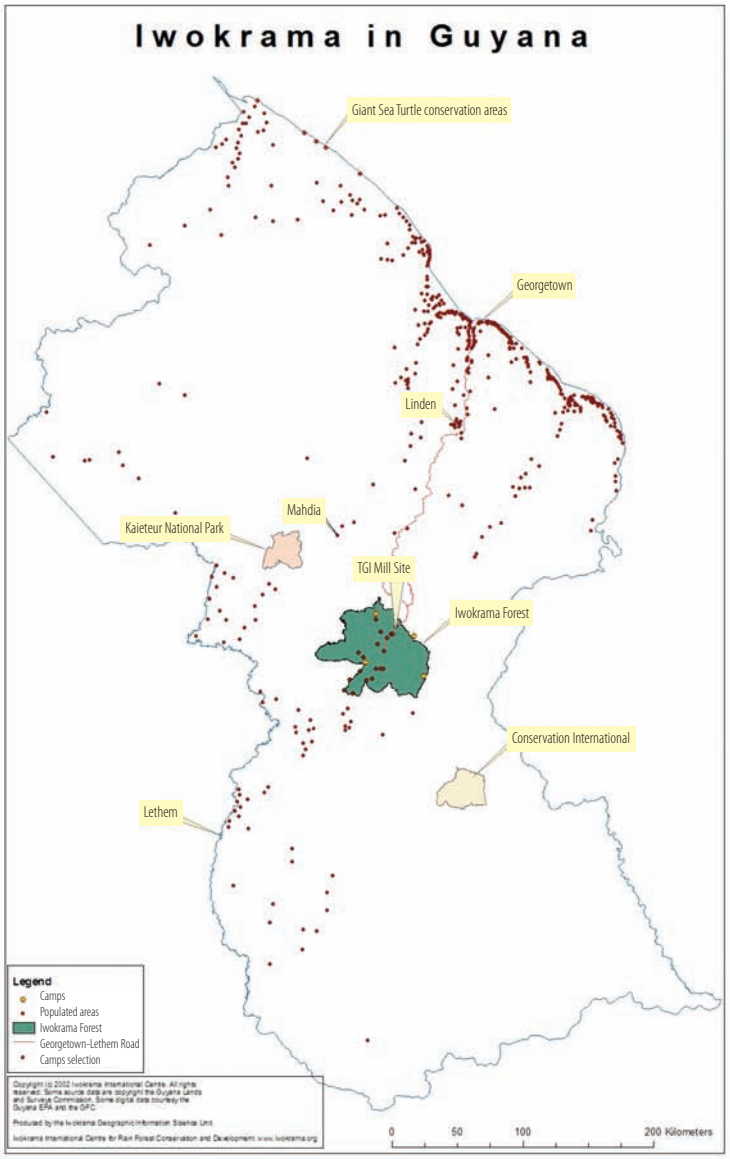


The Iwokrama International Centre for Rain Forest Conservation and Development (IIC) is an autonomous, non-profit institution established by the Government of Guyana and the Commonwealth. It involves the dedication of an intact tropical rainforest—the Iwokrama Forest—to the demonstration of conservation and sustainable use for ecological, social and economic benefits for local, national and international communities.

The Iwokrama Forest is located about 350 km south of Georgetown in Guyana's central highlands (see map above) and rests on the Guiana Shield, a geological formation that encompasses most of Guyana, French Guiana and Suriname and parts of Colombia, the Bolivarian Republic of Venezuela and Brazil. The Iwokrama Forest comprises 371 000 hectares of moist tropical rainforest characterized by sandy soils, slow growth rates and small to medium-sized trees.

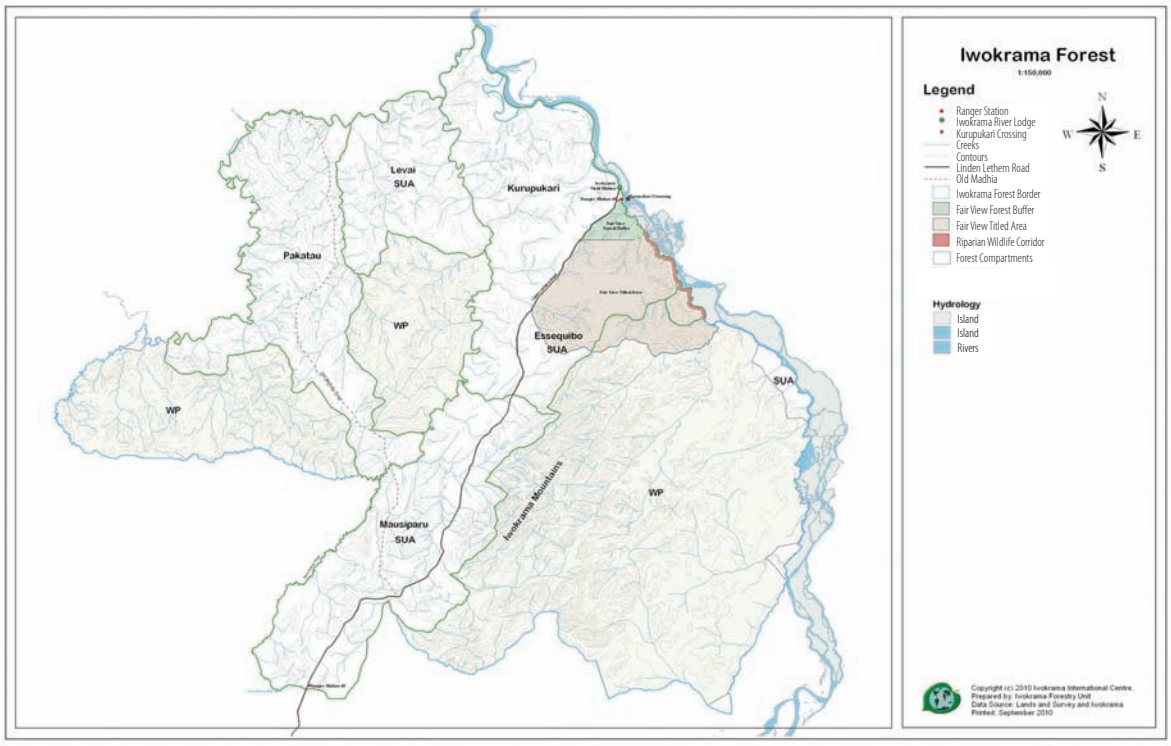
Fundamental to the work of the IIC is the geographical zoning of the Iwokrama Forest into two spatially equal zones: a wilderness preserve (WP) and a sustainable use area (SUA - see map, next page). The SUA is available for multiple resource use, including timber harvesting, and is managed jointly with local communities. The WP serves as a control area for the monitoring of impacts in the SUA and to maintain a pool of Iwokrama's biodiversity. Six percent (about 22 000 hectares) of the Iwokrama Forest is owned by Fair View Village under an Amerindian land title obtained in July 2006. Seventy-eight percent of this land is within the SUA and 22% is within the WP.

ITTO and Iwokrama

ITTO's support for Iwokrama's SFM initiatives dates to 1997 with the approval of an initial ITTO-funded project: *A sustainable management model in the Iwokrama rain forest*[1]. This project laid the groundwork for Iwokrama's sustainable timber harvesting program, which started in 2007. The implementation of the harvesting program was supported by a second ITTO-funded project, approved in 2006: *Implementation of the sustainable forest management programme of the Iwokrama International Centre*[2].

1 PD 10/97 Rev.1 (F)
2 PD 297/04 Rev.3 (F)

Iwokrama Forest, showing wilderness preserves (WP) and sustainable use areas (SUA)



The first ITTO-funded project ran from July 1999 to April 2004, with the specific objective of developing a model of sustainable, commercial-scale management that integrated research and training at all stages. The key outputs of this project were a management-level forest inventory, a feasibility study, a marketing study and a draft forest management plan. In conjunction with other donors, the project also provided support for the zoning report, an environmental impact assessment and the final management plan. It provided the basis for eventual negotiations with a joint-venture partner for the timber business.

The second ITTO-funded project came on stream and was implemented during the start-up of the timber-harvesting operation in 2007 and was recently completed. Its development objective was to address a lack of knowledge on, and a general misunderstanding about, the sustainable nature of forest activities and the profitability of forest use in the Iwokrama Forest.

The second project's specific objectives were to:

- manage the area in order to maximize net revenue from the sustainable production of forest goods and ecosystem services, while developing local employment and training opportunities and providing capacity-building and technology transfer programs for local Amerindian communities; and
- demonstrate, through effective monitoring, how the adopted approach is delivering lasting ecological, economic and social benefits to local, national and international communities.

The five key outputs delivered by the project were:

- training and technology transfer in the development and implementation of silvicultural programs;
- training and technology transfer in operational practices related to forest management;
- training for counterparts in forest management and silviculture;
- the development and implementation of socio-economic monitoring programmes to evaluate the impact of forest management activities on local Amerindian communities; and
- the development of biophysical monitoring programs to evaluate the impacts of forest use on flora, fauna, water and soil resources.

