

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

CONVENCIÓN SOBRE EL COMERCIO INTERNACIONAL DE ESPECIES
AMENAZADAS DE FAUNA Y FLORA SILVESTRES

CONVENTION SUR LE COMMERCE INTERNATIONAL DES ESPECES
DE FAUNE ET DE FLORE SAUVAGES MENACEES D'EXTINCTION



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ITTO – CITES PROGRAM FOR IMPLEMENTING CITES LISTINGS OF TROPICAL TIMBER SPECIES

The attached information document has been submitted by the CITES Secretariat¹.

El documento informativo adjunto ha sido presentado por la Secretaría CITES².

Le document d'information joint est soumis par le Secrétariat CITES³.

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ITTO-CITES PROGRAM FOR IMPLEMENTING CITES LISTINGS OF TROPICAL TIMBER SPECIES

NEWSLETTER



Donors



This is the eighth issue of the **ITTO – CITES Program for Implementing CITES Listings of Tropical Timber Species** newsletter. It is published on a quarterly basis, in English, Spanish and French, and is mainly made available to our African, Asian and Latin American colleagues, sponsors and other individuals interested in the progress of the ITTO–CITES Program. This issue covers a summary of program activities during the period October-December 2010.

Suggestions and contributions from project participants are essential to make future issues of this newsletter as informative and interesting as possible. Please send any correspondence to the relevant contact(s) listed on the last page.

EDITORIAL

These three-and-a-half years from April 2007 to December 2010 proved effective and successful implementation of initial phase of the ITTO-CITES Program. Until December 2010, a total of 21 activities including national and regional workshops have been implemented and for the most part completed in Africa, Asia and Latin America. Nearly 100 manuals, reports, guidelines and papers have been published by these activities. Range States of *Swietenia macrophylla*, *Peripocosis elata* and *Prunus africana* benefited from formulating non-detriment findings and thus determining export quotas through this program. Improved management of CITES listed timber species has occurred in all target countries. Wrap-up regional workshops were organized in September 2010 for Africa and December 2010 for Asia. A final workshop is scheduled in February 2011 for Latin America.

The International Tropical Timber Council (ITTC) adopted a decision at its just completed 46th Session calling for the establishment of a multi-donor facility to ensure the continuation of the ITTO-CITES Program. Communication with potential donors is underway to allow work under this program to continue. Both ITTO and CITES Secretariat are committed to continuing this collaborative partnership to improve the management and conservation of CITES-listed tropical tree species.

We would like to take this opportunity to wish all of our partners a wonderful holiday season and that 2011 brings continued health and much joy!

**Steve Johnson and Pei Sin Tong, ITTO
And Milena Sosa Schmidt, CITES**

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ITTO-CITES PROGRAM IN A NUTSHELL

The "ITTO – CITES Program for Implementing CITES Listings of Tropical Timber Species" aims to ensure that international trade in CITES-listed tropical timber species is consistent with their sustainable management and conservation. The specific objective of the program is to assist national authorities to meet scientific, administrative and legal requirements for managing and regulating trade in *Pericopsis elata* (afroormosia) of Central Africa, *Swietenia macrophylla* (bigleaf mahogany) in Latin America, and *Gonystylus* spp. (ramin) in SE Asia and, in particular, to develop guidance to ensure that utilization is not detrimental to the survival of these CITES-listed tropical timber species.

The main range States exporting significant volumes of these species are Cameroon, Republic of Congo and Democratic Republic of Congo in Africa; Indonesia and Malaysia in Asia; and Bolivia, Brazil and Peru in Latin America.

The direct beneficiaries of this Program are public authorities and private sector operators in the timber sector in the range States. The indirect beneficiaries are other Parties to CITES that trade in these species, who will benefit through capacity building and awareness raising.

FUNDING

The program has received funding from the European Commission, United States of America, Japan, Norway, New Zealand, Switzerland, Germany, the private sector and through ITTO's Bali Partnership Fund.

The European Commission provided a grant worth 2.4 million euros for program implementation, with over USD 1,200,000 provided from the other donors in aggregate to date. ITTO will encourage donors to continue providing funds as requests for support under the program exceed available resources. A recent development has been the provision of funds (over USD 500,000) from several pharmaceutical companies to improve management and produce an NDF report for *Prunus africana* in Cameroon and DRC. Norway also recently provided funding to the program to assist Madagascar with assessing timber species of conservation concern. The USA provided an additional \$200,000 to the program during the 46th ITTC Session. ITTO and CITES are preparing a follow-up grant proposal which will be submitted to the European Commission and other interested donors early in 2011 to allow the program to continue operations.

AGREEMENTS BETWEEN ITTO AND INSTITUTIONS OF RANGE STATES

50 country activity proposals in Africa (7), Asia (23) and Latin America (20) have been submitted to ITTO for consideration under the Program. Of these, 13 activities in Asia, 6 in Africa and 6 in Latin America have received funding from ITTO since 2008. Most activities are now completed except for one on-going in each of Indonesia, Malaysia, Peru, Brazil and Cameroon.

ITTO has signed agreements with the following institutions since program inception:

SIGNED MOUs

Brazil

FUNPEA (Foundation for Supporting Research, Extension and Teaching in Agrarian Sciences) – 2 activities

IFT (Tropical Forest Institute)/J. Grogan – 1 Activity plus extension

Bolivia

Vice Ministry of Environment, Biodiversity and Climate Change – 1 activity

Peru

UNALM (Universidad Nacional Agraria La Molina) – 2 activities

Cameroon

ANAFOR (Agence Nationale d'Appui au Développement des Forêts) – 3 activities

Democratic Republic of Congo

Direction des Ressources Fauniques et Chasse /CITES RDC – 2 activities

Republic of Congo

MINFE (Ministère de l'Economie Forestière) – 1 activity

Indonesia

Government of Indonesia and the Forestry Research and Development Agency (**FORDA**) - 5 Activities (2 Activities by the Centre for Forest and Nature Conservation Research and Development (**CFNCRD**); 1 Activity by the Remote Sensing Laboratory, Faculty of Forestry, Bogor Agricultural University; 1 Activity by the Research Centre for Biology, Indonesian Institute of Sciences; and, with the Directorate General Forest Protection and Nature Conservation - 1 Activity by the Directorate of Biodiversity Conservation.

