

ITTO

International Tropical Timber Organization

**Mission for the Ex-Post Evaluation of Five
ITTO Projects In China**

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COMPLETE REPORT

PROJECTS

- 1. PD 20/95 Rev.2 (I) - Chemical Modification of bamboo culms and their resistance to weathering**
- 2. PD 21/95 Rev.2 (I) - Comprehensive studies of the structure and properties of rattans for effective utilization**
- 3. PD 24/95 Rev.1 (I) - The identification, properties and uses of the tropical timber imported to china from Latin America**
- 4. PD 03/96 Rev. 2 (I) - Development and extension of rubberwood processing and utilization technology**
- 5. PD 25/96 Rev. 2 (M) - China's consumption of forest products and its demands for them from the international market by the year 2010**

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Mission for the Ex-Post Evaluation of Five

ITTO Projects In China

(i) FOREWORD

This is the Complete Report of the ITTO Mission to the Peoples Republic of China for the ex-post evaluation of the following five projects: 1. PD 20/95 Rev.2 (I) Chemical Modification of Bamboo Culms and Their Resistance to Weathering; 2. PD 21/95 Rev.2 (I) Comprehensive Studies of the Structure and Properties of Rattans for Effective Utilization; 3. PD 24/95 Rev.1 (I) The Identification, Properties and Uses of the Tropical Timber Imported to China from Latin America; 4. PD 3/96 Rev.2 (I) Development and Extension of Rubberwood Processing and Utilization Technology; 5. PD 25/96 Rev.2 (M) China's Consumption of Forest Products and its Demands for them from the International Market by the Year 2010. The implementation of this post evaluation followed a decision by the ITTO Committees on Forest Industry and Economic Information and Market Intelligence taken at the meeting of the Twenty-seventh session held in Yokohama, Japan, November 2000. Professor Floriano Pastore Jr. of the University of Brasilia, Brazil, and Professor Ahn Wong-Yung of the Seoul University, Korea, composed this Mission. Its working period was from February to June/2001, with a visit to China from 26/February to 10/March. The Executive Summary of the Report was presented during the Twenty-eighth Session of those Committees at the May ITTO Council Session held in Yaounde, Cameroon.

(ii) ACKNOWLEDGEMENTS

We would like to acknowledge all those who contributed to make this evaluation mission as smooth and effective as possible, specially to Dr. M. Sobral Filho and Dr. Ok Ma, from ITTO, for their indeed efficient support; to all project teams, specially their leaders, for the integral assistance in providing all informations; to Professor Ye Kelin, for his total support in the organization of the mission in China and to Mr. Li Yudong and Mr. Lin Ze Chuan, for their friendly assistance during the journey to Hainan Province; and for the associated researchers Yin Yafang and Man Zhen Yong for their help and friendship during work and pleasant visits to monuments of China.

(iii) GENERAL INTRODUCTION

a) Evaluation Purpose

This ex-post evaluation mission of the five projects in the Peoples Republic of China was decided at the meeting of the Twenty-seventh session of the ITTO Committees on Forest Industry and Economic Information and Market Intelligence held in Yokohama, November 2000. The main purpose of the evaluation is to bring information to ITTO to feed its knowledge base about the general implementation of the projects. There is a considerable need to further implement the ex-post evaluation tool in order to improve the project cycle. As five of ITTO projects had finished recently in China, it was thought that they could be appraised in the same period with a better use of financial resources and time.

b) The Mission Terms of reference

The following twelve items were established as the **TOR** - terms of reference for Ex-Post Evaluation:

- i.** To assess each project's design and contribution to the achievement of their general objectives.
- ii.** To assess the achievement of each project's outputs and specific objectives.
- iii.** To evaluate the impact and relevance of each project.
- iv.** To determine the effectiveness of technology transfer to the forest sector for projects PD 20/95 Rev.2 (I), PD 21/95 Rev.2 (I), PD 24/95 Rev.1 (I) and PD 3/96 Rev.1 (I) and the effectiveness of information dissemination for PD 25/96 Rev.2 (M)
- v.** To assess the overall post-project situation for all projects
- vi.** To define and assess unexpected effects and impacts, either harmful or beneficial, and present the reasons for their occurrences.
- vii.** To analyse and assess implementation efficiency, including the technical, financial and managerial aspects.
- viii.** To recommend follow-up actions in order to enhance utilization of the technologies and other results developed by the projects.
- ix.** Taking into account the results of the evaluation, make an overall assessment of each project's relative success or failure to summarise the key lessons learnt; and identify any issues or problems which should be taken into account in designing and implementing similar projects in future.
- x.** To prepare the evaluation report in accordance with the references for the Project Evaluation Report, as contained in the ITTO Manual for Project Monitoring, Review and Evaluation.
- xi.** To assess the projects' contribution to the relevant ITTA objectives (1987, 1994) and relevant ITTO Action Plans.

- xii. To prepare one or more articles for possible publication in the ITTO Tropical Forest Update (TFU), in consultation with the editor, containing an overview of the projects and summarising the lessons learned from the evaluation work. Appropriate photographs should be provided, if possible.

An special recommendation of the terms of reference was that the evaluation work should be conducted in such way as to answer the questions identified in the ex-post evaluation checklist provided in the ITTO Manual for Project Monitoring, Review and Evaluation (page 29).



The project leaders and directors of Chinese Forestry Academy, State Forestry Administration and CRIWI with evaluators, 2nd and 6th in the first row and Dr. Ok Ma from ITTO, in the centre.

c) Evaluation procedure and activities

The mission's period of work started in the beginning of February, finishing by mid-June/2001. It included a journey of two weeks (from 26/Feb. to 11/March) to China – Beijing and Hainan Province – with a previous stop of two days in Yokohama for a planning meeting. The Executive Summary was presented by one of the evaluators at the ITTO 2001 May Session, hold in Yaounde, Republic of Cameroon, Africa

The evaluation work in China included the following main activities, in a chronological sequence:

(Annex 1 brings the complete list of institutions and people contacted during the mission)

–In Beijing–

- First general meeting in **CRIWI**- Research Institute of Wood Industry (Chinese Academy of Forestry–**CAF**) with summary presentation of each project results;
- Meeting with the Institute of Botany Chinese Academy of Science–**CAS**) team, for ample presentations and discussions about the projects on Bamboo (PD 20/95 Rev.2 (I)) and on Rattans (PD 21/95 Rev.2 (I)); visit to the laboratories and to the Herbarium, the biggest in Asia.
- Meeting with team of the Institute of Scientific and Technological Information (**ISTIF**) of the Chinese Academy of Forestry to visit Consultation Center office, implemented by the project on market information (PD 25/96 Rev.2 (M))-and for a long talk about project implementation;
- Meeting at CRIWI for presentation of rubberwood project (PD 3/96 Rev.2 (I)) and visit to the laboratories linked to the project;
- Visit to the laboratories and facilities of CRIWI used for the Latin America tropical timber project (PD 24/95 Rev.1 (I)), demonstration of the database, and talk on the work implementation;
- Meeting at the Department of International Cooperation of the State Forestry Administration to discuss and understand the mechanism of project selection and monitoring within SFA
(three projects were implemented by institutes linked to SFA);
- Visit to headquarters of **INBAR** – International Network for Bamboo and Rattan for a very productive talk about their work and to collect inputs for project appraisal;
- Visit to **CNFPIC** – China National Forest Products Industry Corporation; to assess the extend of knowledge diffusion to society from projects on market information and LA tropical timber;

–In Hainan Province–

- Visit to Xilian Timber Factory, a state company, to see the technology transfer to the productive sector from the rubberwood project;
- Meeting at the Hainan Province Agriculture Department to talk about the expected demand and supply of rubberwood logs;

–Back to Beijing–

- A general meeting at CRIWI for a speech-presentation of the principal findings and suggestions by the evaluators for all project teams, officials and representatives of the institutions visited during the mission.

d) Duration and budget of projects

The following table shows the general data for the five projects, object of this Ex-post evaluation mission in China.