Sustainable timber harvesting

Sustainable timber harvesting commenced in the Iwokrama Forest in 2007 through a subsidiary company, Iwokrama Timber Incorporated (ITI). In keeping with the IIC's commitment to engage local communities and the private sector in its business development activities, the governance model for timber harvesting included the participation of a Guyanese private-sector company, Tigerwood Guyana Incorporated (TGI), which was established with the express purpose of conducting timber harvesting operations in the Iwokrama Forest. Local Amerindian communities have a 24% shareholding in ITI and appoint one of ITI's directors. ITI is the only FSC-certified timber operation in the entire Guiana Shield.

What does Iwokrama do differently?

FSC-certified timber harvesting has been in operation for more than two years; it provides an exemplary model of governance and shareholding involving Amerindian communities and the private sector. Harvesting is fully compliant with reduced impact logging procedures and the Guyana Forestry Commission code of practice for timber harvesting. It also includes a system to ensure the integrity of the stump-to-ship chain of custody.

The IIC has made a significant investment in personnel through training and technology transfer, including training in reduced impact logging (e.g. forest inventories, road-building, felling, skidding and health and safety); log scaling and lumber grading; tree species identification; and the use of computers. Physical features (e.g. rivers, streams, swamps and slopes), management units, felling blocks, trees, roads, bridges, log markets and skid trails in the SUA have all been mapped using state-of-the-art geographic information systems to facilitate harvesting planning. State-of-the-art data management procedures have also been deployed, including for:

- pre-harvest inventory data compilation and tree selection for harvesting;
- monthly harvesting production reports, including on felling, skidding and trucking; and
- post-harvest inventory reports on completed management units.

Monitoring and research programs in Iwokrama include:

- permanent sample plots for studying growth and yield, the effects of climate change and the impacts of forest use;
- a volume and decay study to inform and improve data management for forest inventories;
- fauna impact surveys; and
- road and river monitoring to detect unauthorized activities.

Understanding SFM at Iwokrama

Net operable area

The net operable area (NOA) is the area within the SUA deemed suitable for sustainable timber harvesting after the exclusion of ecotourism reserves, buffers, steep slopes, seasonal swamps and non-commercial forest types. The NOA encompasses four commercial forest types and covers 108 433 hectares, which is 29% of the Iwokrama Forest. Therefore, 71% of the Iwokrama Forest will never be harvested.

Annual allowable cut

Iwokrama has adopted a harvesting rate of 20 m^3 per hectare on a 60-year cutting cycle, as recommended by the Guyana Forestry Commission. Once an area has been harvested, therefore, it will not be harvested again for 60 years. On a 60-year cycle, the NOA will be harvested at the rate of 1800 hectares per year, which is about 0.5% of the total area of the Iwokrama Forest and 1.7% of the NOA. At 20 m^3 per hectare, Iwokrama could sustainably harvest 36 000 m^3 per year, but the Board of Trustees approved a conservative cut of 20 000 m^3 per year for the first 5-year plan (2007–2011).

Silvicultural system

The silvicultural system being deployed in the Iwokrama Forest is a natural regeneration system, under which only a few trees are selected for removal (selective cutting), allowing natural regeneration to fill the gaps created by harvesting and maintaining standing volumes of all tree species. The minimum diameter at breast height (dbh) for harvesting is 40 cm, although the minimum dbh is higher for some species, ranging from 45 cm for greenheart (*Chlorocardium rodiei*) to 70 cm for purpleheart (*Peltogyne* spp.). The uneven-aged nature of the original forest is maintained in the resultant managed forest.

Harvesting impact in the Iwokrama Forest

A management-level forest inventory of the NOA was conducted in 2003 with funding from ITTO. This provided the data on which all management planning is based. Table 1 summarizes the key values as they relate to timber harvesting and shows that harvesting will, on average, have a low impact on those values, accounting for about 16% of gross volume, 1% of the total number of trees and 6% of stand basal area.

Table 1. Volume, number of trees and basal area in the net operable area, Iwokrama Forest

Volume (m^3/ha)	No. trees per ha	Basal area (m^2/ha)
Average before harvesting		
124	486*	28.2
To be harvested		
20	6	1.6
Remaining after harvesting (assuming maximum AAC)		
104	480*	26.6

* = stems > 10 cm dbh.

Production report

In the first three years of timber harvesting (2007–2009), the operation harvested approximately 2000 hectares and produced about 30 000 m^3 of logs of 20 hardwood species – an average of 15 m^3 and 3.5 trees per hectare. In 2010, the operation achieved its quota of 20 000 m^3 for the first time. Export markets for FSC-certified sawnwood, principally in the form of squares, marine timbers, flooring and exterior decking, have been developed in the Netherlands, New Zealand and the United Kingdom. Market development in other regions, including the United States of America, is under way.

Project sustainability

The factors most critical to the sustainability of SFM in the Iwokrama Forest are:

- continued support from Iwokrama's International Board of Trustees and senior staff;
- continued support by the local Amerindian communities, who are now both local stakeholders and shareholders;
- the financial sustainability of the joint-venture timber operation; and
- successful timber product placement in both export and domestic markets.

The IIC will continue working with international partners like ITTO to ensure that Iwokrama Forest is sustained into the future and that the lessons learned from its sustainable management are widely shared.

The tide turns for Panama's mangroves

An ITTO project helps to conserve and reforest threatened mangroves on Panama's Pacific coast

by José A. Berdiales[1*], Juliana Chavarria and Lourdes Lozano

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Muddy studies: Local children inspect a mangrove reforestation site. *Photo: ANAM*

Panama's mangrove ecosystems will play a vital role in the country's efforts to adapt to climate change, but they are under threat. The project described in this article, which was implemented by the National Environment Authority (*Autoridad Nacional del Ambiente*, ANAM), aimed to reduce pressure on Panama's mangroves by transforming the destructive practices of ecosystem users into sustainable use.

A previous ITTO-funded project (PD128/91 Rev.2 (F)), completed in 1997, conducted a mangrove forest inventory in three regions (Chiriquí, Azuero and Chame), generating significant biological and socio-economic information. This information provided an excellent basis for a follow-up ITTO project, PD 156/02 Rev.3 (Phases I and II), the specific objectives of which were to:

- ensure the conservation and sustainable management of 4000 hectares of mangrove forest;
- reforest and enrich 800 hectares of degraded coastal land; and
- initiate agroforestry and reforestation activities using native timber and fruit trees in a 450-hectare area adjacent to forests in the region's middle and lower catchments.

The project target area comprised threatened areas in the west of the provinces of Panama and Coclé and on the Peninsula of Azuero, all on Panama's Pacific coast. The project had three components: mangrove forest management; agroforestry and reforestation; and extension, with the participation of local and neighbouring communities. The strategy was to address the needs of mangrove forest-dependent communities and ensure their involvement in forest harvesting activities. This was done by organizing and developing small community enterprises and cooperatives with the capacity to provide and market environmental services while also encouraging the conservation and management of the mangrove forests. The outcomes of the project, the two phases of which spanned more than five years, are described below.

Management of 4000 hectares of mangrove forest

In coordination with the government agencies responsible for the use, management, monitoring and harvesting of the country's mangrove forests, the project developed agreed-on methodologies for assessing biophysical (soil and water) and biotic (marine and land flora and fauna) aspects of the mangrove forests. This information was crucial for zoning the area. The methodology was applied in a forest inventory conducted in 4000 hectares of mangrove forest in Chame Bay (Panama Province), with the involvement of local and national forest authorities, a national university and neighbouring communities.

Four communities in Chame Bay were trained in various aspects of mangrove forest management, including the selection of seed trees, the collection of mangrove propagules and seeds, the establishment of mangrove nurseries, mangrove reforestation, and various techniques for the development of mangrove forest management plans. A plan for the management of the mangrove forests in Chame Bay was developed with the involvement of mangrove forest users and stakeholders—local authorities, communities, professionals and researchers. A zoning

map was also produced with the involvement of local communities, specifying areas for sustainable use, conservation and rehabilitation.

The approach developed for the management and harvesting of mangrove forests in Chame Bay can also be applied in the other project areas (Coclé, Los Santos, Herrera and Chiriquí). Under the management plan, the following rules must be applied:

- management units can only be established within the sustainable-use zone;
- harvesting permits cannot be issued within 25 meters of a riparian protection zone or 25 meters of an *albina* (coastal salt flat);
- natural boundaries such as rivers, estuaries and roads should be considered in the establishment of forest stands; and
- the management unit allocated to each community should be no larger than the area established for this purpose in the management plan.

The project stimulated considerable community learning by ensuring compliance with the methodology established for forest harvesting operations and by allowing and encouraging a wide range of uses. The project also assisted communities to undertake the following activities in their designated sustainable-use areas:

- Inventory and tree measurement, in which all trees with diameter at breast height greater than or equal to 7 cm were assessed. Stem form was classified and the number of trees per diameter class in each management unit estimated. According to the management plan, 15% of the best trees ("type A") may be harvested, while the rest are to be retained as seed sources.
- The establishment of mangrove iguana and rabbit farms.
- The production of honey from African *Avicennia* bees.

Sweet: Chame Bay community members undertaking mangrove apiculture with *Avicennia* bees. *Photo: J. Leigh*

- The extraction and production of red mangrove charcoal using more efficient and less-polluting kilns, combined with tree-replanting as appropriate. Community organizations can sell their charcoal directly to supermarkets, which is more lucrative for them.