Malaysia

Ministry of Natural Resources and Environment Malaysia (**NRE**) and the Malaysian Forestry Research and Development Board - 8 Activities (2 Activities implemented by the Forest Department Sarawak and Sarawak Forestry Corporation; 3 Activities by the Forestry Department Peninsular Malaysia; 2 Activities by the Forest Research Institute Malaysia (FRIM); and, 1 Activity by the Malaysian Timber Industry Board (MTIB).

Information about each country activity (country, title, abstract, executing agency) can be found on the ITTO website <www.itto.int>. The following section provides brief descriptions and progress reports during the period October-December 2010 for all activities that are currently underway and completed. Activities pending funding will be reviewed in early 2011 with a view to making the most effective use of remaining program resources.

ACTIVITIES IN DETAIL

Africa

Cameroon

"Management of *Pericopsis elata* in forest concessions" (ANAFOR)

This activity was proposed to collect data on the state-of-the-art of *Pericopsis elata* in the forest concessions in Cameroon, including data on phenology, processing, status and stocking, and to promote the silviculture of the species. A total of seven expected outputs were identified including (i) abundance/density specified for each concession; (ii) the minimum exploitable diameter well defined for the country; (iii) indices of harvest defined; (iv) sustainable harvest quota of *P. elata* calculated on a scientific basis; (v) conversion ratio for *P. elata* established; (vi) silvicultural operations promoted. The key results obtained are: a) the distribution area of *Pericopsis elata* which is 5 339 023 ha, larger than 4 855 738 ha outlined in the literature, which is restricted to the East region of the country; b) the setting of Minimum Exploitable Diameters (MED): 80 cm, 90 cm, or 100 cm is under the discretion of the Cameroon government - the ideal diameter which conciliates both ecological and economic concerns is 90 cm; c) the Assamela processing rate is 0.4242 instead of 0.33 as used by the Cameroon CITES Management Authority, considering this rate, it leads to an export quota of 14,400 m³ at MED 100 cm instead of 15,200 m³ and 25,334 m³ at MED 90 cm; d) in December 2009, ANAFOR (CITES Scientific Authority) drafted the first Non-Detriment findings (NDF) report on Assamela based on results obtained by the ITTO-CITES program in Cameroon; e) on 25 February 2010, the Ministry of Forestry and Wildlife organized the national workshop for the validation of results obtained from the ITTO/CITES program in Yaoundé, Cameroon; f) on 15th June 2010, the Ministry of Forestry and Wildlife signed a decision N° 0511/D/MINFOF/SG/DF/BSJ, reducing the minimum exploitable diameter (MED) of *P. elata* from 100 cm to 90 cm – based on this decision, the annual quota of Assamela in Cameroon will be 25 334.07 m³; g) from March 1 – 4, 2010, the Executing agency, ANAFOR, organized a training workshop on the silviculture of *P. elata* at Yokadouma, East Region of Cameroon. A total of 15,490 seedlings were sown in 9 nurseries settled in 11 forest management units (FMU) belonging to 5 forest companies. All outputs expected in this activity were completed.

"Management of *Pericopsis elata* in forest plantations" (ANAFOR)

This activity addresses the management of *Pericopsis elata*'s plantations in Cameroon to determine important tools for enhancing the silviculture of this species in the country. A total of five expected outputs were identified: i) a report on the state-of-the-art of the plantation; ii) zoning; iii) protection of the plantation; iv) research results; v) capacity-building and dissemination of *P. elata* silviculture. The results of the studies served to draft a training book on the silviculture of *P. elata*. The simple management plan of the Bidou forest plantation is available and was presented to participants during the national workshop organized, on 25 February 2010, in Yaoundé. The two days training workshop was organized in Bidou in August 2010; a total of 35 villagers and local forest officers were trained on the silviculture of Assamela;



Bidou plantation before clearing (left) and after clearing (right), Cameroon
Photo by: Ngueguim Jules

the Bidou plantation was cleaned in August 2010; this consisted of cutting (removing) about 30% of Assamela trees as recommended in the simple management plan. The Cameroon Government is looking for additional funds to implement the guidelines of simple management plan of the Bidou forest plantation.

"Non-detriment findings for *Prunus africana* (Hook. f.) Kalman in Cameroon" [ANAFOR]

This activity seeks to address Non-detriment findings report for *Prunus africana* in Cameroon. The expected outputs are: (i) A well-established state-of-the-art on production, processing, transport and trade in *P. africana* products; (ii) delimitation of Prunus Allocation Units (PAUs) and estimating *Prunus* density; and, calculating sustainable harvesting quota; (iii) a simple management plan prepared and implemented for each PAU; (iv) silvicultural operations; (v) capacity-building for CITES authorities (enhancement and enforcement of control system); (vi) research on sustainable management of *P. africana* in Cameroon; (vii) making a Non-detriment findings report for *P. Africana*; and (viii) dissemination of the results. A Non-detriment findings report on *P. africana* is available for the Northwest region of Cameroon, containing precise data on distribution area, density and harvesting quota per community forest. *Prunus* quotas will be defined for the remaining regions (Southwest and the Adamaoua region) by February 2011.

Democratic Republic of Congo

"Training of different stakeholders in the verification of the CITES permits compliance and the use of 'CITESWOOD ID' tool in the Democratic Republic of Congo" (OCC/OFIDA)

This activity refers to the national training workshop held in Kinshasa, Gombe in June 2009 on the use of CITES tools. The goal was to contribute to the control of international trade in *Pericopsis elata* through the training of field inspectors. A total of 40 participants attended this workshop. The second training workshop on CITES tools is planned for December 2010 in Kinshasa Gombé. This activity has been concluded and the report is now available on the program website.