Table: general figures for the projects

Project reference number	Project short name	Duration (months)		Budget contribution (Values in US\$)			
		Planned	Actual	China	ITTO	Country	Total
PD 20/95 Rev.2 (I)	Bamboo	48	43	79,000	83,345	Japan	162,345
PD 21/95 Rev.2 (I)	Rattan	48	43	56,000	88,620	Japan	144,620
PD 24/95 Rev.1 (I)	LATTs	24	28	80,000	112,000	Japan	192,000
PD 3/96 Rev.2 (I)	Rubberwood	24	28	193,60	214,798	Japan and Switzerld.	408,398
PD 25/96 Rev.2 (M)	Market Information	24	29	66,000	177,915	Japan	243,915

(vi) THE PROJECTS EVALUATION

1. BAMBOO PROJECT: PD 20/95 REV.2 (I) CHEMICAL MODIFICATION OF BAMBOO CULMS AND THEIR RESISTANCE TO WEATHERING

1.1 PART I: EXECUTIVE SUMMARY

▪ Basic data and information

- Implementing agency: Institute of Botany of the Chinese Academy of Sciences
- Project leader: Dr. Lin Jinxing,
- Starting date: March 1996,
- Duration: planned, 48 months – actual, 43 months
- Budget and funding sources (US\$): total budget: 162,345.00; Government of China: 79,000.00, Government of Japan: 83,345.00

This project studied the chemical modification to improve bamboo dimensional stability and resistance to biodegradation. The research work was focused on five selected bamboo species from Southeast Asia (*Phyllostachys pubescens*, *Bambusa lapidea*, *Sinocalamus latiflorus*, *Sinocalamus oldhemi* and *Pseudosasa amabilis*). Laboratory research work and field weathering tests were complemented by a comprehensive literature survey and study tours to selected overseas research institutes with recognized knowledge and experience on chemical modification of wood and wood materials.

▪ The proposal: specific objectives and planned outputs

Its development objective was to explore an effective means of relieving pressure on the major tropical timber species by improving a range of bamboo-culm properties. The four specific objectives were:

- a) to improve the dimensional stability and the resistance of bamboo culms to degradation by means of chemical modifications;
- b) to determine the feasibility of chemical modifications in large scale production in the industry;
- c) to investigate the weathering effects on chemically modified bamboos
- d) to introduce the knowledge and extend the technique of chemical modification on bamboos to the relevant units in the producing countries.

The intended outputs were:

- 1) to submit a research report on the production of chemically modified bamboos; and
- 2) to edit, publish and mail a treatise of "Chemical modification of bamboo culms and their resistance to weathering" (in English), containing: **a)** a review of chemical modification of woods with implications for bamboo utilization; **b)** reasons of selecting chemical agents for bamboo culms in this project; **c)** selections of bamboo culms and chemical agents; **d)** effects of different chemical treatments on dimensional stability and mechanical properties of different taxa of bamboo culms; **e)** effects of weathering on modified bamboos under accelerated conditions; and **f)** the useful prescription for bamboo treatment and its potential applications in the industry.

▪ The actual outputs

The project produced the following main outputs:

- (i) A technical report entitled "Chemical Modifications of Bamboo Culms and Their Resistance to Weathering" (in Chinese). This report comprises (i) review of chemical modification of wood and wood/plastic composites, (ii) review of the structural characteristics of bamboo culms and modification methods of bamboo culms, (iii) results of experimental chemical modification of bamboo culms (iv) physical properties of the chemically modified bamboo culms and (v) results of weathering tests of bamboo culms under natural and accelerated conditions.
- (ii) A technical report entitled "Biological Studies on Bamboo Culms" (in Chinese). This report includes lignification of fiber and vessel walls in bamboo culms.
- (iii) A report of a study tour to compile information and data on chemical modification of wood. In October 1998, the project staff visited the Department of Bio-material Science of the University of Tokyo, the Wood Research Institute of the Kyoto University and the Forestry and Forest Products Research Institute in Tsukuba.

- (iv) Three research papers were published in scientific journals: (i) Bamboo Structure and its Modification. Chinese Botanical Bulletin, 1997, 14(4):30-37 (ii) Analysis of Autofluorescence in the Cell Walls of Bamboo Culms. Acta Botanica Sinica, 1999, 41(7):711-714, and (iii) Comparative Anatomical Studies on Four Bamboo Species from Guangxi province. Journal of Bamboo Research, 1998, 17(1):18-23.

- **Efficiency and operational aspects**

The project implementation as far as the resources, human and financial funds, are concerned can be considered under normal and sound execution. The space and the facilities are very adequate and friendly for scientific research.

- **Effectiveness**

The proposal was too ambitious if one takes into account the expertise of the executing agency, the Institute of Botany, very well prepared for basic botanic studies, which proposed an important technological work, the bamboo chemical treatment for improvement of its properties. The Institute enlarged the specific objectives to a great extent including activities and knowledge beyond that existing in its team. For that had to rely on other institutions, becoming somehow vulnerable to fully accomplish the objectives as proposed. A great amount of important work was produced, but clearly some of the objectives were not attained, specially those related to the technology transfer to the productive sector, a difficult task even for institutions oriented for this target. Although the objectives were not accomplished, the project outputs are good in quantity and quality, easily proving that the research team worked hard to prepare a body of good results.

- **Impacts and effects**

The executing agency had to rely on the expertise of other institutions for a substantial part of the project, mainly the chemical treatment of bamboo. Three unexpected factors strongly contributed for the project low effectiveness: 1) a Ph.D. student, who would perform the bamboo treatment work, left the country after completing his studies; 2) a professor linked to the Research Institute of Wood Industry, contracted for the chemistry work, got sick and had to discontinue his contract; 3) a third option was an eminent professor of Nanning University, who effectively implemented the treatment studies, condensed in the output 1, but his busy agenda did not allow him to give a greater contribution as required by objectives.

- **Conclusions**

It could be observed in this project a problem of project design which did not follow a reasonable relation between the subject, the object and the objective, that should be proposed taking into account, as much as possible, the characteristics of the first two. Although the project PD 24/95 Rev.2 (I) design was not adequate, the results were important. Firstly, it concluded basic and inedited studies for the understanding of bamboo growth. Secondly, it laid down the basis for chemical treatment, with increment of up to 30% of culm weight. This is low when compared with wood results. The bamboo fiber structure is much closed, avoiding the chemicals flowing in the radial direction, but the penetration was sufficient for changing weathering characteristics of bamboo. One cannot say that these are sufficient studies for industrial use but they surely are the bases for new and possibly conclusive development work for bamboo chemical treatment. A question should be answered before defining the treatment: what are the dimensions for the pieces to be treated, because longitudinal penetration is much easier. When the uses are pre-selected (and they are so many) and the degree of technology to be employed is also defined, it decreases the diversity of possible alternatives for treatments and helps to focus the technological development, consequently with greater efficiency of resources and time spent.