Based on the experience gained in Chame Bay, the project provided training on sustainable mangrove management to charcoal producers, government officials and people among the communities of Monte Oscuro, Sajalices and El Espavé.

800 hectares of mangrove forests rehabilitated

In cooperation with mangrove forest communities and technical and professional staff in related agencies, the project established and validated criteria for the selection of enrichment planting areas and for reforestation plans. This process was aided and enriched by an exchange of experiences on mangrove forest restoration and harvesting with the ITTO-funded Cispata Bay project in Colombia (PD 060/01 Rev.1 (F)).

Also in cooperation with local communities, nine mangrove nurseries were established near estuaries, harbours and streams to produce seedlings of *Rhizophora racemosa*, *R. mangle* and *Pelliciera rhizophorae* (piñuelo). In Phase 1 of the project, 562 hectares of mangrove forest were rehabilitated with the participation of community support groups, using the three previously listed species as well as *Avicennia germinans*. It is significant that four mangrove species were used in the restoration effort because many similar initiatives use only a single species (*R. mangle*). In the project's second phase, community groups collected and selected propagules and identified the best sites for planting the various mangrove species to be used in rehabilitation. Rehabilitation efforts focused on those areas under logging pressure and, in some other areas, attempted to accelerate natural regeneration processes.

In cooperation with the existing mangrove nurseries, the Directorate for the Promotion of Environmental Awareness (*Dirección de Fomento a la Cultura Ambiental*) encouraged schools around Chame Bay and in four other regions to create their own nurseries as a way of promoting environmental awareness and assisting in the rehabilitation program. Each school developed the capacity to produce seedlings of *R. mangle* and *P. rhizophora*. Bag filling, nursery construction, irrigation and plant-tending activities were carried out by community groups, teachers and students. Table 1 shows the total area reforested in the five regions in the project area, and the species and number of propagules used. Following completion of the project, an additional 45 hectares in Chame Bay had been

Preparing to plant: Mangrove nursery in Chame Bay. *Photo: J. Leigh*

reforested with *R. racemosa*, and reforestation activities were continuing in the remaining regions using *R. mangle* and *P. rhizophora*.

Table 1. Reforestation targets achieved by the project

Region	Species	Number of propagules	Reforested area (ha)
Chame Bay	*R. racemosa*	291 835	261.5
	R. mangle	439 070	390.1
Cocle	*R. racemosa*	13 300	12.0
	R. mangle	147 974	133.0
Herrera	*R. mangle*	4444	4.0
Los Santos	*R. mangle*	22 700	15.1
Chiriquí	*R. racemosa*	14 900	5.1
Total		**934 223**	**820.8**

450 hectares allocated to agroforestry and reforested

Eighteen multiple-use native species were selected for propagation. Six family nurseries and eight community nurseries were established in the project area. Nine communities were trained in, and are working on, the establishment of forest nurseries and the production of organic manure as a sustainable environmental business activity.

Family and community nurseries produced 41 509 seedlings in the first year of operations, generating income of 6226.55 Panamanian balboa (PAB), which was distributed among community organizations, benefiting 134 people (60% of them women). In its first phase, the project purchased seedlings at a price of PAB 0.15 per seedling. Seedling production is now the responsibility of local communities, who received training in this activity.

The rehabilitation target set in Phase 1 of the project was met—251 hectares were planted with multiple-use native species in the project's area of influence in the middle and lower catchments of the region. The agroforestry component of the project benefited 967 people in the communities of Panama Oeste, Coclé, Herrera and Los Santos. A database was developed on trees planted in selected plots, including tree type and location. An agreement was signed with landowners for the tending of planted trees, which will ensure the continuity and monitoring of activities and facilitate the assessment of impacts on the communities involved in the project. In the final year of the project, a total of 142 hectares was reforested and progress was made in the construction of nine community nurseries: one in Monte Oscuro; four in Coclé; one in Paris de Parita (Herrera); two in Los Santos; and one in Chiriquí. Reforestation sites were selected, taking into account the need to rehabilitate the middle and upper basins of rivers surrounding the mangrove forest areas. These activities were carried out with the participation of community groups in all five regions. The plots reforested in the first four years of project operations were assessed in the final year; there was a seedling survival rate of 80% and average height growth of 1.5 meters per year.

Conclusion

The project made considerable progress in the quest to sustainably manage Panama's precious Pacific coast mangroves. A management plan developed with the participation of the Chame Bay community for a 4000-hectare mangrove forest is serving as a model for other communities. A significant area of mangrove forest has been rehabilitated, and buffer zones have been planted with local species.

Communities now have experience in establishing and managing seedling nurseries, and environmental awareness has been raised among students and teachers in five project communities. In the province of Chiriquí, for example, the project rehabilitated mangrove stands of *P. rhizophorae*, which had been displaced by a fern known as *negra jorra (Acrostichum* species). In these rehabilitation activities, the project used *P. rhizophorae* seedlings produced in community nurseries with ANAM's assistance. The project also rehabilitated areas of *juncales* (reedbeds) in the Cenegón del Mangle Wildlife Sanctuary (Herrera) with the participation of the París de Parita community, using *Avicennia germinans* and *Laguncularia racemosa,* species that occur naturally in the area but which were being displaced by reeds.

A two-year mangrove forest conservation and sustainability project with community participation in environmental services, partly inspired by this ITTO project, has been submitted by ANAM to HSBC Insurance. This follow-up project will encourage the development of a range of mangrove-based income-earning activities, such as marine culture, forest harvesting, charcoal production, honey production and tourism activities such as bird-watching, boat rides, nature tours and iguana farming.

The final report of this project (Spanish only) is available on request (leigh@itto.int).

Fellowship report

The impact of logging damage on tropical rainforests, their recovery and regeneration

by Victor K. Agyeman

Director, Forestry Research Institute of Ghana (agyemanvictor@yahoo.com)

Damaging cut: Logging operations in Ghana can impact forest flora and fauna. *Photo: K.O. Afriyie*

This paper summarizes the results of work carried out under an ITTO Fellowship that was recently completed. The objective of the Fellowship was to publish a book[1] on the impact of logging damage on forest mortality and regeneration in the high forest zones of Ghana. The book (an annotated bibliography) was based on information generated by a DFID/FRP project (R6716 – *Impact of harvesting on forest mortality and regeneration in the high forest zones of Ghana).* The aims of the project were to improve knowledge of the negative impacts of logging in tropical rainforests and to recommend improvements in the logging system. The total number of references in the annotated bibliography is 1327. Most of the papers focus on four broad areas, namely: (1) logging damage; (2) recovery after logging; (3) regeneration after logging; and (4) biodiversity of the residual forest.

Logging damage

Papers addressing the impact of logging damage cover both forest flora and fauna. Many papers have used GIS and remote sensing techniques, field assessment of logging activities and models to assess logging damage on forest flora. Several papers report on tree fall gaps, logging in forest coupes, and damage to residual stands.

The book highlights that literature addressing the impact of timber harvesting methods and operations on animal taxa is biased towards birds and primates. For birds, authors have variously reported: significant decreases in bird species richness and diversity; only slight differences in species diversity; and similarity in bird richness, but with important changes in species abundance and composition after logging. Primate responses to logging are also variable. Some primate species are highly dependent on undisturbed forest (specialists like *Hylobates* spp., *Cercophitecus* spp. and *Chiropotes* spp.), while others prefer disturbed habitats and will be more likely to survive in disrupted areas (generalists like *Macaca* spp., *Colobus* spp. and *Cebus* spp.). After logging, the intensity of hunting increases primarily because of easier access to remote forests by new roads and of the greater human presence in the area, and this impact is an important component of the impact of logging.

Recovery after logging

Many studies focus on structural measures of logged forest recovery, such as basal area, aboveground biomass, tree height and stem density. Other studies examine changes in canopy structure, the frequency and size of canopy gaps, and light availability during forest recovery. Forest recovery was also measured in terms of the abundance and richness of species used for non-timber products.

The impact of logging on soil nutrients and cycling has been an important area of research. Disturbance that impacts soils as well as aboveground vegetation, such as the use of bulldozers and skidders during logging operations, can significantly slow down the rate of forest structural recovery and can have long-lasting effects on species composition. The recovery of soil fertility is closely linked with the recovery of aboveground biomass.

Regeneration after logging

Several of the papers included in the bibliography highlight that the natural regeneration of many species

1 Hawthorne, W.D., Marshall, C.A.M., Abu Juam, M. and Agyeman, V. 2011. The impact of logging damage on tropical rainforests, their recovery and regeneration: an annotated bibliography. OFI, U.K.

is gap size dependent and that the sizes of gaps created determine the type of species which regenerate and the extent of natural regeneration. Medium-sized openings resulting from felling gaps and skid trails favor the natural regeneration of most of the economic timber tree species, many of which are non-pioneer light demanders, compared to other gaps. Small (branch or small tree fall) and large (multiple tree fall, haulage roads and loading bays) gaps result in reduced regeneration and a decline in the economic value of the tropical high forests. Timber harvesting affects the forest micro-environment and also stimulates the growth and regeneration of tree species.