"Dissemination of the CITES convention and its implementation texts within the distribution area of *Pericopsis elata* (Afromosia/Assamela) in the Democratic Republic of Congo" (DRFC)

This activity aimed to disseminate the CITES and its implementation tools. In spite of the delay in the implementation of this activity, efforts were made by DRC authorities. The DRC authorities organized three dissemination and provincial workshops as originally planned. The first workshop was from 3 – 5 February 2010 at Kinshasa Gombé; the second workshop from 11–12 August 2010 in Kisangani; and the third from 17–18 August 2010 in Matadi. More than 35 participants from the Congolese Control Office (OCC), the Congolese Customs Office (OFIDA), forest officers, transporters (road and air), trade/timber companies attended the workshops. Recommendations were made to better implement the CITES regulations in DRC. DRC has not made much progress for conserving flora species compared to the wildlife sector; participants, therefore, suggested to develop a list of threatened plant species in DRC. During discussions, many problems were raised as constraints for implementing the CITES regulations in DRC, for instance stipulating export quotas, inclusion of species in CITES appendices, difficulty to operate due to the public insecurity, difficulty of forest control and monitoring without proper logistics, difficulty to know timber production statistics based on logging permits.

which would be an agreement among three administrations: trade, finance, and the environment; i) enforcing the conservation of *Diospyros crassiflora* and *Millettia laurentii* by including these two species in the appendix 4 of the Ministerial Order n° 056/CAB/MIN/AFF-ECNPF/01/00 of 28th March 2000; iii) strengthen forest control at different checkpoints (ports, airports); iv) using dry seal for certificate of origin; v) revising the Ministerial Order fixing the forest taxes and allowances; vi) development of database on logging, timber processing, transportation and trade statistics; vii) providing proper logistics for forest control, data collection and analysis; and viii) mobilizing funds for identifying flora species to be included in Appendices 4 and 5 of the Ministerial Order n° 056/CAB/MIN/AFF-ECNPF/01/00 .

Republic of Congo

"Assessment of Afrormosia in a production forest to ensure its sustainable management in Congo-Brazzaville" (MINFE)

This activity aims to ensure that the export of Afrormosia products by the Industrial and Forestry Society of Congo (SIFCO) is not detrimental to the conservation of the species in the Tala-Tala forest management unit (621,000 ha), in the Northern Congo. The key outputs are reports on: i) the state-of-the art on exploitation, wood processing, trade, and control on *Pericopsis elata*; ii) analysis on the gaps between CITES and the national policy; and iii) biological and ecological research on *P. elata*. In addition, inventory showing the simple management plan on *P. elata* is available. The authorities of SIFCO signed a service note increasing the minimum exploitable diameter (MED) of *P. elata* from 60 to 70 cm as recommended by the ITTO-CITES Program in Congo. The DRC authorities are currently conducting inventories on Afrormosia in the AAV 2010 – 2011. The last meeting of the scientific Committee in charge of drafting the Non-detriment findings report on Afrormosia for Tala Tala was carried out from 13 to 16 December 2010.

Asia

Malaysia

"Non-detriment findings report on *Gonystylus bancanus* – a quantitative assessment of *G. bancanus* in two selected permanent forests of Sarawak" (FDS/SFC)

The objective is to collect data on the status and stocking of *G. bancanus* in the production forests of Sarawak, namely, the Kayangeran Forest Reserve in Lawas and the Saribas Lupar Protected Forest in Sri Aman. The objective has been achieved and 2 reports were produced. They are (i) Non-detriment Findings Report on *Gonystylus bancanus* - A Quantitative Assessment of *G. bancanus* in two selected Permanent Forests of Sarawak; and (ii) Completion Report - Non-detriment Findings Report on *Gonystylus bancanus* - A Quantitative Assessment of *G. bancanus* in two selected Permanent Forests of Sarawak. The Activity was completed in October 2010.

"Quantification of dry and wet inland *Gonystylus* spp. (ramin), *Aquilaria* spp. (agarwood) and *Intsia* spp. (merbau) in Peninsular Malaysia" (FDPM)

The objectives are: (i) to collect information on the distribution, status and stocking of dry and wet inland *Gonystylus* spp., *Aquilaria* spp. and *Intsia* spp.; and (ii) to establish 10 permanent sample plots to monitor the growth, mortality and recruitment of *Gonystylus* spp. Both objectives have been achieved and 2 reports were produced. They are: (i) The Quantification of Dry and Wet Inland *Gonystylus* spp. (Ramin), *Aquilaria* spp. (Agarwood) and *Intsia* spp. (Merbau) in Peninsular Malaysia; and (ii) Completion Report "The Quantification of Dry and Wet Inland *Gonystylus* spp. (Ramin), *Aquilaria* spp.

(Agarwood) and *Intsia* spp. (Merbau) in Peninsular Malaysia". The Activity was completed in October 2010.

"Generation of spatial distribution maps of *Gonystylus bancanus* (ramin) using hyperspectral technology and determination of sustainable level of harvest of ramin in production forests of Peninsular Malaysia" (FRIM)

The objectives are: (i) to generate spatial distribution maps through the use of hyperspectral technology and non-spatial information of ramin; and (ii) to determine the sustainable level of harvest for ramin in production forests of Peninsular Malaysia. Both objectives have been achieved and a total of 12 papers and reports were published. They are: (i) Generation of Spatial Distribution Maps of *Gonystylus bancanus* (Ramin) using Hyperspectral Technology; (ii) Population Dynamics and Optimum Harvest of *Gonystylus bancanus* in Production Forests of Peninsular Malaysia; (iii) Ecological Characteristics of a *Gonystylus bancanus*-rich Area in Pekan Forest Reserve, Pahang, Malaysia; (iv) Ecological and Management Status of Ramin (*Gonystylus* spp.) in Malaysia; (v) Generation of Spatial Distribution Maps of *Gonystylus bancanus* (Ramin) using Hyperspectral Technology and Determination of Sustainable Level of harvest of Ramin in Production Forests; (vi) Development of Local Volume Table (LVT) for Peat Swamp in Pekan Forest Reserve, Pahang with special reference to *Gonystylus bancanus* (Ramin melawis); (vii) Phenological Behaviours of *Gonystylus bancanus* (Miq.) Kurz in Pekan Forest Reserve, Pahang, Peninsular Malaysia; (viii) GONYSTYLUS *BANCANUS* – Jewel of Peat Swamp Forest; (ix) Optimum Harvesting Regime of Peat Swamp Forest; (x) High Resolution Airborne Hyperspectral Data for Mapping of Ramin (*Gonystylus bancanus*) Distribution in Peat Swamp Forest; (xi) Discriminating of Endangered Peat Swamp Forest Species using Hyperspectral Image Analysis at Canopy Scale; and (xii) Completion Report - Generation of Spatial Distribution Maps of *Gonystylus bancanus* (Ramin) using Hyperspectral Technology and Determination of Sustainable Level of Harvest of Ramin in Production Forests of Peninsular Malaysia. The Activity was completed in October 2010 .