The project proposal did not have a Logical Framework Matrix – LFM, what added some difficulty for the evaluation.

Considering the project's impact and relevance to society, the main document was edited in Chinese and was sent to several institutions and will surely be useful to those who wish to make further studies and utilization of bamboo culms. The translation of this document would make it much more prone to play a role in this field of investigation. In addition to this, we can say the project results are bases for new studies but cannot, at the moment, be transferred to the productive sector.

The overall post project situation is surely positive as the implementing team is consolidated as a research group; some students got post graduation studies during the development of the work, benefiting directly or indirectly from the existence of the ITTO project. In addition to this, the Institute team carries probably the best knowledge on bamboo anatomy as well as bamboo chemical treatment.

▪ **Recommendations**

A follow-up project should be presented by the same agency, changing the approach and the strategy of execution. Taking the knowledge already accumulated in this project as the basis, the new proposal would be directed towards the preparation of the knowledge for diffusion to the productive sector. The expertise of INBAR, Nanging University and CRIWI, could be seek among others, for the selection of uses and type of technology that would be of major interest.

It should be further strengthened the ITTO support for projects on faster growing species for the production of NTFP, like bamboo and rattan that meet the demand

of society for many products like furniture, paneling, flooring, etc, decreasing the pressure on natural tropical forest.

1.2 PART II: MAIN TEXT

BACKGROUND INFORMATION

▪ Project Rationale

As a general hypothesis, it is believed that chemical treatment of bamboo culms is an adequate way of improving general properties of these forest products. Bamboo is probably one of the most used non-timber forest products and could be considered an important fast growth species that can significantly relieve the demand for timber from the tropical forest. It has more than 1,500 documented uses and a very broad spectrum of manufacturing technology, ranging from the complete handcraft to the automatic scale production. It has recently received much more research attention with important technology development such as the bamboo culm flattening for use as flooring. Even though, there was no established treatment for improvement of its dimensional stability and weathering properties. In order to fulfill this lack, the project was proposed.

▪ Objectives

The proposed development objective was to explore an effective means of relieving pressure on the major tropical timber species by improving a range of bamboo-culm properties, and the specific objectives were:

- to improve the dimensional stability and the resistance of bamboo culms to degradation by means of chemical modifications;
- to determine the feasibility of chemical modifications in large scale production in the industry;
- to investigate the weathering effects on chemically modified bamboos;
- to introduce the knowledge and extend the technique of chemical modification on bamboos to the relevant units in the producing countries.

▪ Intended outputs

The expected outputs were:

- to submit a research report on the production of chemically modified bamboos;

- to edit, publish and mail an treatise of “Chemical modification of bamboo culms and their resistance to weathering” (in English), including the following:
 - a review of chemical modification of woods with implications for bamboo utilization;
 - Reasons of selecting chemical agents for bamboo culms;
 - Selections of bamboo culms and chemical agents;
 - Effects of different chemical treatments on dimensional stability and mechanical properties of different taxa of bamboo culms, at least in five species of commercially important bamboos: *Bambusa sinospinosa*, *Phylostachys pubescens*, *Phylostachys bambusoides*, *Pseudoasa amabilis*, *Sinocalamus latiflorus*.
 - Effects of weathering on modified bamboos under accelerated conditions;
 - The useful prescription for bamboo treatment and its potential applications in the industry.

▪ **Planned activities**

The Project Proposal followed the old stile of ITTO project formulation and it did not include a Logical Framework Matrix. The list of activities planned to be implemented were:

- to collect experimental materials from south China;
- visit of two scientists to the Department of Forest Products Sciences/The University of Tokyo, Wood Research Institute/Kyoto University and Forestry and Products Research Institute/Tsukuba, Japan to collect scientific data on chemical modification of woods;
- laboratory works, including:
 - sectioning and drying of rotary-peeled culm veneer;
 - selecting and preparation of chemical agents;
 - pretreatment of samples;
 - reaction of culm veneer with boiling chemicals in the cambers;
 - post treatment of samples;
 - weathering of samples under both natural and accelerated conditions;
 - measurement of color change;
 - observation of structural changes under light and scanning electron microscopy

THE PROJECT IMPLEMENTATION

▪ **What was done: actual outputs**

Based on field investigation and preliminary tests, the project team Project selected the five commercially important bamboos species: *Phyllostachys pubescens*, *Bambusa lapidea*, *Sinocalamus latiflorus*, *Sinocalamus oldhemi* and *Pseudosasa amabilis*), and the chemicals for the treatments: phenol-formaldehyde resin, acrylic monomer acylamine derivatives, allyl phthalate, blocked isocyanate and acrylictin. Physical tests and electron microscopy observations assessed chemical treatment immediate efficiency. Weathering tests were carried out under accelerated conditions and included two wood species for comparison. An inedited study of the lignification process of bamboo during its growth was conducted in parallel. The project rendered also several contacts, study tours and a botanic collection of bamboo samples.

The actual outputs were:

- 1) A technical report on the chemical modification of bamboo culms and their resistance to weathering,
- 2) Biological Studies on Bamboo Culms Development, a technical report.
- 3) Study Tour Report to Japan by Dr. He Xinqiang (16 days in October 1998)
- 4) Reports on the attendance of two conferences:
 - International Workshop of Bamboo towards 21st Century, Hangzhou, China, Sep/97;
 - Workshop of Chinese Bamboo and Rattan Experts, held by INBAR, Beijing, Apr./97;
- 5) Four academic papers:
 - Bamboo structure and its modification. Chinese Botanical Bulletin, 1997, 14(4): 30-37.
 - Microspectrofluorometric analysis of auto fluorescence in the cell walls of bamboo culms: Acta Botanica Sinica, 1999, 41(7): 711-714
 - Comparative anatomical studies on four bamboo species from Guangxi Province: Journal of Bamboo Research, 1998, 17(1): 18-23.
 - Modification of bamboo. Tropical Forest Update (ITTO Newsletter), 1997, 7(4): 30-47.

SCOPE OF THE EVALUATION

▪ Efficiency and operational aspects

Financial funds were disbursed and spent as planned as can be seen from an internal auditing of the Division of Planning and Administration of the Institute of Botany. The employment of available human resources was also under normal condition, with the positive aspect that post-graduated students were engaged in the project execution as a normal procedure of the Institute. The environment, the space and the facilities are very adequate and friendly for scientific research. The equipment bought with ITTO funds is in good conditions and in continued use.