The book highlights that tropical forest tree species differ markedly in their tolerance of shade and their ability to respond to changes in irradiance. Responses of species to variation in irradiance have been studied by growth analysis using shade houses, gaps created in the forest or light response curves. It was also shown that proximity of disturbed areas to remnant forest patches with 'seed trees' promotes more rapid recovery, particularly in species composition.

Biodiversity of residual forest

Many papers report that logging activities may result in the disappearance of species, thus reducing species diversity. Uncontrolled logging has considerable impact on biodiversity conservation, forest structure and species composition and may lead to the loss and fragmentation of forests. The removal of seed trees reduces the potential of the forest to regenerate after logging.

The impact of logging on forest fauna is similar to that on flora and depends on the ecology of particular species or group of species. Logging alters the habitat of wildlife by changing or destroying nesting, feeding and breeding sites. Since different silvicultural systems produce forest stands with different forest structures, their impacts on animals varies depending on animal habitat requirements and the ability to recolonize logged forest.

The way forward

Analysis of the current status and trends has led to the identification of themes that are likely to be important in determining the future of tropical timber harvesting in Ghana and elsewhere. These include:

i. *Pressures for sustainable management will continue to gather force.* While some progress has been made in this direction, more is needed to satisfy the principles of sustainable forest management. In particular, efforts should be made in reducing harvesting and processing waste.

ii. *Demand for social equity will increase.* Although there is general recognition of the roles of forests in local people's livelihoods, in practice the social aspects of forestry are often neglected or sacrificed in pursuit of financial expediency. It is expected that demands for greater participation and responsibilities and benefits will intensify in the face of dwindling resources.

iii. *Increasing restrictions on access to forests through physical and regulatory constraints.* With a global deforestation rate of 1.3% and overall forest quality decline, it seems evident that the future holds greater physical resource constraints.

iv. *Timber trade will remain important.* In spite of (i) to (iii) above, trade in timber products will continue to be important through its contributions to foreign exchange earnings and GDP. Wood demand in the domestic market will also increase due to population growth and other factors.

Against the general policy background and factors that are likely to shape the future of timber harvesting in the tropics, the following options have been proposed:

i. *Improve efficiency in forest harvesting and wood processing.* Significant economic gains could be made if the current rates of product recovery (now about 50% for harvesting and about 30% - 45% for log processing) could be improved. Improvements in processing efficiency could help to diminish the pressure on the forests by reducing the volume of logs required to manufacture the same volume of products.

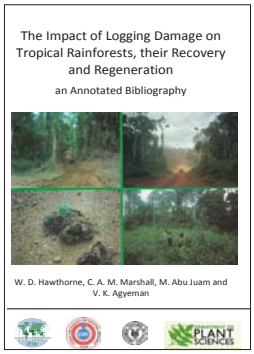
ii. *Increase production from forest plantations, particularly on degraded forests lands.* A relatively new prospect for encouraging investment in plantations is to provide measures for sequestering carbon in exchange for pollution rights under climate change agreements. While details are still to be agreed, the Kyoto Protocol lays a foundation for a potential vast new investment in forest plantations. Ghana, for example, needs to negotiate for investment in this area in support of its plantation development and the Forestry Development Master Plan.

Acknowledgements

Preparation and printing of the bibliography was made possible by a grant from DFID Forestry Research Programme under Project No. R6716 and a Fellowship grant from the International Tropical Timber Organization (ITTO).

Limited copies of the annotated bibliography produced under this Fellowship are available on request (aoki@itto.int).

Selected recent ITTO Fellowship reports



W.D. Hawthorne, C.A.M. Marshall, M.Abu Juam and **V.K.Agyeman**

Ghana

The impact of logging damage on tropical rainforests, their recovery and regeneration: an annotated bibliography

2011

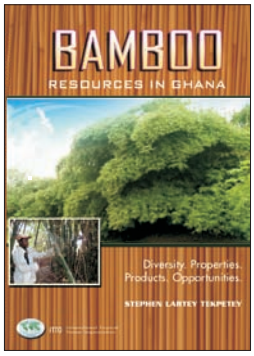
ISBN 9780850741688

Catty Samaniego Arcos

Peru

Análisis de los mecanismos que emplean las instituciones públicas respecto a la gobernabilidad del sector forestal en el Perú

2012



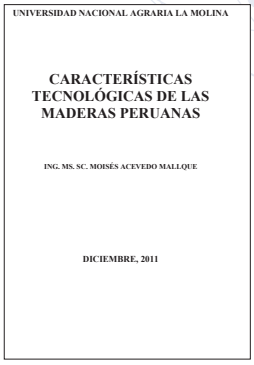
Stephen Lartey Tekpetey

Ghana

Bamboo resources in Ghana: diversity. properties. products opportunities.

2011

ISBN 9789988162696



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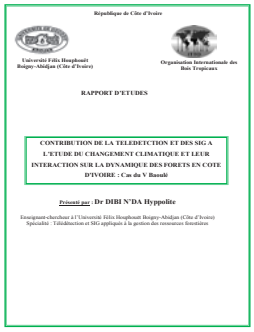

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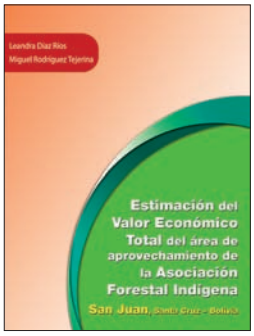

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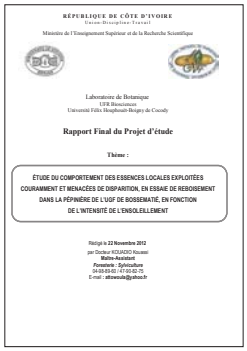

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2012

Note: ITTO fellow indicated in bold when there are multiple authors. Limited copies of publications available on request from aoki@itto.int.

2013 Fellowships awarded

Twenty-five fellowships totaling almost $150 000 were awarded to nationals of 16 countries (including 13 female applicants) as listed below by the International Tropical Timber Organization in the 2013 Spring Cycle.

Mr. Allotey, Abraham Addo-Ansah (Ghana), to undertake the '2nd International Biochar Training Course' at Nanjing Agricultural University in Nanjing, China; **Mr. Aminou (Cameroon)**, to undertake the Postgraduate Program in 'Agronomy and Agricultural Science' at University of Dchang in Dchang, Cameroon; **Ms. Asumang-Yeboah, Doreen (Ghana)**, to undertake a Short Course on 'Climate Change Governance: Adaptation and Mitigation as Institutional Change Process' at Wageningen UR Centre for Development Innovation in Wageningen, Netherlands; **Ms. Azefor, Asah Nangah (Cameroon)**, to undertake a Post Graduate Diploma Program in 'Development and Natural Resource Management' at Pan African Institute for Development West Africa in Buea, Cameroon; **Ms. Beltran, Ana María (Colombia)**, to undertake a Short Training Course on 'Tropical Plant Systematics' at Organization for Tropical Studies in San Jose, Costa Rica; **Ms. Bihi, Bekebang Confort (Cameroon)**, to carry out Master's Research on 'Understanding the Socio-Economic Implications of Reducing Emissions from Deforestation and Degradation (REDD+) for Forest Dependent Communities along the Dja Biosphere Reserve in Cameroon' at the University of Buea in Buea, Cameroon; **Ms. Cerrato Gevawer, Amparo Sarahi (Honduras)**, to undertake an International Course on 'Governance of Forests and Landscapes' at World Agroforestry Center and CIFOR in Bogor, Indonesia; **Dr. Dasgupta, Modhumita (India)**, to participate in a Hands-on Training on 'Molecular Cytogenetic Techniques' at Texas A&M University in Texas, U.S.A.; **Mr. Guevara Torres, Jorge Iván (Colombia)**, to undertake the XXV International Intensive Course on 'Diversified Management of Tropical Natural Forests' at CATIE, Turrialba, Costa Rica; **Mr. Haro-Carrión, Gonzalo Xavier (Ecuador)**, to undertake an International Course on 'Landscape Functions and People: Strategic Approaches for Climate Smart, Sustainable and Productive Landscapes' at Wageningen UR Centre for Development Innovation in Bangkok, Thailand; **Mr. Houetchegnon, Towanou Olivier (Benin)**, to carry out Ph.D. Research on 'Ecological Study of *Prosopis africana* (Guill., Perrott., and Rich.) Taub (Fabaceae) in Benin, West Africa' at the University of Parakou in Parakou, Benin; **Ing. Jiménez Torres, Alexandra del Cisne (Ecuador)**, to undertake the XXV International Intensive Course on 'Diversified Management of Tropical Natural Forests' at CATIE, Turrialba, Costa Rica; **Mr. Khaung, Ye (Myanmar)**, to undertake a Master's Programme in 'Natural Resources and Peace' at United Nations Mandated University for Peace in San Jose, Costa Rica; **Mr. Konan, Djézou (Côte d'Ivoire)**, to carry out Ph.D. Research on 'Study of the Dynamics, Floristic, Structural and Germination Potential of the Seed Ground of the Forest of Yapo Abbot: Contribution to the Sustainable Management of Forests in Côte d'Ivoire' at the University of Abobo-Adjamé in Côte d'Ivoire; **Ms. López Solis, Harie Elizabeth (Guatemala)**, to undertake the XXV International Intensive Course on 'Diversified Management of Tropical Natural Forests' at CATIE, Turrialba, Costa Rica; **Dr. Midha, Neha (India)**, to undertake an International Course on 'Landscape Functions and People: Strategic Approaches for Climate Smart, Sustainable and Productive Landscapes' at Wageningen UR Centre for Development Innovation in Bangkok, Thailand; **Mr. Montefrio, Marvin Joseph Fonacier (Philippines)**, to prepare a Publication 'Manual for Conflict Management Involving Peoples' Organization in Community-Based Forest Management Areas in the Philippines'; **Ms. Moussavou Boussougou, Inès Nelly (Gabon)**, to carry out Ph.D. Research on 'Wood Degradation of Aleppo (*Desbordesia glaucescens*), Sorro (*Scyphocephalium ochocoa*) and Beli (*Paraberlinia bifoliolata*) by Fungi Responsible for Decay' at Laval University in Quebec, Canada; **Ms. Muñoz Valadez, Lucia (Mexico)**, to undertake a Study Tour on 'Forest Management and Study of the Structure and Composition of the Rainforest Habitat of Black Howler Monkey (*Alouatta pigra*) in One Area of Terrestrial Priority: Lower River Usumacinta' in Emiliano Zapata, Tabasco, Mexico; **Mr. Namuene, Kato Samuel (Cameroon)**, to undertake Ph.D. Research on 'Monitoring and Evaluation of Timber Exploitation in Forest Management Units in South-Western Cameroon: A Forest Informatics Approach' at the University of Buea in Buea, Cameroon; **Mr. Reátegui Moscoso, Alfonso José (Peru)**, to prepare a Technical Document on 'Contribution to the Knowledge and Control of Pests of Forest Plantations with Native Species'; **Ms. Sau, Andi Adriana We Tenri (Indonesia)**, to participate in the IUFRO 2013 Joint Conference of 3.08 & 6.08: 'Future Directions of Small-Scale and Community-Based Forestry' in Fukuoka, Japan; **Mr. Tondjo, Kodjo (Togo)**, to undertake Ph.D. Research on 'Modeling of Structure-Function Relationships in the *Tectona grandis* (Teak) Plantation to Estimate and Optimize the Quality of the Wood' at the University of Lome in Lome, Togo; **Mr. Visoni Xitumul, Francisco Iván (Guatemala)**, to undertake the XIV International Intensive Course on 'Economic Bases for Management and Valuation of Environmental Services' at CATIE, Turrialba, Costa Rica; and **Ms. Widawati, Emila (Indonesia)**, to undertake Master's Research on 'Forest Land Tenure in REDD+ Implementation in Indonesia: Issues and Challenges' at Seoul National University in Seoul, Korea.