"The development of *Gonystylus* spp. (ramin) timber monitoring system using radio frequency identification (RFID) in Peninsular Malaysia" (FDPM)

The objectives are: (i) to develop a customized cost-effective *Gonystylus* spp. timber monitoring system using radio frequency identification (RFID); and (ii) to develop an automated detection and notification mechanism for tracing non-compliances using customized cost-effective handheld data logger in Peninsular Malaysia. The objectives have been achieved and a total of 3 reports were produced. They are: (i) Ramin Timber Monitoring System Using Radio Frequency Identification (RFID); (ii) Technical Guideline for Radio Frequency Identification (RFID) System; and (iii) Completion Report - The Development of *Gonystylus* spp. (Ramin) Timber Monitoring System Using Radio Frequency Identification (RFID) in Peninsular Malaysia. The Activity was completed in October 2010.

"Developing DNA database for *Gonystylus bancanus* in Sarawak" (FDS/SFC/FRIM)

The objectives are: (i) to study the genetic variation and differentiation of *G. bancanus* population in Sarawak; and (ii) to develop a DNA database for *G. bancanus* to enhance efforts in tracing and tracking of *G. bancanus* timber. Both objectives have been achieved and 2 publications were produced, namely, (i) The Development of DNA Database for *Gonystylus bancanus* in Sarawak; and (ii) Completion Report - Development of DNA Database for *Gonystylus bancanus* in Sarawak. The Activity was completed in June 2010.

Three Additional Project Activities Started in Malaysia During 2010

"Sawn Timber and Plywood Recovery Study of Ramin (*Gonystylus bancanus*) in Peninsular Malaysia" (FDPM/MNRE)

The Faculty of Forestry, University Putra Malaysia has been engaged to undertake the study on the recovery rate of ramin logs for the manufacture of sawn timber and plywood, as well as to develop a technique for quantifying wood waste from sawmilling and in plywood production. A number of sawmills producing ramin timber have been surveyed and historical data on plywood production using ramin logs have also been examined.

A total of 2 reports is envisaged to be produced. They are: (i) Sawn Timber and Plywood Recovery Study of Ramin (*Gonystylus bancanus*) in Peninsular Malaysia; and (ii) Completion Report - Sawn Timber and Plywood Recovery Study of Ramin (*Gonystylus bancanus*) in Peninsular Malaysia. This Activity is expected to be completed in March 2011 instead of May 2011 as approved by ITTO earlier.

"National Workshop on Enforcement Compliance for Trade in Ramin (*Gonystylus* species)" (Malaysian Timber Industry Board (MTIB/MPIC)

The objectives of the national Workshop are: (i) to understand the CITES Convention and its trade enforcement mechanism and implementation related to ramin; (ii) to develop common understanding and practices related to trade control for ramin and related timber/plant species listed under CITES; (iii) to establish effective communication channel and networking within the enforcement agencies in Malaysia directly or indirectly involved in ramin trade; and (iv) to establish a mechanism to coordinate effective implementation of CITES regulation in Malaysia. In this context, a total of 2 reports will be produced, namely, (i) a Proceedings of the national Workshop and (ii) a Completion Report on the Activity, both before the end of February 2011.

"Regional Workshop on the Sharing of Findings from the Activities Implemented in Indonesia and Malaysia under the ITTO-CITES Project on Ensuring International Trade in CITES-listed Timber species is Consistent with their Sustainable Management and Conservation" (FRIM/MNRE)

The objectives of the regional Workshop are (i) to share, learn and discuss the findings of each Activity implemented in Indonesia and Malaysia under the ITTO-CITES Project, (ii) to identify and adapt relevant findings from the Indonesian Activities by Malaysia and *vice versa*, and (iii) to identify potential projects and activities to further ensure that the international trade in ramin is consistent with their sustainable management and conservation. A total of 2 reports will be produced, namely, (i) a Proceedings of the regional Workshop and (ii) a Completion Report on the Activity, both before the end of February 2011.

Indonesia

"Improving inventory design to estimate growing stock of ramin (*Gonystylus bancanus*) in Indonesia" (SEAMEO/BIOTROP)

The objectives of the Activity are (i) to develop an inventory design using satellite technology for estimating the standing stock of ramin, as well as the other species found growing in the peat swamp forests in Sumatra and Kalimantan, and (ii) guidelines for ramin inventory and Non-detriment Findings (NDF) assessment on ramin, including conducting a short training workshop on the inventory method and NDF assessment on ramin.

All the objectives of the Activity have been achieved and a total of 11 reports were published. They are (i) Proceeding Technical Workshop: Review of the existing Methods and Design for Ramin Inventory in Peat Swamp Forest; (ii) Selection Methods, Provision of Satellite Images and Interpretation; (iii) Ground Check of Selected Sites; (iv) Re-evaluation of Method; (v) Relative Efficiency of Double Sampling in Peat Swamp Forest; (vi) *Panduan Inventarisasi Sediaan Ramin di Hutan Rawa Gambut* (Manual of Ramin Inventory in Peat Swamp Forest); (vii) *Teknik Inventarisasi Sediaan Ramin di Hutan Rawa Gambut* (Inventory Technique of Ramin in Peat Swamp Forest); (viii) *Panduan Penilaian Non-Detrimental Finding untuk Ramin (*Gonystylus* spp.)*; (ix) Guideline for Non-Detrimental Finding Assessment on Ramin (*Gonystylus* spp.); (x) An Executive Summary: Improving Inventory Design to Estimate Growing Stock of Ramin (*Gonystylus bancanus*) in Indonesia; and (xi) Completion Report - Improving Inventory Design to Estimate Growing Stock of Ramin (*Gonystylus bancanus*) in Indonesia. The project was completed in August 2010.

"Assessing silvicultural system on ramin: review on the current practice and re-vitalization of existing permanent sample plots" (CFNCRD)

The objectives of the Activity" are (i) to review and evaluate the silvicultural system and its practice, (ii) to re-vitalize the existing permanent sample plots of ramin and the other species found growing in peat swamp forests so as to obtain a better understanding on the population dynamics, growth and yield of ramin; (iii) to develop guidelines for monitoring fruiting-flowering and ramin seed handling, and (iv) a manual on vegetative propagation techniques, including conducting a short training workshop on the manual for monitoring fruiting-flowering and ramin seed handling, as well as on vegetative propagation techniques.