- **Effectiveness**

As a general word about the project it could be said that it was ambitious as proposal if one takes into account the expertise of the executing agency, the Institute of Botany, very well prepared for basic botanic studies, which proposed an important technological work, the bamboo chemical treatment for improvement of its properties. In order to increase its probability of getting its project approved, the Institute enlarged the specific objectives to a great extent including activities and knowledge beyond that existing in its team. For that had to rely on other institutions, becoming somehow vulnerable to fully accomplish the objectives as proposed. A great amount of important work was produced, but clearly some of the objectives were not attained, specially those related to the technology transfer to the productive sector, a difficult task even for institutions oriented for this target. As can be seen above (The proposal), specific objectives 'b' and 'd', and output number 2 were not fully achieved, by the reasons already cleared, but the project outputs are in such quantity and quality, easily proving that the research team worked hard to prepare a body of good results.

- **Impacts and effects**

The executing agency had to rely on the expertise of other institutions for a substantial part of the project, i.e. the chemical treatment of bamboo. Three unexpected factors strongly contributed for the project effectiveness: 1) a Ph.D. student, member of the team, very acquainted with chemistry, who would perform the bamboo treatment work, left the country after completing his studies; 2) a professor linked to the Research Institute of Wood Industry, contracted for the chemistry work, got sick and had to discontinue his contract; 3) a third option was to approach an eminent professor of Nanging University, who effectively implemented the treatment studies, condensed in the output 1, but his busy agenda did not allow him to give a greater contribution as required by objectives.

1.3 PART III: CONCLUSIONS AND RECOMMENDATIONS

- **Conclusions**

Conclusions are presented as follows, highlighting (in bold) the Terms of Reference.

It is safe to say that this project presented a problem of **project design** which did not follow the relation between the subject, the object and the **objective**, that should be proposed taking into account, as much as possible, the characteristics of the first two. If we can restrict the project implementation difficulties to a question of project design, we are in a better position to appraise **the outputs**. At the same

time, a proposal for avoiding or decreasing such problems in the future is included in Recommendations.

Although the project PD 24/95 Rev.2 (I) design was not adequate, the results were important. Firstly, it concluded basic and inedited studies for the understanding of bamboo growth. Secondly, it laid down the basis for chemical treatment, with increment of up to 30% of culm weight. This is low if compared with wood results. The bamboo fiber structure is much closed, avoiding the chemicals flowing in the radial direction, but the penetration was sufficient for changing weathering characteristics of bamboo. One cannot say that these are sufficient studies for industrial use but they surely are the bases for new and possibly conclusive development work for bamboo chemical treatment. A question should be answered before defining the treatment: what are the dimensions for the pieces to be treated, because longitudinal penetration is much easier. When the uses are pre-selected (and they are so many) and the degree of technology to be employed is also defined, it decreases the diversity of possible alternatives for treatments and helps to focus the technological development, consequently with greater **efficiency of resources and time spent**.

The project proposal did not have a Logical Framework Matrix – LFM, what added some difficulty for the evaluation. We consider LFM an important feature of ITTO projects in general. The strict demand of its inclusion in the proposal is a powerful tool to induce developing planning capacity. When it comes associated with a well-designed project, the probability of project success is higher, and the project monitoring and evaluation are easier. On this point, the evaluation mission has also some contribution included in the Recommendations.

Considering the project's **impact and relevance** to society, the main document was edited in Chinese and was sent to several institutions and will surely be useful to those who wish to make further studies and utilization of bamboo culms. The translation of this document would make it much more prone to play a role in this field of investigation. In addition to this, we can say the project results are bases for new studies but cannot, at the moment, be **transferred to the productive sector**. Before that, the following aspects must be worked out: basic definitions (uses and technological degree), chemical process definition, pilot scale tests and specific studies on the economic feasibility.

The **overall post project** situation is surely positive as the implementing team is consolidated as a research group, some students got post graduation studies during the development of the work, benefiting directly or indirectly from the existence of ITTO project, what is by sure positive. Besides that, the group carries probably the best knowledge on bamboo anatomy as well as chemical treatment.



The Institute of Botany, responsible for Bamboo and Rattan projects, produced important outputs, examples are the botanic documentation of bamboo growth and the botanic key for rattan identification

▪ Recommendations

We are convinced that a follow-up project should be presented by the same agency, changing the approach and the strategy of execution. Taking the knowledge already accumulated in this project as the basis, the new proposal would be directed towards the preparation of the knowledge for diffusion to the productive sector. The expertise of INBAR, Nanging University and CRIWI, could be seek among others, for the selection of uses and type of technology that would be of major interest, with a great chance of success, being cost effective.

As far as ITTO is concerned, we understand that it should be further strengthened the support for projects on faster growing species for the production of NTFP, like bamboo and rattan that meet the demand of society for many products like furniture, paneling, flooring, etc, decreasing the pressure on natural tropical forest.

2 RATTAN PROJECT: PD 21/95 REV.2 (I) COMPREHENSIVE STUDIES OF THE STRUCTURE AND PROPERTIES OF RATTANS FOR EFFECTIVE UTILIZATION

2.1 PART I: EXECUTIVE SUMMARY

▪ **Basic data and information**

- Implementing Agency: Institute of Botany, Chinese Academy of Sciences
- Project leader: Dr. Lin Jinxing,
- Starting date: March 1996,
- Duration: planned, 48 months - actual, 43 months
- Budget and funding sources (US\$): total Budget: 144,620.00 ;
Government of China: 56,000.00; Government of Japan: 88,620.00

Rattans are around 650 spiny climbing palms belonging to 13 genera, distributed in two tropical regions: West Africa and Asia. They are remarkable Non-Timber Forest Products (NTFP) used for furniture and handicrafts and many consuming countries import millions of tons of these raw materials or processed canes from tropical regions. In this way the production of rattan offers much employment opportunity to the local people and has become one of the important sources of foreign-revenue in the countries like Malaysia, Indonesia, Papua New Guinea, The Philippines and Nigeria.

Although rattans products play important role as non-timber forest products being used for many uses for centuries, there was no comprehensive study to bring together the knowledge already existing and preparing, as well, a system for rattan identification based on anatomic characteristics. The project worked to fulfil this open space.

▪ **The proposal: specific objectives and planned outputs**

The development objectives are related to the possible release of pressure on the tropical forest by spreading the use of rattan and increasing trade between rattan producing and consuming countries. The following are the specific objectives:

- To make systematic studies on structure, properties and utilization of rattans imported from Southeast Asia and West Africa;
- To establish a comprehensive database which can be questioned commercially from many different view points;
- To gather information and knowledge of rattans and make them available to potential importers and users in the world.

The expected outputs were:

- A research report on structure, properties and utilization of 200 species imported from Africa and Asia.
- To establish a database including taxonomy, morphology, distribution, stem structure, properties and utilization, to become an information source to be accessed in many ways, being useful for scientific and practical uses.

- Edit, publish and disseminate a treatise on stem, structure, properties and utilization of rattan (in English)

- **What was done: actual outputs**

During project implementation, the research team carried out an extensive literature survey, study and sample collection tours in Southeast Asia, West Africa, tropical parts of China, and exchange of samples with institutes and botanical gardens. There was intensive cooperative work with several institutes in China and in various countries like Ghana, Malaysia, Germany and England. The research work on the structure and properties of rattans was rich in basic and applied results. The following outputs were produced during the project:

- 1) A key for identification of rattan species based on a database, which contains several anatomic characteristics.
- 2) The organization of a botanic collection with all commercial species of rattan.
- 3) Preparation of a table with botanical names and trade names by country (in Chinese).
- 4) Anatomical descriptions of all collected samples.
- 5) A technical report entitled "Structural Analysis of Rattan Stems" (in Chinese), including the anatomic description of 13 genera.
- 6) Two reports on the study tour to collect rattan specimens.
- 7) A research paper published in *Acta Phytotaxonomica Sinica*.