ITTO Fellowship Program

ITTO offers fellowships through the Freezailah Fellowship Fund to promote human resource development and to strengthen professional tropical forestry and related expertise in member countries. The goal is to promote the sustainable management of tropical forests, the efficient use and processing of tropical timber, and better economic information about the international trade in tropical timber.

The next deadline for applications is 23 August 2013. Fellowship activities should begin not earlier than 1 February 2014.

Please apply on-line at www.itto.int. Further details are available at www.itto.int or from Dr. Chisato Aoki, Fellowship Program, ITTO; fellowship@itto.int; Fax 81 45 223 1111 (see page 2 for ITTO's postal address)

Courses

Scholarships of the German Academic Exchange Service (DAAD) for the MSc programme 'Tropical and International Forestry'
Location: University of Goettingen, Germany
Cost: Semester fee is about 740 Euros; scholarships provide about 20 000 Euros to cover all costs of the MSc course.
Application deadline: 15th September 2013
Scholarships are being offered for the German Academic Exchange Service (DAAD) MSc programme 'Tropical and International Forestry' at the University of Goettingen (Germany). The DAAD annually provides several scholarships for talented students from developing countries. The scholarship covers living costs, study fees, health insurance, travel costs and German language courses for the whole course (24 months). The MSc programme 'Tropical and International Forestry' (TIF) is fully taught in English and includes courses such as Tropical Forest Ecology and Management, Soil Science, Forest Economy, an interdisciplinary Students' Project abroad, and a research-based master's thesis. About 60% of students in the programme are international. In 2011, an international student survey awarded Goettingen University the top place among German universities.
Contact: www.econsort.ugent.be/index.asp?p=1305&a=1305 or write to the international students' tutor Ray Wollenzien (tiftut@uni-goettingen.de)

Online Course on Climate Change Diplomacy: 'Negotiating Effectively Under UNFCCC'
Cost: 800 USD
Application deadline: 6 September 2013 (course runs 16 September – 10 November 2013)
This online course developed by the UN will develop participants' understanding of the climate change policy framework by building an appreciation of the science, causes and impacts of climate change, the history of the policy making process and the UNFCCC framework. It will also consider the pertinent challenges currently facing climate change negotiators in making progress with what is currently on the negotiating table. The course will take a close look at the negotiations to-date and will consider the hot topics for negotiators as we move towards establishing a new global agreement on climate change by 2015. The course will highlight the role of gender in the negotiations and also the specific interests of parties who are most vulnerable to impacts of climate change.
Contact: www.unitar.org/event/climate-change-diplomacy-2

World Forest Institute International Fellowship Program
Location: Portland, Oregon, USA
Cost: Twelve-month Fellowships cost US $20 000. Shorter terms are prorated. Hence, a six-month Fellowship would cost US $10 000. See link below for details.
Application deadline: Applications accepted year-round; 6 to 12 month programs available
The WFI Fellowship Program brings forestry and forest products professionals from around the world to work at the World Forest Institute for 6 to 12 months. Over 100 Fellows from 30 countries have participated in the program. The Fellowship Program offers participants many opportunities, such as: conducting studies in the Pacific Northwest related to forestry, meeting with many different forestry organizations and corporations, building a network of forestry contacts, and promoting the dissemination and exchange of information regarding global forest resources and their utilization.
Contact: www.wfi.worldforestry.org/index/international-fellowship.html

Market trends

Stark divergence of financial and real economy holds down tropical timber exports

By Michael Adams

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In none of the recovery periods during past economic crises affecting tropical timber markets has the divergence between the financial economy and the 'real' economy been so stark. In global financial markets there is growing optimism that the stability now achieved will open the way to economic growth and this has encouraged the flow of money into equities, pushing up stock prices. As is usual, equity market trends are always far ahead of activity in the real economy, which is why, despite relief that the worst of the current downturn may be over, tropical timber markets remain as dull as they were 12 months ago.

Grim import trends

In 2012, EU imports of all major tropical timber products fell by at least 13% (tropical sawnwood), up to a massive 30% drop in log imports from tropical suppliers. US imports of tropical wood products in 2012 fared a bit better than for the EU, with modest growth in hardwood plywood imports, up 9% from 2011 levels. However, the US data does not separate tropical and temperate hardwoods, so caution must be exercised when interpreting this figure. US imports of hardwood mouldings declined 8.5%, while furniture imports grew by over 8% (although, again, the tropical component of furniture imports is difficult to determine from available statistics).

In Asia, Japan's imports of plywood (-4%), sawnwood (-6%) and logs from tropical countries all declined in 2012 compared to levels in 2011, with the steepest drop being recorded for tropical log imports which were down by more than a third. To cap the gloomy picture, imports by China of both tropical logs (-10%) and tropical sawnwood (-4%) fell in 2012 compared to levels in 2011.

The story behind the economic indicators

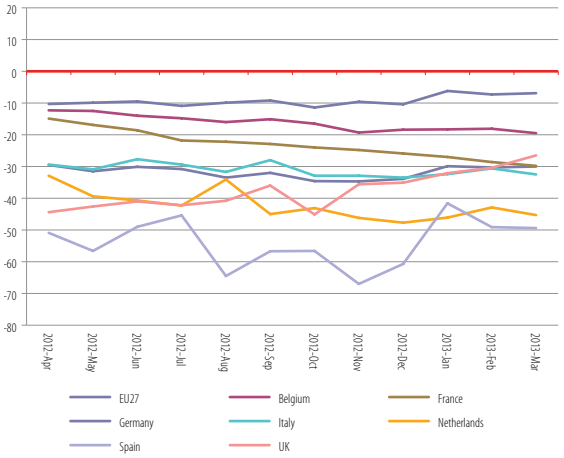
A brief look at trends in construction and house building activity, an indicator closely correlated with demand for wood products, provides clues as to why demand for wood products is flat and when recovery might be expected in the market for tropical timber.

EU housing, five years of uninterrupted decline

For the last five years, the Eurostat construction index for both the EU27 and euro-area group of countries has fallen consistently, with only an occasional short-lived reversal. In the first quarter of 2013, EU-27 construction activity reached new lows, dropping 5.2% compared to the same quarter in 2012, and down 2.8% compared to the previous quarter (Figure 1).