All the objectives of the Activity have been achieved and a total of 9 reports were published. They are (i) *Evaluasi Sistem Silvikultur Hutan Rawa Gambut di Indonesia* (The Evaluation of the Silvicultural System in Peat Swamp Forest Area in Indonesia); (ii) *Draft Revisi Sistem Silvikultur di Hutan Rawa Gambut* (Draft Revision Silvicultural System in Peat Swamp Forest Area); (iii) *Tinjauan dan Evaluasi Petak Ukur Permanen di Hutan Rawa Gambut* (Review and Evaluation of Permanent Sample Plot of Peat Swamp Forest); (iv) *Desain dan Pembuatan Plot Pengamatan Ekologi dan Dinamika Populasi Ramin dan Jenis-jenis lain pada Hutan Rawa Gambut di Sumatra dan Kalimantan; Buku I: Laporan Utama* (Design and Establishment of Ecological Observation Plot and Population Dynamic of Ramin and other species in Peat Swamp Forest in Sumatra and Kalimantan; Book 1: Main Report); (v) *Desain dan Pembuatan Plot Pengamatan Ekologi dan Dinamika Populasi Ramin dan Jenis-jenis lain pada Hutan Rawa Gambut di Sumatra dan Kalimantan; Buku II: Data base Hasil Pengukuran Tahap I* (Design and Establishment of Ecological Observation Plot and Population Dynamic of Ramin and other species in Peat Swamp Forest in Sumatra and Kalimantan; Book II: Data base Phase I); (vi) *Manual Monitoring Musim Berbunga – Berbuah dan Produksi Benih Ramin (*Gonystylus bancanus*)* (Technical Guideline for Monitoring Flowering and Fruiting of Ramin [*Gonystylus bancanus*]); (vii) *Pedoman Teknis Pembuatan Stek Pucuk Ramin (*Gonystylus bancanus*)* (Technical Guideline for Vegetative Propagation of Ramin [*Gonystylus bancanus*]); (viii) An Executive Summary: Assessing Silvicultural System on Ramin: Review on the Current Practice and Re-vitalization of existing Permanent Sample Plots (Silviculture, Study Plots, Seed Production and Propagation of Ramin); and (ix) Completion Report - Assessing Silvicultural System on Ramin: Review on the Current Practice and Re-vitalization of existing Permanent Sample Plots. The Activity was completed in August 2010.

Latin America

Brazil

"Exploratory assessment on the population distribution and potential uses of non-*Gonystylus bancanus* species in Indonesia" (CFNCRD/FORDA)

The objectives of the Activity are (i) to explore the current status of *Gonystylus* species (non-*G. bancanus*) in Indonesia through literature review and field survey; (ii) to conduct further analyses of the genetic relationship between species and in vitro propagation of *Gonystylus* species; (iii) to develop a guidebook for species identification, including conducting a training workshop on species identification for field staff, and (iv) to undertake initial establishment of ramin gene pools at Kedaton, Ogan Komering Lilir in South Sumatra and the Sebangau National Park and Tumbang Nusa Research Station, both located in Central Kalimantan.

All the objectives of the Activity have been achieved and a total of 7 reports were produced. They are (i) Literature review on *Gonystylus* spp. other than *Gonystylus bancanus*: Botany, Ecology and Potency; (ii) *Evaluasi Kelimpahan Jenis, Populasi, Habitat dan Status Regenerasi Beberapa Jenis Gonystylus terpilih* (Non - *Gonystylus bancanus*) (Evaluation on Species Diversity, Population, Habitat, and Regeneration Status of Selected *Gonystylus* Species [Non - *Gonystylus bancanus*]); (iii) Genetic relationship between species of *Gonystylus* spp.; (iv) Upaya Induksi Kalus Embriogenik dari Potongan Daun Ramin (Embriogenic Callus Induction Effort from Ramin Shoot); (v) *Panduan Identifikasi Jenis-Jenis Ramin (Gonystylus spp.) di Indonesia* (Guidebook for Field Identification of Ramin species [*Gonystylus* spp.]) in Indonesia; (vi) An Executive Summary: Exploratory Assessment on the Population Distribution and Potential Uses of Non-*Gonystylus bancanus* species in Indonesia (*Gonystylus* spp. [Ramin]: Population Status, Genetics and Gene Conservation); and (vii) Completion Report - Exploratory Assessment on the Population Distribution and Potential Uses of Non-*Gonystylus bancanus* species in Indonesia. The Activity was completed in August 2010.

Additional Project Activity Started in Indonesia During 2010

"Review on Ramin Harvest and Trade: CITES Compliance, Tri-National Task Force on Trade in Ramin, Trade Control and Monitoring" (Forest Protection and Nature Conservation, Indonesia Ministry of Forestry)

This activity involved the preparation of 4 technical reports covering a roadmap for sustainable management and conservation of ramin; a review on the work of the Tri-national Task Force on Trade in Ramin; a study on the strengthening of CITES trade compliance system through the dissemination of CITES rules and regulation on the listing of ramin and other plant species; and a review on trade data collection, monitoring and trade control. In this regard, a training workshop on CITES compliance system and a verification workshop on trade data collection, monitoring and trade control will be held in late December 2010, while another workshop on the work of the Tri-National Task Force on Trade in Ramin will be held in early January 2011. This Activity is now re-scheduled to be completed in January 2011 instead of March 2011 as was approved by ITTO earlier.

"Bigleaf mahogany (*Swietenia macrophylla*) in the Brazilian Amazon: long-term studies of population dynamics and regeneration ecology towards sustainable forest management" (IFT/J. Grogan)

This project's objective is to establish a biological foundation for sustainable forest management systems for mahogany based on long-term studies of survival, growth, reproduction, and regeneration by natural populations in primary and logged forests. Project activities during the fourth quarter of 2010 focused on completing fieldwork in southeast Pará. Fieldwork began at the principal research site, Marajoara, in mid August and continued through the first week of December. Mahogany trees and seedlings under study since 1995 were re-censused during this time for survival, diameter and height growth, and fruit production rates.

Other Project activities included continued data management, analysis, and synthesis for publication. A manuscript by Norghauer, Nock and Grogan, titled 'The importance of tree size and fecundity for wind dispersal in a threatened tropical tree', was provisionally accepted for publication by the scientific journal PLoS Biology. This article reports results from a large-scale study of seed dispersal by mahogany trees at Marajoara in southeast Pará. A manuscript by Grogan & Schulze, titled 'The impact of annual and seasonal rainfall patterns on growth and phenology of emergent tree species in southeast Pará, Brazil', was completed and will be submitted for review to the scientific journal Biotropica by the end of December. A manuscript by Grogan, Schulze, Pantoja, Vidal and Lentini, titled 'Enrichment planting of big-leaf mahogany in logging gaps in Acre, Brazil', was in process and will be submitted for review to the scientific journal Forest Ecology and Management by the end of January 2011.