- **Efficiency and operational aspects**

The execution of PD21/95 Rev.2 (I) was normal and in good practice for the finance funds use as well as human and equipment resources. The engagement of post graduation studies was also observed in this project. Again, the finance auditing was internal to the Institute, as it seems to be the normal practice in China.

- **Effectiveness**

It can be said that the specific objectives and expected outputs were attained. The project was implemented as planned, and, overall, benefiting from a project design correctly proposed and adequate to the executing agency. Still in the aspect of effectiveness, there is something to say on the language used in the edition of the project results. Similarly to the Bamboo project, Chinese was used throughout. Although the Chinese speaking population is big enough to weigh in the balance, there is a formal compromise in the proposal, to publish in English the important resulting documents.

- **Impacts and effects**

In this project there was no uncounted impact or effect. The project design was adequate and took into account only the knowledge already existing in the executing agency, without having to rely too much on external help or work, for the implementation.

▪ **Conclusions**

The Evaluation conclusions are listed as follows:

- Project design was adequate and will contribute to the achievement of general objective;
- Project outputs and specific objectives were almost completely attained. Some minor work has to be done to adequate the material for dissemination. As an example we have the translation to English of the table with botanical and commercial names, and uses of rattans;
- Impact and relevance to society will be felt as the results are disseminated to the beneficiaries. The key for rattan identification based on anatomical features and macroscopic description is inedited and will fulfil a gap in the rattan identification;
- The information dissemination will be possible when the material is adequate for dissemination as it is suggested here;
- The post project situation is completely positive, as the implementing institution has today a concentrated knowledge on rattan, ready to give further and important contribution to society in this field;
- As overall assessment, this project can be considered as a success of implementation.

▪ **Recommendations**

The recommendations are presented under three headings:

➤ As further work:

- to prepare the key for rattan identification for very wide distribution.
- based on the key, to construct a correlation table between botanical name, trade name, properties and uses.

➤ For the project institution and team:

- to approach institutions like INBAR AND CRIWI for focusing the attention on the widespread use of knowledge on rattan.

➤ For ITTO:

- to strengthen the cooperation work with INBAR.
- to support the publication and widespread distribution of:
 - rattan classification key and
 - rattan species, trade names by country, properties and uses

2.2 PART II: MAIN TEXT

BACKGROUND INFORMATION

▪ The project rationale

Rattan is the generic name of spiny climbing palms belonging to 22 genera and about 650 species, naturally occurring in two tropical regions, West Africa and Southeast Asia. There are almost 30 commercial species. For their facility of work, curving characteristics and so on, the rattan stems are very used in a great number of applications, especially furniture. The species are also fast growing what make them special for land stabilization and non-timber forest production. Similarly to bamboo, the wide range of technologies used for their processing increases still further the interest in this group of species. Although well studied, there was no comprehensive study relating the anatomic features with properties and commercial uses. As it normally happens, the trade and use of these species follows the spontaneous pattern, without much relation with the scientific knowledge. So as to bridge this gap, it would be very welcome to create a database and related knowledge to link the anatomic characterization with names, properties and uses of rattan stems.

▪ Objectives

The following were understood in the PD 21/95 Project Proposal as development objectives:

- to make effective utilization of rattan stems in the industry by introducing and transferring the knowledge on their properties and utilization of rattans to the units of producing countries;
- to reduce the pressure on the major tropical timber species by expanding the uses of rattans in the industry; and
- to enhance the international trade between rattan-producing and consuming countries by providing a comprehensive database with a large quantity of useful information.

The Specific Objectives were proposed as:

- to make systematic studies on structure, properties and utilization of rattans imported from Southeast Asia and West Africa;
- to establish a comprehensive which can be questioned commercially from many different view points; and
- to compile information and knowledge of rattans and to disseminate to producing countries and users in the world.

▪ Intended Outputs

The proposed outputs for PD 21/95 Rev.2 (I) were set in the proposal:

- to submit a research report on structure, properties and utilization of over 200 species of important rattan stems imported from Southeast Asia and West Africa;
- to establish a database as information resources including name of species (Latin, trade and vernacular name) haits, external morphology, distribution, stem structure (construction of vascular bundles, frequency of component elements, fiber length and width of wood and bark), stem properties (density, shrinkage, mechanics, drying, durability and processing) and utilization etc. The database should be possible to answer some different questions, for example (i) which species are known to be used for a particular purpose? (ii) what are the known uses for a particular species? (iii) which other species in database have similar groups of characters and could be put to similar uses? (iv) which species in the database have similar characters to those in an unknown rattan samples.
- Edit, publish and disseminate a treatise on stem structure, properties and utilization of rattan imported from Southeast Asia and West Africa (in English).

▪ **Planned activities**

Similarly to the Bamboo Project, this Project did not have as well a Logical Framework Matrix. The list of proposed activities included:

- Collection of rattan specimens and scientific data in South China, Indonesia, Malaysia, the Philippines and Nigeria and Ghana;
- Arrangement of visits to Royal Botanic in England, Rijkshearium at Leiden University in The Netherlands and Institute of Wood Biology, Hamburg University in Germany to collect specimens and information of rattans witch were studied by other scientists previously;
- Laboratory works to be undertaken in the Institute of Botany, Chinese Academy of Sciences, including:
 - Preparation and examination of samples,
 - Description of structural features,
 - Investigation of physical and chemical properties;
- Translation of Latin and trade names of rattan species to English and Chinese
Relevant information written in other languages to English and Chinese;
- Compiling a treatise on stem structure properties and utilization of rattans imported from Southeast Asia and West Africa.

THE PROJECT IMPLEMENTATION

▪ What was done

The project carried out literature surveys and research work on the structure and properties of rattans with a view to improving their utilization in China. Collection of rattan samples was conducted in three main regions: West Africa, Southeast Asia and tropical regions in China. Samples were collected with the cooperation of various institutes such as the Forest Research Institute of Ghana, the Forestry Research Institute Malaysia, the Chinese Academy of Forestry, Xishanbanna Botanical Garden at Yunnan province, the Research Institute of Tropical Forestry at Guangzhou and the Forest Farm at the College of Tropical Crops in Hainan Province. In addition, a number of rattan specimens were collected from the Department of Wood Biology, Hamburg University, Germany.