Particularly worrying is that the downturn in construction is now almost universal across the continent. Comparing the first quarter of 2013 with the same period in 2012, construction production was down in Czech Republic (-11%), Germany (-3.7%), France (-3.3%), Netherlands (-8.2%), Poland (-15.9%), Portugal (-20.8%), Romania (-3.9%), Slovenia (-24%), Slovakia (-10.9), Sweden (-0.4%), and the UK (-7.4%). These declines are only partly offset by gains in Latvia (+9.8%) and Hungary (+4.8%). After five years of almost uninterrupted decline, construction activity across the EU is at 75% of the all-time peak in 2007.

Figure 1. EU construction index (% change on previous year)



Source: Eurostat

No end in sight to recession in EU construction sector

Euroconstruct, a network for construction, finance and business forecasting in Europe, has reported that high unemployment, stagnant economic growth as well as strained public sector finances suppressed European construction activity throughout 2012. In June last year, a 2% decline in construction activity during 2012 was forecast. However in December 2012 it became clear that the decline was worse at around 4.7%. Euroconstruct now forecasts a further decline of around 1.6% for 2013 and only a minor improvement of 1% in 2014 and 1.9% in 2015.

The debt-ridden EU member states have the most severely affected building sectors. Spanish construction output fell by over 30% during 2012, following double-digit declines in 2009, 2010, and 2011. A further 23% decline is forecast for the Spanish housing and construction sectors this year. Portugal and Ireland also experienced double-digit declines in construction output in 2012 and prospects for a rapid recovery are slim.

However, moderate growth is forecast for some key EU member states. Germany is Europe's largest construction/housing market and growth in German construction is expected to resume this year. Low single-digit growth is also forecast in 2013 for Denmark, Norway, Sweden and Switzerland.

Japan 2012 housing starts - sixth lowest since 1965

While there has been some recovery in housing starts in Japan, total starts in 2012 were 882 797, the sixth lowest level since 1965. In March this year housing starts were

71 456 units, 7.3% more than in March last year marking seven consecutive monthly increases. If this rate is sustained the seasonally adjusted annual starts would be 904 000 units for 2013, still a long way from a *Japan Forest Products Journal* forecast of 920 000 annual 2013 starts. Even this forecast, based on a survey of major house builders in Japan, represents less than 5% growth in housing starts from 2012, hardly sufficient to light a spark under Japanese tropical wood product imports.

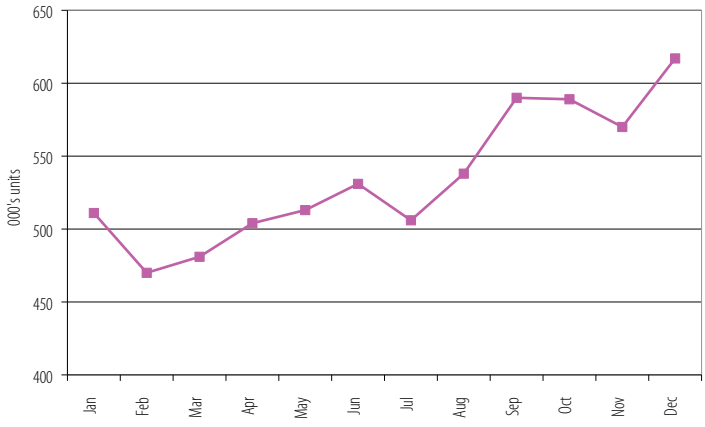
Recovery of US housing market

A rare example of good news on the global housing front is from the US where the recovery of the housing market picked up in the second half of 2012 with unsold inventories dropping and new starts on the rise. In December 2012 US builders started work on homes at the fastest pace in four years and finished 2012 with the best performance since the housing market began to collapse in late 2006 and 2007 (Figure 2). Improvement in home building in 2012 has boosted construction spending. Spending on private residential units increased in eight months in 2012, rising to a 4-year high and nearly 33% above the worst levels recorded during the third quarter of 2010.

Building permit data remains positive, although there was little monthly change in permits issued in December 2012. The total number of permits issued in 2012 was 813 400, 30% above 2011. The number of building permits issued in March this year was 902 000 (seasonally adjusted annual rate), down 4% from February. The number of permits issued is usually an indicator of future building activity.

Annualized US housing starts passed the 1-million mark in March 2013 for the first time since 2008. The number of total starts rose to 1.036 million homes in March (seasonally adjusted annual rate), up by 7% from February. Multi-family starts increased by 31%, while single-family starts fell by 5%. The share of single-family homes in total starts declined to just 60%. Builders of single-family homes have difficulty keeping up with demand because of increasing material costs and worker shortages.

Figure 2. 2012 US monthly housing starts*



* single family units, approximately 70% of total units

Source: US Department of Commerce, US Census Bureau, Foreign Trade Statistics

China achieves solid 2012 real estate sales

Chinese residential real estate sales in 2012 grew 14.9 percent according to the National Bureau of Statistics of China. Continued growth in demand for homes is good news for the domestic wood product manufacturing sector and for exporters supplying timber to the Chinese market. However, the growth in real estate sales slowed markedly over the year as the government sought to put a brake on markets.

Sales of commercial buildings in China, a major driver of demand for joinery products and office furniture, increased in 2012. The total floor area of office buildings sold in 2012 increased 12.4 percent. Preoccupation with the prevalence of Chinese-produced wood products in the international markets distracts attention from the rapidly developing domestic market for wooden building materials and added-value wood products. The expansion of domestic demand in China serves to balance declines in exports such that demand for timber raw materials will continue to grow.

Where to in 2013?

It is encouraging that there are fewer negative trends visible in available first-quarter import statistics of tropical wood products (Table 1) but the markets have a long way to go to recover to the pre-crisis levels of 2006/7.

EU still second largest importer

Demand in the EU remains weak and continued declines in imports of tropical plywood, sawnwood and logs have been reported. European demand for African hardwood remains quiet, with orders in northern European markets similar to last year and demand very weak in southern Europe. However, low demand is balanced by restricted supply.

The market for tropical hardwoods in Italy also remains weak. Many large Italian wood manufacturing companies are believed to be in serious financial difficulty as domestic demand has crashed. In Spain, sawn hardwood imports last year suffered a 37% fall compared to the previous year and were less than a quarter of the volume that prevailed before the economic crisis. For 2013 Spanish importers foresee no improvement in market conditions.

Market conditions are slightly better in parts of northern Europe. The UK has been one of the more robust markets in Europe for tropical wood. UK importers are experiencing reasonable demand so far this year with most expecting sales for 2013 to be similar to last year. Demand for tropical timber in Germany has been reasonably consistent and importers say that demand in the first half of 2013 is likely to be firm.

EUTR offers both risks and opportunities

A key issue for tropical wood suppliers to the EU is the effectiveness, efficiency and equity of enforcement of the new EU Timber Regulation (EUTR) that entered into force in March. It's hard to imagine a worse time than the present for introduction of the EUTR. The economic downturn in Europe has reduced EU consumption of tropical hardwoods by about 50% in the last five years. Many EU importers are, with justification, concerned that while they become increasingly discriminatory in their procurement practices, tropical wood trade flows will simply be diverted to other markets. At the same time, the economic downturn means that both government authorities and the private sector in EU member states often lack the resources to implement the regulatory and due diligence procedures required by the EUTR.

The challenges of the EUTR and related FLEGT VPA processes are profound and made all the more challenging by the current market environment in the EU but it is worth remembering that even with the downturn the EU remains the world's second largest importer of timber products (after China), accounting for around 17% of the global import value.

Table 1. Change in 2012-2013 first quarter import volumes (selected tropical timber products, major markets)

EU imports	% change Qtr1 2012-Qtr1 2013	US imports	% change Qtr1 2012-Qtr1 2013	Japan imports	% change Qtr1 2012-Qtr1 2013	China imports	% change Qtr1 2012-Qtr1 2013
Hardwood plywood	-2.5%	Tropical sawnwood	-10%	Plywood	5%	All logs	5.7%
Tropical sawnwood	-15.7%	Hardwood plywood	31%	Tropical sawnwood	-12%	Tropical logs	6.5%
Tropical logs	-25.7%	Furniture	6%	Tropical logs	-46%	All sawnwood	3.4%
						Tropical sawnwood	-4.7%

Can US growth continue?

US economic data released in June 2013 shows continued strength in private consumption despite income growth weakness; the question worrying analysts is just how long this can be sustained. Sentiment up to mid 2013 was driven by the improving housing market and a strongly rising stock market. One serious concern for US economic growth is the slow pace of business investment.

US imports of hardwood plywood (which includes tropical plywood) surged in the first quarter by over 30%, but it is unlikely this growth will continue. In sharp contrast, imports of tropical sawnwood fell 10% in the first quarter. On the other hand, imports of wooden furniture recorded a modest gain in the first quarter (6%).

The US housing market has been struggling to rise from the depths of recession for several years but the rebound in demand over the past twelve months, during which home building has improved to just over a million units (annualized rate), has lifted sentiment. Continued expansion in house building and more investment in home improvement bodes well for tropical timber suppliers.

Japan's tropical log imports forecast to fall

In early 2013 the Japan Foreign Timber General Supply and Demand Liaison Conference (JFTGSDLC) released forecasts for timber imports in 2013 (Table 2). While total demand for logs in 2013 is forecast to be much as it was in 2012, demand for tropical logs is expected to fall by around 40% largely because of the closure of one of Japan's major tropical plywood mills. The change in first quarter imports shown in Table 1 above largely bears out these forecasts. Japan continues to import significant volumes of tropical plywood and demand in 2013 is forecast to be higher than in 2012 as a result of expected increased activity in the construction and house building sectors.