Work continued with Middlebury College colleagues R. Matthew Landis and Chris Free on manuscripts using a population modeling framework based on 1995–2009 demographic data collected at the Marajoara, Corral Redondo, and Acre-Sena Madureira sites to address basic and applied questions about mahogany population dynamics. This project will be completed in January 2011.

"Ecology and silviculture of mahogany (*Swietenia macrophylla* King) in the western Brazilian Amazon" (UFRA/FUNPEA)

The Project on "Ecology and Silviculture of Mahogany (*Swietenia macrophylla*) in the Western Brazilian Amazon" with the participation of a forest company Batisflor, the Federal Rural University of Amazonia (UFRA) and the financial support of ITTO is essential for achieving the project objectives. The project aims to establish best silvicultural practices that enable harvesting of mahogany in natural forests and to suggest improvements to the current Brazilian Federal Law (IN No. 07, of August 22, 2003), which establishes the preparation of forest management plans for conservation of the species. Specific objectives are: i) To evaluate mahogany populations in logged and unlogged forests, size class distribution and dynamics, phytosociology and stocking; ii) to test silvicultural techniques to establish natural regeneration and enhance volume production in natural forests; and, iii) to support research and extension activities of graduate students. The project can be divided in two phases: Phase I, consisting of activities developed before logging, according to the approved forest management plan (pre-harvesting activities), and Phase II, consisting of activities to be developed after logging (post-harvesting activities).

Phase I: Establishment of the annual coupe. According to the forest management plan, an Annual Production Unit (UPA) of 6,000 ha has been established; each UPA is sub-divided into 100 ha working units (*Unidade de Trabalho* - UT), which are also subdivided into 25 ha harvesting units. The following activities were completed to date: i) Making 100% Forest Inventory of all species, including mahogany species; ii) preparation of the logistic map of the area, including all tree species properly georeferenced; iii) preparation of the logistic map of the area, including all tree species properly georeferenced; iv) preparation of the logistic map of the area, specifically for mahogany species; based on these maps, prepare the planning of the location of Permanent Parcels (PP) and specific parcels for monitoring the induction of the Natural Regeneration of mahogany; v) establishment and measurement of PP and parcels of the natural regeneration of mahogany; vi) creation of database of all data collected in the field during this first phase; and vii) data processing, analysis and discussion to draw conclusions and recommendations from the collected data.

Phase II: Activities of the project have not been carried out according to the original schedule because of the delay in the approval process of the Annual Operation Plan (POA) and the authorization for harvesting (AUTEF) by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA). The results of the Phase I, so far, will greatly contribute to revising the guidelines for mahogany harvesting in natural forests. This project was originally expected to be completed in February 2011, but the completion date has been postponed due to unforeseen difficulties faced during the project implementation.

"Management of *Hypsipyla grandella* in *Swietenia macrophylla* King Plantations in Pará and São Paulo States, Brazil" (UFRA/FUNPEA)

The main objective is to select an integrated management system for controlling the shoot borer *Hypsipyla grandella* in mahogany reforestation areas in Pará and in São Paulo. The main results were as follows: i) the most efficient mahogany drill insect control systems in the state of Pará are "mahogany plantation intercropped with *Toona ciliata* plus application of Colacid solution", "mahogany plantation intercropped with *T. ciliata* plus fertilization with boron and calcium and application of Colacid solution", with 94.02% and 100% efficiency in control, respectively; ii) in the State of Sao Paulo, mahogany plantation intercropped with *T. ciliata* system combined with Colacid solution application was the most effective with 92.36% control; iii) preparation and selection of Colacid spray solution which has already been used in the experiments in Aurora do Pará and São José do Rio Preto, due to its practical application, as well as it presents an effectiveness similar to standard Colacid solution (drops application); iv) building lifting platforms and pantograph type lifting platform that allows the application of silvicultural treatments (pruning and application of treatments) in mahogany trees with 3 m to 8 m in height.

These results were published in the XXIII Brazilian Congress of Entomology held in Natal (RN) from 26 to 30 September 2010, under the following titles: i) Management of mahogany drill insect *Hypsipyla grandella* (Zeller, 1848) (Lepidoptera: Pyralidae) in Aurora do Para; and ii) Management of mahogany drill insect *Hypsipyla grandella* (Zeller, 1848) in Sao Jose do Rio Preto, São Paulo

Due to high treatments effectiveness, mahogany trees showed an excellent growth; especially in Sao Jose do Rio Preto, where the average height reached 8.89 m for mahogany trees of 38 months of age.



Pantograph type platform used for mahogany drill management experiment in Sao Jose do Rio Preto (SP), Brazil. Photo by: Orlando Ohashi

The activities that are pending are experiments on "Effects of applying different levels of calcium and boron on the resistance of mahogany cultivated in hydroponics means to the caterpillar of *Hypsipyla grandella* compared" under the responsibility of Dr. Mario Lopez, which is planned to be completed by the end of February 2011.

Bolivia

"Population density and forest harvesting impact on natural regeneration and diameter growth of mahogany (*Swietenia macrophylla*)" (MEBCC)

The Ministry of Environment and Water of Bolivia, through IBIF, is implementing the project "Population density and forest harvesting impact on natural regeneration and diameter growth of mahogany (*Swietenia macrophylla* King)." The main objective is to assess the current status of mahogany populations to determine harvest levels that maintain the existence of the species. The specific objectives are: 1) Determine the current and potential distribution and density and current population structure of mahogany in the main eco-regions of the country; 2) study the natural regeneration, growth and survival of mahogany trees in a sub-humid forests under different intensities of use and application of silvicultural treatments; and, 3) propose a conservation strategy and monitoring of mahogany.

The study has completed the fieldwork phase, assessing the main areas of mahogany distribution along the lowlands of Bolivia. A total of 25 sites were visited, making a total of 1,186 parcels (20 x 100 m) in the departments of Pando, Beni, Santa Cruz and La Paz, for gathering information on distribution, density, regeneration and population structure of mahogany. Continued monitoring of the experimental permanent parcels of IBIF has been carried out to know the population dynamics and the effects of logging.

So far, comprehensive database of studies on mahogany in Bolivia have been compiled, including data on density and distribution of mahogany, from Annual Forest Operation Plans of different forest areas (period 2001 - 2008). The analysis of current mahogany's situation in the country will be obtained from secondary information and field data. This comprehensive analysis of diverse knowledge on ecology and management of the species, together with an active participation of different forest users, will allow developing a strategy for adequate monitoring and management of this species in Bolivia. This project is expected to be completed in February 2011.