The project produced the following outputs:

- (i) A technical report entitled "Structural Analysis of Rattan Stems" (in Chinese): The report illustrates micro and ultra-structure details of stems of selected rattan species. This report comprises five parts; (i) introduction of rattan with its distribution worldwide and research in taxonomy and classification of rattan (ii) research techniques, (iii) anatomical description of 13 genera (*Calamus*, *Daemonorops*, *Plectocomia*, *Pototium*, *Plectocomiopsis*, *Ceratolobus*, etc.) (iv) variability of anatomical features: structure of vascular bundles, parenchyma tissues, vessel, cortex, fibers, epidermal cells and cell inclusions and (v) identification keys to the generic level based on anatomical features.
- (ii) A rattan database (in Chinese): It includes 19 characteristics of anatomical structure (number of epidermal cell, length of vascular bundle, number of phloem bundle, number of protoxylem vessel, etc.), 14 characteristics of morphology (geographic distribution, habit, stem diameter, inter-node length, etc.) and 4 characteristics of property (density, shrinkage and natural durability, etc.).
- (iii) Two reports of the study tour to collect rattan specimens and relevant information on stem structure, properties and utilization of rattans: In April 1996 the project team visited the Jodrell laboratory and herbarium, Royal Botanical Garden Kew and the Forestry Institute of Oxford University and Department of Wood biology the Hamburg University, Germany. In September 1998 the project team visited the Forest Research Institute Malaysia and other relevant institutes including rattan processing factories the Jinniang

- (iv) A research paper was published in Acta Phytotaxonomica Sinica.

SCOPE OF THE EVALUATION

▪ Efficiency and operational aspects

The same conditions of project execution observed for Bamboo (PD20/95 Rev.2 (I)), by the same Institute, can be applied here: good and precise use of funds, activities executed as planned, the good use of equipment, adequate human resources, including the formation as post graduated students, the friendly research atmosphere, and so on. Again, the finance auditing was internal to the Institute, as it seems to be the normal practice in China.

▪ Effectiveness

With no doubt, one can say that the specific objectives and expected outputs were attained. The project was implemented as planned, and, overall, benefiting from a project design correctly proposed and adequate to the executing agency. A comparison with the Bamboo project is inevitable, and the good execution of this project by the same Institute just confirm all the statement put forward in the issue of project design, discussed before in the first project and in the Recommendations.

Still in the aspect of effectiveness, there is something to say on the language used in the edition of the project results. Similarly to the Bamboo project, Chinese was used throughout. Although the Chinese speaking population is big enough to weigh in the balance, there is a formal compromise in the proposal, to publish in English the important resulting documents.

▪ Impacts and effects

In this project there was no uncouneted impact or effect. Again comparing with the first project, in this rattan project the design was adequate and took into account only the knowledge already existing in the executing agency, without having to rely too much on external help or work, for the implementation. The result is clear: no adverse impact or effect.

2.3 PART III: CONCLUSIONS AND RECOMMENDATIONS

▪ Conclusions

We indicate our conclusions following the Terms of Reference for this evaluation. The meaning words in relation to the Terms are highlighted in bold characters. If a comment is done in another part, it is not included here:

- Project design was adequate and will, in the long run, contribute to the achievement of **general objective**.
- Project **outputs and specific objectives** were almost completely attained. Some minor work has to be done to adequate the material for dissemination. As an example we have the translation to English of the table with botanical and commercial names, and uses of rattans.
- **Impact and relevance** to society will be felt as the results are packed and disseminated to the beneficiaries. The key for rattan identification based on anatomical features and macroscopic description is inedited and will fulfil a gap in the rattan identification.
- The **information dissemination** will be possible when the material is adequate for dissemination as it is suggested here.
- The **post project situation** is completely positive, as the implementing institution has today a concentrated knowledge on rattan, ready to give further and important contribution to society in this field.
- As **overall assessment**, this project can be considered as a success of implementation.

- **Recommendations**

The recommendations are presented under three headings:

- As further work:
 - to prepare the key for rattan identification for very wide distribution.
 - based on the key, to construct a correlation table between botanical name, trade name, properties and uses.
- For the project institution and team:
 - to approach institutions like INBAR AND CRIWI for focusing the attention on the widespread use of knowledge on rattan.
- For ITTO:
 - to strengthen the cooperation work with INBAR.
 - to support the publication and widespread distribution of:
 - rattan classification key and
 - rattan species, trade names by country, properties and uses

3. LATIN AMERICAN TIMBERS PROJECT: PD 24/95 REV.1 (I) THE IDENTIFICATION, PROPERTIES AND USES OF THE TROPICAL TIMBER IMPORTED TO CHINA FROM LATIN AMERICA

3.1 PART I: EXECUTIVE SUMMARY

- **Basic data and information**

- Implementing Agency: Research Institute of Wood Industry(CRIWI), Chinese Academy of Forestry ;
- Project leader: Mrs. Jiang Xiaomei
- Starting Date: May 1997;
- Duration: planned, 24 months – actual, 27 months;
- Budget and funding sources (US\$): planned total Budget: 192,000.00 - actual US\$ 204,370
 - Government of China: planned 80,000.00 – actual, US\$ 92,370
 - Government of Japan: 112,000.00

▪ **The proposal: specific objectives and planned outputs**

The development objective is the one of the main reasons for ITTO's existence the introduction of LKS and the increase of TT trade, in this case between Latin America and China. The proposal mentions only one specific objective: "to help Chinese end users and trade agents to understand the properties and utilization of Latin America tropical timber". The project proposal lists three outputs:

- Development of a database of LA tropical timbers,
- Compiling a handbook on LA tropical timbers,
- Dissemination of handbook to users.

▪ **What was done: actual outputs**

Based on the experience already acquired in previous ITTO projects, the executing agency provided a great deal of work: samples collection, their identification, physical properties description and organizing the information in convenient means for diffusion, besides the diffusion itself.

Two study tours of three experienced researchers to Peru and Brazil and to three States with good research institutions in the USA, were very productive in providing technical and scientific data, wood samples, information on the species, live experience in the regional forest and in the production suppliers sites.

The following outputs came out:

- LA tropical timber database (in English and in Chinese): a computerized information system, designed for the identification, properties and uses of LA TTs
- Preparation and edition of a handbook on LA TT (in Chinese), including the description of wood structure, properties and uses of 208 Latin American timbers. A total of 700 copies were distributed and sold.
- Organization of a training course for identification of LA TT with 34 participants from various parts of China.
- A publication entitled "The Properties and Uses of Major Commercialized Tropical Timbers from Latin America" for promotional use, with color pictures of 30 commercial species (in Chinese).
- Technical Reports on the study tours to the USA, Brazil and Peru

- **Efficiency and operational aspects**

The visits to CRIWI laboratories, the talkings with research team and project product user, the observations of outputs point to the general view of progress and advance made under this project implementation. The project execution was very efficient with all the planned activities being executed in the scheduled time and the resources and funds being spent appropriately. The scientific and technological environment is very adequate for research development and project execution. Post-graduate students took part in the ITTO project under evaluation.

- **Effectiveness**

This project, the third and last of a series studying timbers from the three tropical regions, benefited from previous experiences and resulted a well-designed project, executed under normal research conditions, producing an abundant quantity of planned and non-planned outputs. The original specific objective, the one existing in the proposal and three others not explicit in the original proposal, were completely attained. The project proposal had a Logical Matrix Framework, which made easier the evaluation procedure.

- **Impacts and effects**

The well-prepared design of the project with a skilled team made the project less vulnerable to uncertainties and there was no adverse impact or effect on the project.