China rebalances international trade

China's 2012 imports of logs and sawnwood fell short of the levels in 2011 but first quarter 2013 data shows that this downward trend has been partly reversed. Imports of tropical logs expanded in the first quarter (Table 1).

Efforts are being made by China's policy makers to address the country's trade imbalance and plans to accelerate imports and to transform the structure of China's foreign trade have been prepared. Measures include adjustments to tariff structures, strengthening the range of information services and increasing transparency and coordination between the private sector and government agencies.

China's foreign trade has grown robustly over the past 10 years and the country has established itself as a major trading nation but still, analysts say, quality and industrial efficiency remain problems. The current development model for China's foreign trade, which relies on low cost resources such as energy and labor, is considered unsustainable. The competitiveness of labor intensive industries in developing counties has improved to such an extent that exporters in such countries can compete very effectively with Chinese exporters. Reports from Chinese government agencies say a decision has been made to restructure trade so as to ensure it drives economic and social development in the country, which could signal greater opportunities for exporters of added value wood products for the domestic market in China.

Table 2. Forecast change in Japan's imports

Product/source	2012/2013 % change
Logs	
Tropical	-38
for plywood	-42
for sawnwood	-23
N. American	3.6
Russian	1.9
Radiata	-0.4
EU	no change
All log imports	-0.5
Sawnwood	
Tropical	2.2
N. American	0.2
Russian	8.6
Radiata	-0.6
EU	3.2
All sawn imports	1.1

Source: JFTGSDLC

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Topical and tropical

Compiled and edited by Ken Sato

Negotiations on European forest agreement suspended

The 4th session of the Intergovernmental Negotiating Committee for a Legally Binding Agreement (LBA) on Forests in Europe (INC-Forests4) was convened from 10-14 June 2013 in Warsaw, Poland. The session was attended by over 140 participants and observers from 33 countries, the EU, Japan, and 19 regional and international organizations, forestry associations and NGOs.

INC-Forests4 reached agreement on several elements of the LBA (which may be open to signature by all UN members), but was unable to reach final agreement on several others. Since the INC process is limited to four negotiating sessions, delegates decided to reconvene INC-Forests4 for three days on dates and at a place to be announced before sending the results of INC-Forests to an Extraordinary Ministerial Conference scheduled for November 2013 (see Meetings, page 32). Outstanding issues to be considered at the resumed session include: decisions on the depositary/host for the convention; interim and permanent secretariat arrangements; adjustments to the final clauses that might be necessary following the choice of the depositary; and provisions for admission of observers, the rules for the compliance committee and voting rights.

FSC says "no go" to logging company in DRC

The Forest Stewardship Council (FSC) has recently revoked certifications granted to the multinational Danzer Group due to complaints from Greenpeace which alleged violation of FSC's human rights policy at a logging site in the Democratic Republic of Congo (DRC) operated by Danzer subsidiary SIFORCO.

According to the complaints filed by Greenpeace, in May 2011 Congolese police and military forces, paid by SIFORCO, attacked a community protesting logging operations. According to witnesses, security forces committed acts of physical violence which included rape of women and girls, destruction of property, and arbitrary arrests. SIFORCO claimed it had only asked the security forces to retrieve stolen goods.

Though Danzer Group disagrees with the outcome, it has accepted the loss of FSC certification of the DRC operation and stated its commitment to resolving the issues involved as well as applying for re-association with the FSC. "We respect the right of FSC to impose disassociation under conditions that could represent severe reputational risk to its system," noted Danzer Group CEO Hans-Joachim Danzer. Danzer sold SIFORCO in early 2012 but the revocation of its FSC certificates, which became effective in May 2013, will affect its current African logging subsidiary, *Industrie Forestière de Ouesso* (IFO), which manages the largest area under FSC forest management certificates in the Congo Basin.

Trees, the root of hydropower

Standing trees in the rainforest are important for the generation of hydropower, according to recent research published in the Proceedings of the National Academy of Sciences (PNAS).

Continued deforestation in the Amazon region could significantly lower the output of hydropower dams by causing a reduction in flows of rivers and streams. Researchers say that projected outputs of these dams may be reduced by one-third. Until recently, the general belief of hydropower operators was that the felling of trees in forests near dams would improve the flow of river waters reaching the dams. But in the PNAS study, climate projections for the Amazon Basin were modeled in detail, as were the characteristics of the rivers on which the dams were built.

Scientists found that rainfall in the region is 6–7 percent lower now due to accumulated deforestation as opposed to what it was under full forest cover. At current rates of deforestation there could be up to a 40% loss of Amazon forests by 2050, resulting in less rain and 35–40 percent less electrical power than planned from regional dams.

Internet to net illegal loggers

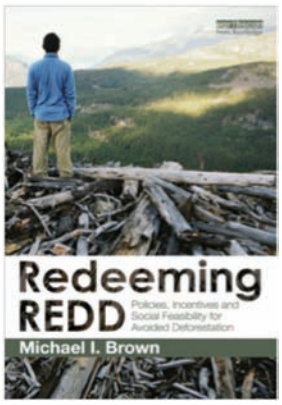
Gemalto, a Dutch company that develops digital security systems and network security, is using machine-to-machine (M2M) communications in efforts to preserve rainforests and thwart illegal loggers in the Amazon.

A tracking device (known as "Invisible Tracck") uses Gemalto's tiny and powerful Cinterion BGS2 M2M module to enable Brazil's law enforcement agencies to track individual trees using cell-phone and internet technology. The cellular device is tucked into a case smaller than a deck of cards which is camouflaged to blend in with tree trunks and installed in remote active harvesting areas deep within the forests. When a tagged tree is harvested, it alerts officials from the Brazilian Institute of Environment as soon as it passes within 20 miles of a cellular network. Authorities can then pinpoint and track the harvested product and intercept the illegal loggers in the act of selling the illegally harvested timber at sawmills. The use of this technology could lead to quicker prosecutions and contribute to efforts to combat illegal forest activities.

The Invisible Tracck device is meant to supplement traditional methods of satellite surveillance and monitoring of illegal deforestation in high-risk areas with known populations of valuable trees. Gemalto is working on developing Radiation Data Exchange (RED) technology to boost the communications signals of the device in areas without effective cellular network coverage.

Recent editions

Compiled and edited by Ken Sato



Brown, M.I. 2013. *Redeeming REDD. Policies, incentives and social feasibility for avoided deforestation.* Routledge. London, UK. ISBN: 9780415517867 (paperback), 9780415 517874 (hardback)

Available from: http://www.routledge.com/books/details/9780415517867/

This book presents a critique of the aims and policies of REDD as currently structured, particularly in terms of social feasibility. It demonstrates how hopes for REDD to be able to reduce greenhouse gas emissions as well as enhance people's livelihoods and biodiversity conservation are unrealistic. There is an assumption in many discussions that technical or economic fixes are sufficient for REDD's success. However, the social and governance problems likely to be associated with REDD, and its enhanced version known as REDD+, make such assumptions implausible. Instead, to enhance prospects for achieving the aims of REDD/REDD+, the author provides a roadmap for developing a new social contract that puts people first.

Engel, A. 2013. *Training manual: collaborative conflict management for enhanced national forest programmes.* FAO. Rome, Italy. ISBN: 9789251073902

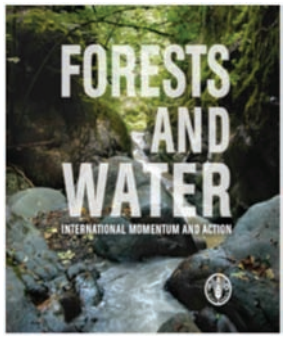
Available from: http://www.fao.org/docrep/017/i3101e/i3101e00.pdf

This manual, published by the National Forest Programme Facility at FAO, provides guidelines for designing and conducting training courses for practitioners involved in managing conflict related to forest policy. It suggests a general framework for a five-day course and provides training activities, questions that training participants in conflict management workshops often ask, and a sample training agenda.

Hall, A. 2012. *Forests and climate change: the social dimensions of REDD in Latin America.* Edward Elgar, UK. ISBN: 9781849802826

Available from: http://earthprint.com/productfocus.php?id=EE127

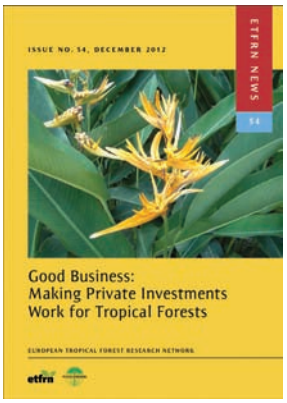
This book raises questions over some of the basic assumptions that underpin REDD policies in Latin America. It raises doubts about whether sufficient account is being taken of the complex social, economic, cultural and governance dimensions involved, advocating a comprehensive 'social development' approach to REDD planning. It is the first book to comprehensively examine REDD policies across Latin America, including a focus on social aspects. It will prove invaluable to academics and postgraduate students in the fields of environmental studies, environmental politics, geography, social planning, social and environmental impact assessment, development studies, and Latin American studies. Policymakers, planners and practitioners working on REDD at national and international levels (both official and NGO sectors) will also find plenty of data in this comprehensive resource.