Peru

"Evaluation of commercial stocks and strategy for the sustainable management of mahogany/cedar in Peru" (UNALM)

Following donor consultations at the 43rd ITTC session, additional funding of \$209,500 was provided from program funds to extend work carried out under PD 251/03 Rev.3 (F) on mahogany to *Cedrela* spp. in Peru. The Project PD 251/03 (cedar component) ended its activities in March 2009. The final report included the methodology and results obtained by the Project. The main findings are: i) the dendrological identification of tree samples of different species and the analysis of soil and organic material to provide description of cedar habitat and its accompanying species; ii) the analysis of form and volume determined the form factor for cedar at the national level, which is 0.6822, and the volume tables for this tree species; iii) A map of the probability of occurrence of *Cedrela* spp was generated and a map of current density of cedar populations in the Peruvian Amazon. The population of cedar has been estimated between 1 million and

1,154,000

individuals in the country; 62.12% of the population is below the minimum cutting diameter (DMC) and 37.88% are commercial trees; (iv) the most important factor in the destruction of cedar habitats is the land use change to other uses such as agriculture and/or livestock; v) the populations of cedar have been depleted due to road building, combined with changes to the hydrographic network and the technological changes introduced in forestry operations. However there are forest areas with *Cedrela* spp in recovery, especially in places where habitats were once destroyed. The results of the project will help the Peruvian government making non-detriment findings for cedar. The final report of this Project was presented to the ITTC at its 45th session in November 2009.

“Design, validation and adjustment of the methodology for monitoring and periodic evaluation of the plots for characterization of mahogany and cedar populations in Peru” (UNALM)

This activity began in July 2009 under the coordination of the Universidad Nacional Agraria La Molina (UNALM), and all activities ended in May 2010. The main objective was the design, validation and adjustment of the methodology for monitoring and periodic evaluation of the plots for characterization of mahogany and cedar populations in Peru; specific objectives were: i) to understand the dynamics of mahogany and cedar population recovery and the influence of related species; and, ii) to identify silvicultural parameters of cedar and mahogany to allow detailed monitoring to support making non-detrimental findings of these timber species. The key outputs are: i) Report on the analysis of various field reports and information processing to establish a baseline with updated information, proposing a methodology for monitoring cedar and mahogany population; ii) Field manual for the continuous evaluation of mahogany and cedar populations; Draft manual for supporting field verifications; iii) proposal on participatory silvicultural practices and adjusted for cedar populations recovery; and iv) report on the silvicultural criteria used in monitoring cedar and mahogany populations' recovery, adjusting the size of populations. Major changes based on the results obtained by the project are: i) the export quota for the year 2010-2011 has been proposed; the proposal to determine the quota for 2011-2012 was based on silvicultural practices; ii) the draft bill of new Forestry and Wildlife Law include silvicultural plans for some timber species in danger based on the results of the project; iii) the Ministry of Environment (MINAM) has accepted the proposal on silvicultural practices; iv) MINAM will establish a new method of setting future quotas according to forest management units, considering the possibility of concession areas; v) MINAM will establish the necessary recommendations, considering the sustainability and precautionary principle, as previously accepted by INRENA and the General Directorate of Forestry and Wildlife of MINAG; and, vi) the proposed regeneration of timber species needs yet a few steps to be fully adopted by forest users. The database on cedar and mahogany populations continues to be updated and maintained by professors of the Faculty of Forest Sciences of UNALM.

Other ITTO-CITES Program Studies

“Market Study of *Cedrela odorata* in Bolivia, Brazil and Peru”

The governments of Bolivia, Brazil and Peru deal with cedar and mahogany timber species listed in CITES Appendices differently that affect cedar market. Peru included cedar to CITES Appendix III in 2001 and from 2004 the government established export quotas for mahogany, with the granting of export permits for both species with two ocular inspections (by exporting company and port of shipment). Bolivia and Brazil requested to include cedar in CITES Appendix III in 2009 and 2010, respectively; the mahogany export in Brazil is prohibited and in Bolivia yet there is no defined export quotas based on population studies of mahogany; and the export permit is not as strict as in Peru.

On the other hand, the implementation of CITES regulations in these countries is neutralized by weak institutional capacity in the forest sector and the low priority in the decision-making process to promote the sector. Brazil, Bolivia and Peru are three neighboring countries with the largest population of cedar and mahogany and with high levels of production and export of highly valued timber products in the international market; therefore, it is recommended to design and implement a regional strategy ITTO-CITES oriented primarily to: i) capacity building of Management and Customs Authorities of exporting and importing countries in the identification of wood products from cedar and mahogany; ii) harmonize criteria and implement a timber traceability system in the process of granting export permits; iii) monitoring monthly flow of export / import, and FOB / CIF prices of wood products of species listed in CITES appendix and its inclusion into the ITTO database; iv) evaluate and improve systems of information, control and forestry statistics adjusted into national legislation and international commitments (CITES, ITTO, FLEGT, Lacey Act); v) implement pilot projects of timber traceability for timber species listed in CITES appendix; and vi) promote technological development for the replacement of cedar and mahogany in domestic and international market. This project is expected to be completed by the end of December 2010.

“Support Compliance of CITES Convention in Guatemala and Peru: In-country Technical Assistance for the Development of the National Timber Yield Tables for Mahogany (*Swietenia macrophylla*) Standing Volume & Export Grade Sawnwood”

Mahogany (*Swietenia macrophylla*) is one of the most valuable species of tropical timber in international trade. Harvesting and illegal logging of this species have led to its inclusion in CITES Appendix II. The governments of Guatemala and Peru have expressed their wishes for developing national volume tables for this species. In this context, the World Bank and the International Tropical Timber Organization, decided to support the governments of Guatemala and Peru in the preparation of their National Timber Yield Tables from Standing Roundwood to Sawnwood of Mahogany. This will contribute to the effective implementation of CITES regulations.