- **Conclusions**

- The project results are directed towards the achievement of development objective in the long run.
- As project design was adequate, its execution was efficient with good results already being disseminated to main beneficiaries, according to the proposed specific objective.
- This project is well oriented with Government efforts for the internal supply of timber. Its impact and relevance to society is already in course: the seminar for identification had the presence of 34 technicians from various parts of China, who will use the acquired knowledge. China has a great potential demand for timber and the results of this project can be very effective, as they are already being disseminated to companies and trades.
- The effectiveness of technology transfer is clear. The Handbook edition of 700 units is sold out, and there are various inquiries for this and other project

products. A second print of the Handbook was being arranged during the evaluation period. The database had less impact until now, since it requires more skilled people for its operation, which is not the case for most of the companies.

- The overall post project situation is quite positive. The databases for the three tropical regions can now be grouped to constitute the first world tropical timber database with 600 species, 200 for each region, all work done with ITTO funding. Besides that, the research team is consolidated and ready to answer questions and give useful orientation to the productive sector.
- The project overall assessment is, with no doubt, positive. Even though there are some inconsistency or difficulty already observed in the project proposal on names and terms of the project manual like the OVIs – Objectively Verifiable Indicators, which were not clear in this proposal and were absent in the previous two projects.
- This kind of project contributes to the general objective of ITTO, specifically with ITTA Article 23, paragraph 5 (a and e) and 6 (a to e).

▪ **Recommendations**

Our main suggestions and recommendations are as follows under three headings:

➤ As further work:

- To seek help in LA region for a fine revision on Database;
- To further disseminate the Database by its diffusion through CRIWI Site;
- To republish the Handbook which is sold out.
- To advertise and diffuse the project results in the specialized media.

➤ For the project institution and team:

- To prepare a follow-up project for bringing together the tropical timber the three regions.
- To join other laboratories in CRIWI and other institutes like Institute of Scientific and Technological Information to face the challenge of real introduction of lesser-known species. An interesting approach is the planned supply of real adequate samples (some 10 to 20 M³) to industrial companies, following actively and critically its utilization, reporting the difficulties and problems to be solved by the research teams.

➤ For ITTO: to continue the support of projects for the introduction of LKS in China.



The evaluators (2nd and 7th, from the left) in visit to CRIWI with PD 24/95 Ver.1 (I) Project leader (4th) and researchers: a classical study of lesser known species from Latin American with great chance of success.

3.2 PART II: MAIN TEXT

BACKGROUND INFORMATION

- **Project rationale**

PD 24/95 Rev.1(I) is typically a classical project of studying a group of **lesser-known species – LKS**, preparing the field for their introduction into the market, a knowledge area where ITTO is accumulating a considerable experience in its relatively short life. The project has some different aspects driving the research efforts and project results. First, the project is in China, with the biggest population in the world and is undertaking an important move towards economy privatization, with increase in the standards of life, and after all a crescent demand for materials including timber, what favors the introduction of LKS.

The present work fits into a normal sequence pattern of work, which CRIWI is doing for the diversification of wood for the internal market. This work, already as an ITTO project, started with tropical –TT timbers from Southeast Asia. After that, a second project was done for Africa, and now, Latin America. This last region is very far in distance, increasing the freight and transport difficulties what is reflected by

the very low trade between the two regions but there is great potential of supplying part of China's TT demand with Latin American production.

▪ **Objectives and planned outputs**

The development objective is the one of the main reasons for ITTO's existence: the increase of TT trade between China and Latin America and the introduction of LKS. The proposal mentions only one specific objective: "to help Chinese end users and trade agents to understand the properties and utilization of Latin America tropical timber". The project proposal lists three outputs:

- Development of a database of LA tropical timbers,
- Compiling a handbook on LA tropical timbers,
- Dissemination of handbook to users.

A critical review of project proposal in comparison with what has been done it is possible to identify some important specific objectives and outputs which are in the proposal as activities, but for some reasons (considered basic work, for example) they are not explicit as objectives and outputs and cannot be objectively verifiable. In other words, they mean a lot of work, but are not a project product as such. As an example, it could be suggested three additional specific objectives in this project (outputs could be identified for them):

- To collect TT in LA region
- To describe anatomically the woods collected
- To increase the CRIWI wood collection

THE PROJECT IMPLEMENTATION

▪ **What was done**

The technical literature on Latin American tropical timbers was reviewed and research work on wood anatomy and selected physical properties was implemented at the CRIWI laboratories. Technical information and wood samples were provided by relevant institutes in Brazil, Colombia, Guyana, Panama, Surinam, etc. In order to learn experience on identification, properties and utilization of tropical timbers species from Latin America, the project team visited the USDA Forest Products laboratory, the Department of Wood and Paper Science of the North Carolina University and the Department of Wood and Forest Products of the Virginia Polytechnic Institute (U.S.A.) from 27 April to 16 May 1998. The project team also visited relevant institutes in Brazil and Peru in November 1997. With these study tours, 263 wood samples and related technical references were collected.

Based on the experience already acquired in previous ITTO projects the executing agency provided a great deal of work: samples collection, their identification, physical properties description and organizing the information in convenient means for diffusion, besides the diffusion itself.

The project produced and disseminated technical and promotional materials to assist Chinese importers and tropical timber users to properly identify, process and utilize wood from Latin America. The goal was to increase the effective utilization of tropical timber and promotion of the trade between China and producing countries in Latin America.

- **Actual outputs**

The project produced the following outputs:

- (i) A database of "Tropical Timber in the Latin America Region" (in English and in Chinese): This computerized information system, which was designed for the identification, properties and uses of Latin American Tropical Wood, includes names, provenance, anatomical features, properties and main uses of 200 species. The image of wood anatomical features (600 frames) was stored for each species.
- (ii) A handbook of "Tropical Timber in the Latin American Region" (in Chinese): This handbook includes the description of wood structure, properties and uses of 208 Latin American timbers.
- (iii) A promotional publication entitled "The Properties and Uses of Major Commercialized Tropical Timbers from Latin America" (in Chinese): In the publication 30 species of commercial tropical timbers in Latin America were described with color photographs.
- (iv) Reports of study tours to the USA, Brazil and Peru
- (v) Organization of a training course for identification of LA TT with 34 participants from various parts of China.

Following the reasoning of identifying implicit specific objectives and outputs, we can list three further outputs for the project, improving the project cost and benefit ratio:

- Collection of wood samples of various countries in LA region.
- Anatomic description of collected woods.
- Increasing the CRIWI wood collection in 208 species (~2 %).

SCOPE OF THE EVALUATION

- **Efficiency and operational aspects**

All the local observations at CRIWI laboratories, talkings with research team, visiting the facilities used in the project execution, all agree with impressions from progress and completion reports reading. These facts and information allow us to affirm that project execution was very efficient with all the planned activities being executed in the scheduled time and the resources and funds being spent appropriately. Funds were object of an internal auditing as normal for Chinese Academies of Forestry and Science. As observed in other institutes, the scientific and technological environment is very adequate for research development and project execution. Post-graduate students took part in the ITTO project under



evaluation.

A non direct output of PD 24/95 Ver.1 (I) was the increase of 2% in the number of samples of the big wood collection of CRIWI.