FAO. 2013. *Forests and water: international momentum and action.* FAO. Rome, Italy. ISBN 9789251074183

Available from: http://www.fao.org/docrep/017/i3129e/i3129e.pdf

This publication, which is an output of FAO's close collaboration with key partners on forests and water between 2008 and 2011, synthesizes the main outcomes and recommendations of a number of events to develop a comprehensive and practical international forests and water agenda. It provides an overview of forest and water interactions and describes the increasing international momentum around this topic. It then presents, in chronological order, summaries of the various events held between 2008 and 2011, as well as their main outcomes and recommendations. It concludes with an analysis of the key recommendations and a proposal for an international forests and water agenda for the coming years.



Asen, A., Savenije, H. and Schmidt, F. (Eds.). 2012. *Good business: making private investments work for tropical forests.* ETFRN News 54. Edward Elgar, UK. ISBN: 9781849802826

Available from: http://www.etfrn.org/publications/good+business+ making+private+ investments+ work+for+ tropical+forests

This issue of *ETFRN News* brings together 23 articles that present and analyze concrete examples of various private actors along the tropical forest-finance chain (small, medium and large forest entrepreneurs and intermediary and advisory organizations). The experience of these private investment frontrunners presents a compelling case for revisiting business as usual. As policymakers and private actors refine their strategy for seizing opportunities and managing the risks associated with emerging forest-related markets, these articles demonstrate that overall economic, social and environmental benefits can be reaped if investments are targeted correctly.

Meetings

4-7 August 2013
21st International Wood Machining Seminar
Tsukuba, Japan
Contact: www.ffpri.affrc.go.jp/en/symposium/iwms21/

14-16 August 2013
APEC 2nd Ministers Responsible for Forestry Meeting
Cusco, Peru
Contact: www.apec.org/events-calendar.aspx

26-30 August
6th International Ecosystem Services Partnership Conference
Bali, Indonesia
Contact: www.espconference.org/ESP_ Conference

27-30 August 2013
IV Mesoamerican Congress of Protected Areas
San Jose, Costa Rica
Contact: www.forests-l.iisd.org/events/iv-mesoamerican-congress-of-protected-areas/

27-29 August 2013
International Union of Forest Research Organizations (IUFRO) Resources for the Future Task Force
Vancouver, Canada
Contact: william.nikolakis@ubc.ca; iufro2013.forestry.ubc.ca/

3-6 September 2013
Mediterranean Regional Office of the European Forest Institute (EFIMED) Annual Meeting
Barcelona, Spain
Contact: sarah.adams@efi.int ; www.efimed.efi.int/portal/events/?bid=967

8-12 September 2013
Future Directions of Small-Scale and Community-Based Forestry
Fukuoka, Japan
Contact: iufro.fukuoka@gmail.com; ffpsc.agr.kyushu-u.ac.jp/policy/IUFRO/IUFROF2013.html

11-13 September 2013
International Symposium on Tropical Forest Ecosystem Sciences (IUFRO)
Bintulu, Sarawak, Malaysia
Contact: Seca Gandaseca (seca@btu.upm.edu.my); www.btu.upm.edu.my/v3/index.php/ms/component/content/article?id=227

17-19 September 2013
Forests Africa: Opportunities for a Green Economy
Nairobi, Kenya
Contact: John.Prydz@unep.org; www.un-redd.org/Opportunities_for_a_GreenEconomy_Conference/tabid/106056/Default.aspx

23-27 September 2013
European Forest Institute 20 Years Science and Policy Forum
Nancy, France
Contact: Ulla Vänttinen , AC20years@efi.int ; www.efi.int/portal/efi20years/ac2013/

24–27 September 2013
EFI 20 Years: Our forests in the 21st century – ready for risks and opportunities?
Nancy, France
Contact: www.efi.int/portal/efi20years/ac2013/

24-25 September 2013
Carbon Forum Asia
Bangkok, Thailand
Contact: www.carbonforumasia.com

24-27 September 2013
9th Fair of machinery and products for the timber sector and 1st Amazon Fair
Belem, Para, Brazil
Contact: wrsp@wrsaopaulo.com.br; www.wrsaopaulo.com.br/index.php/eventos/ feira-de-belem

25-26 September 2013
Lignofuels 2013
London, UK
Contact: www.wplgroup.com/aci/conferences/eu-eef4.asp

26–27 September 2013
International Workshop on Domestic Offset Schemes
"Towards scattered ambitions?"
Zürich, Switzerland
Contact: www.zurich-cma.org/event/international-workshop-on-domestic-offset-schemes-towards-scattered-ambitions/

30 September 2013 - 4 October 2013
19th Session of the African Forestry and Wildlife Commission
Windhoek, Namibia
Contact: FAO Regional Office for Africa; foday.bojang@fao.org; www.fao.org/forestry/afwc/en/

7-9 October 2013
International Scientific Conference on Hardwood Processing (ISCHP) 2013
Florence, Italy
Contact: secretariat@ischp2013.org; www.ischp2013.org/home-page/

7-11 October 2013
3rd International Congress on Ecosystem Services in the Tropics
Medellin, Colombia
Contact: www.medellin.unal.edu.co/secosistemas/

7-11 October 2013
CIFOR Annual Meeting
Bogor, Indonesia
Contact: www.forests-l.iisd.org/events/cifor-annual-meeting/

7-11 October 2013
8th Meeting of the CBD Working Group on Article 8(j) and Related Provisions
Montreal, Canada
Contact: secretariat@cbd.int; www.cbd.int/meetings/

8-9 October 2013
Implementing Criteria and Indicators for Sustainable Forest Management. Pan-European Forum
Vienna, Austria
Contact: christelle.rambour@efi.int; www.ci-sfm.org/pan-european-forum-in-vienna-austria-8-9-october-2013.html

14-18 October 2013
37th Session of IPCC
Batumi, Georgia (tentative)
Contact: IPCC-Sec@wmo.int; www.ipcc.ch/scripts/_ calendar_template.php?wg=8

14-18 October 2013
17th meeting, the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention on Biological Diversity (CBD)
Montreal, Canada
Contact: secretariat@cbd.int; www.cbd.int/meetings/

4-8 November 2013
25th Asia-Pacific Forestry Commission
New Zealand
Contact: www.fao.org/forestry/33587/en/

5-6 November 2013
Extraordinary Ministerial Conference, MCPFE
Madrid, Spain
Contact: liaison.unit.madrid@foresteurope.org

6-8 November 2013
1st Executive Level Environmental Compliance and Enforcement Committee Meeting
Meetings of the Interpol Wildlife, Pollution and Fisheries Crime Working Groups
Nairobi, Kenya
Contact: www.interpol.int/Crime-areas/Environmental-crime/Conferences-and-meetings/Meetings/1st-Executive-Level-Environmental-Compliance-and-Enforcement-Committee-Meeting

11-22 November 2013
19th Session of the Conference of the Parties to the UNFCCC
Warsaw, Poland
Contact: secretariat@unfccc.int; www.unfccc.int

15 November 2013
PEFC Stakeholder Dialogue
Kuala Lumpur, Malaysia
Contact: info@pefc.org

20-21 November 2013
Bioenergy Commodity Trading 2013
Brussels, Belgium
Contact: www.wplgroup.com/aci/conferences/eu-eet3.asp

25-30 November 2013
49th Session of the International Tropical Timber Council and Associated Sessions of the Committees
Libreville, Gabon
Contact: itto@itto.int; www.itto.int

9-13 December 2013
Metsä 2013 - Joint Session of the 37th European Forestry Commission- 71st UNECE Committee on Forest and Forest Industry
Rovaniemi, Finland
Contact: www.unece.org/ index.php?id=32311

9-13 December 2013
European Forest Week
Rovaniemi, Finland
Contact: eve.charles@unece.org; www.unece.org/index.php?id=31600; www.forests-l.iisd.org/events/european-forest-week-2/

3-7 February 2014
3rd meeting of the Intergovernmental Committee for the Nagoya Protocol (ICNP) on access and benefit-sharing (ABS) of the Convention on Biological Diversity (CBD)
Seoul, Korea (tentative)
Contact: secretariat@cbd.int; www.forests-l.iisd.org/events/icnp-3/

10-14 February 2014
World Congress on Agroforestry 2014
Delhi, India
Contact: www.wca2014.org/

4-6 June 2014
Third Forest Science Forum and 12th International Conference on Bio-based Composites in Pan-Pacific Region
Beijing, China
Contact: Feng Caiyun, bjmaryfeng@163.com

8-14 June 2014
20th World Congress of Soil Science
Jeju, Republic of Korea
Contact: www.20wcss.org/

23-27 June 2014
Fifth meeting of the Working Group on Review of Implementation (WGRI) of the Convention on Biological Diversity (CBD)
Montreal, Canada [tentative]
Contact: secretariat@cbd.int; www.cbd.int/meetings/

23-27 June 2014
FAO Committee on Forestry - 22nd Session
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