The major objective is to provide technical assistance to the National Council of Protected Areas - CONAP and the National Forest Institute INAB (Guatemala), to General Directorate of Forestry and Wildlife Fauna - DGFFS and Office to Monitor Forest Concessions - OSINFOR (Peru) in the participatory preparation of their national timber yield tables for mahogany, based on conversion factors statistically reliable from standing volume to export quality sawnwood. The operational strategy is participatory and maximalist. Participatory because it works with all stakeholders and maximalist because they used trees that would be used by forest concessionaires within the current POA, to obtain information, so that there is no need to log other trees exclusively to develop the table. The tables will be used by the concessionaires to estimate their production volumes and negotiate ex ante the volumes obtained after timber processing. State institutions will have a tool to improve their controls and develop a better implementation of CITES Convention. The government will develop a process of socialization and training on the use of table and it will be submitted for the approval of the Peruvian mahogany national group. This table will promote sustainability of mahogany species because the use of conversion table benefits all actors who legally exploit the resource. The national timber yield table for Guatemala has been completed, according to the National Hardwood Lumber Association (NHILA). In the case of Peru, the process of timber yield table development is in its finalization stage. This project is expected to be completed by the end of December 2010.

RECENT EVENTS

2nd Africa Regional Workshop on Afrormosia in Cameroon

The 2nd African regional workshop was held in Limbé, Cameroon, between 29 September and 2 October 2010 on sustainable trade of *Pericopsis elata's* timber and *Prunus africana's* bark, hosted by the Government of Cameroon through its Ministry of Forestry and Wildlife. The objective was to make a mid-term evaluation of Project Activities under implementation in the range countries to share experiences among CITES authorities as a useful tool for better achieving non-detriment findings requirements, and to develop a new participatory Action Plan for 2011–2013.

2nd Asia Regional Workshop on Ramin in Malaysia

The government of Malaysia successfully hosted a four-day "Regional Workshop on Sharing of Findings from the Activities Implemented in Indonesia and Malaysia under the ITTO-CITES Project on Ensuring International Trade in CITES-listed species is Consistent with their Sustainable Management and Conservation" in Kuantan, Pahang, Malaysia from 1-4 December 2010 where a total of 61 participants attended. The objective of the workshop is to share results and experiences from the project activities implemented under the ITTO-CITES Project in Indonesia and Malaysia, including identifying and adapting relevant findings from the Indonesian Activities by Malaysia and vice versa.

National Workshop on Enforcement Compliance for Trade in Ramin, Malaysia

The three-day "National Workshop on Enforcement Compliance for Trade in Ramin (*Gonystylus* species)" was successfully held in Kuala Lumpur, Malaysia from 8-10 December 2010 where a total of 42 participants attended. The major objective is to enhance the knowledge of enforcement agencies staff in Malaysia directly or indirectly involved in ramin trade.



The Regional Workshop Opening Ceremony, 1-4 December 2010, Kuantan, Pahang, Malaysia.
Photo by: Yusni Idris

UP COMING EVENTS

Workshop in DRC

DRC will host the 2nd CITES training workshop from 22 – 24 December 2010 in Kinshasa, Gombé. The objective of the workshop is to train participants on the use of CITESWOOD ID tool.

LA Regional Workshop in Brazil

The Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) will host the 3rd Latin America regional workshop of the ITTO-CITES Program on ensuring international trade in CITES-listed timber species is consistent with their Sustainable Management and Conservation, on February 15-17, 2011, in Brasília, Brazil. The objective of the workshop is to share results and experiences from the Activities implemented under the ITTO-CITES Program in the range States in Latin America, Bolivia, Brazil and Peru.

CITES Plants Committee Meeting

The Nineteenth Meeting of the CITES Plants Committee will take place from 18-21 April 2011, in Geneva, Switzerland. Amongst relevant topics on timber issues, progress report of the Working Group on the Bigleaf Mahogany and Other Neotropical Timber Species [Decisions 15.91, 15.92 and 14.146 (Rev. CoP15)] and progress report on the joint CITES-ITTO Program will be discussed.

PROGRAM MONITORING

In order to increase the transparency of the ITTO-CITES Program, external monitoring has been regularly conducted, including independent European Commission monitoring carried out in mid-2008 and 2009, and an ITTO-funded External Monitoring Review/ Evaluation of the Program in late 2009-early 2010. In addition, regular monitoring of field implementation is conducted in Africa, Asia and Latin America by respective regional coordinators.



Regional Workshop Field Trip, Kuantan, Pahang, Malaysia.
Photo by: Yusni Idris

ARTICLE

Big-leaf Mahogany Growth & Yield Model for Simulating Population Growth, Production Outcomes, and Recovery Rates across Multiple Cutting Cycles

By C. Free, R.M. Landis & J. Grogan

In recent decades big-leaf mahogany has been intensively harvested across its natural range in tropical South America. Future timber production from natural forests will depend on protection and stewardship of surviving commercial populations through sustainable management practices. The Big-leaf Mahogany Growth & Yield Model, under development by Free, Landis & Grogan, will project population recovery and timber production from simulated harvests of mahogany in the Brazilian Amazon. The model will offer forest managers a computer-based tool for assessing the impact of current management practices on both pre-installed example mahogany populations and on user-entered populations. The growth & yield model uses the NetLogo 4.1.1 platform and can be installed on computers using Windows or Mac OS X operating systems. The model will also be accessible from a web-based platform.

The growth & yield model functions (algorithms) are derived from demographic data collected annually during 1995–2009 for nearly 600 mahogany trees and many thousands of seedlings, saplings and poles at multiple field sites in southeast Pará and Acre. Model simulations can be run with or without harvesting. Under logging scenarios, the model harvests (kills) trees at specified intervals; between harvests, surviving individuals grow, reproduce, and die at rates observed in field studies. Harvest simulations are based on current legal management practices in Brazil (60 cm minimum diameter cutting limit, 20% commercial retention rate, minimum 5 commercial trees / 100 ha retention density, 30-year cutting cycle). Forest managers can input mahogany population data from field inventories in order to project recovery and production outcomes following multiple harvests at legal management sites. Each of the four harvest parameters can be changed to view population and timber production outcomes under alternative management scenarios.

The growth & yield model interface allows harvest simulations to be set up and run by clicking on a series of computer screen 'buttons'. For a given starting population and harvest scenario, each 'run' will yield a slightly different outcome (number of trees and commercial volume harvested, surviving density, etc.). This occurs because the model functions for survival, growth, and reproduction are assigned randomly at the beginning of each simulation, leading to different long-term outcomes. For this reason average outcomes from multiple simulations will best represent long-term population recovery and production rates for a given population and harvest scenario.

The model will be able to generate automated outputs from single and multiple simulations detailing harvest results such as abundance and densities of commercial and non-commercial trees, and harvest volumes from successive logging events at specified time intervals (cutting cycle).



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