- **Effectiveness**

This project is the third and last of a series devoted to timbers from the three tropical regions. In this way the experienced team of CRIWI, leaded by Mrs. Jiang Xiao Mei proposed a well-designed project, which was executed under normal research conditions, producing the abundant quantity of planned outputs. The original specific objective, the one existing in the proposal and three others we suggested, were completely attained. The project proposal had a Logical Matrix Framework, which made easier the evaluation procedure.

- **Impacts and effects**

The well-prepared design of the project with a skilled team made the project less vulnerable to uncertainties and there was no adverse impact or effect on the project.

3.3 PART III: CONCLUSIONS AND RECOMMENDATIONS

- **Conclusions**

In accordance with the terms of reference for the evaluation mission, the conclusions will be pointed out in the following paragraphs unless it has been already or will be matter of comment in other sections (the words that identify TOR are in bold character):

- The project results are directed towards the achievement of **development objective** in the long run.
- As **project design** was adequate, its execution was efficient with good results already being disseminated to main beneficiaries, according to the proposed **specific objective**.
- This project is well oriented with Government efforts for the internal supply of timber. Its impact **and relevance** to society is already in course: the seminar for identification had the presence of 34 technicians from various parts of China, who will use the acquired knowledge. As stated before (Background information), China has a great potential demand for timber and the results of this project can be very effective, as they are already being disseminated to companies and trades. Naturally a scientific as well as technological project as this one will not by itself create the necessary condition for the expansion of imports of TT from Latin America. The project knowledge is the basis. The work of introducing timber species into the market should be complemented with other actions like diffusing rolls of timber exporters, trade missions from both sides and so on.
- The **effectiveness of technology** transfer, in this case, knowledge dissemination, is clear. The Handbook edition of 700 units is sold out, and there are various inquiries for this and other project products. A second print of the Handbook was being arranged during the evaluation period. The database had less impact until now, since it requires more skilled people for its operation, which is not the case for most of the companies.
- The overall **post project situation** is quite positive. The databases for the three tropical regions can now be grouped to constitute the first world tropical timber database with 600 species, 200 for each region, all work done with

ITTO funding. Besides that, the research team is consolidated and ready to answer questions and give useful orientation to the productive sector.

- The project **overall assessment** is, with no doubt, positive. Even though there are some inconsistency or difficulty already observed in the project proposal on names and terms of the project manual like the OVIs – Objectively Verifiable Indicators, which were not clear in this proposal and were absent in the previous two projects. In the Recommendations we turn back to this.
- This kind of project does contribute to the general **objective of ITTO**, specifically with **ITTA Article 23**, paragraph 5 (a and e) and 6 (a to e).

Recommendations

The main suggestions and recommendations follow under three headings:

- As further work:
 - To seek help in LA region for a fine revision on Database.
 - To further disseminate the Database by its diffusion through CRIWI Site;
 - To republish the Handbook which is sold out.
 - To advertise and diffuse the project results in the specialized media.
- For the project institution and team:
 - To prepare a follow-up project for bringing together the tropical timber the three regions.
 - To join other laboratories in CRIWI and other institutes like Institute of Scientific and Technological Information to face the challenge of real introduction of lesser-known species. An interesting approach is the planned supply of real adequate samples (some 10 to 20 M³) to industrial companies, following actively and critically its utilization, reporting the difficulties and problems to be solved by the research teams.
- For ITTO: to continue the support of projects for the introduction of LKS in China.

4 RUBBERWOOD PROJECT: PD 3/96 REV.2 (I) - DEVELOPMENT AND EXTENSION OF RUBBERWOOD PROCESSING AND UTILIZATION TECHNOLOGY

4.1 PART I: EXECUTIVE SUMMARY

▪ Basic data and information

- Implementing Agency: Research Institute of Wood Industry (CRIWI), Chinese Academy of Forestry;
- Project leaders: Professor Ye Kelin, Director of CRIWI and Mr. Li Yuedong, CRIWI Assistant Director;

- Starting Date: October 1996;
- Duration: planned, 24 months – actual, 28 months;
 - Budget and funding sources (US\$): total Budget: 408,398
 - Government of China: \$193,600
 - Government of Japan: \$150,000;
 - Government of Switzerland: \$ 64,798

China is already the fourth rubber producer in the world and its plantations started late in relation to Malaysia and Thailand, in the fifties. Following to the same pattern of these two countries, rubber trees will be replaced in large quantities, and very soon the production of the derived rubberwood (the abbreviature **RW** is used in this report) shall increase considerably, fulfilling, at least in part the Chinese huge demand for raw-material for the forest products industry. Although already in use, the

RW technology is out of date and the product quality is poor. Those two neighbor countries are much advanced in this industry, but it is not a simple task the transfer of knowledge. It depends, first of all, the basic knowledge of the fungi and insects, which are attacking the wood. Besides that, it is important to develop expertise, during the basic studies and technology development, in order to be able to diffuse the new techniques in a sustainable manner. This Project 03/96 Rev2 (I) was designed to solve these gaps in the RW utilization, one of the main technological task of this project was the decrease in the concentration of PCP – Pentachloro phenol in the preservation formula.

▪ **The proposal: specific objectives and planned outputs**

The development objective of this project was to further improve RW processing and utilization by adopting mature technology to give a contribution for better utilization of RW. The proposal contains only one specific objective, which was to upgrade the efficiency and competitiveness of the RW processing industry in China. This broad specific objective could be divided into three:

- Development of improved RW preservation technology without PCP.
- Research and definition of drying schedules.
- Development of treatment for fire retardation.

Observing the activities already present in the proposal and what was intended in the project, we could suggest three other specific objectives, which were in the proposal but in an implicit form:

- RW insects survey and identification.
- RW fungi survey and identification.
-

▪ **What was done: actual outputs**

The research team studied, developed and introduced to the productive sector RW processing technologies aimed to the increase of efficiency and competitiveness of the RW industries in the Country. The main areas of work were: **a)** the identification and classification of insect and fungi damaging RW; **b)** the definition of drying techniques; **c)** selection and development of appropriate RW preservation methodologies and **d)** development of fire-retardant RW plywood to increase and diversify the utilization of RW products.

The implemented activities were those expected for a project like this: literature surveys, study tours, insect and fungi field collection, intensive laboratory work in various fronts and equipment in laboratory scale (biology and chemistry benches, kiln drying, treatment plant, plywood plant and properties testing), pilot scale experiments (drying and preservation) and technology diffusion (seminars and technical visits).

The following main outputs and results were produced:

- A technical report on RW processing (in English);
- A manual on RW processing technologies (in Chinese);
- A report of a study tour to Malaysia and Thailand in June 1997,
- Presentation of two research papers in international conferences: on fire-retardant at IRG-WPC Conference (Canada, May 1997); and on drying testing at IUFRO, (USA, July 1997);
- A technical report on the general overview and recommendations for RW processing and industrialization in China;
- The conclusion of a general screening of preservation treatments using alternative chemicals to PCP and different procedure;
- The definition of three drying schedules for boron preservative treated RW lumber;
- The conclusion of the first study to define a treatment for fire treatment of RW plywood;
- The realization of a RW technological workshop to diffuse project results, with great participation of most of the beneficiaries.

Following our reasoning that other specific objectives could be made explicit in the project, some other important outputs can be listed:

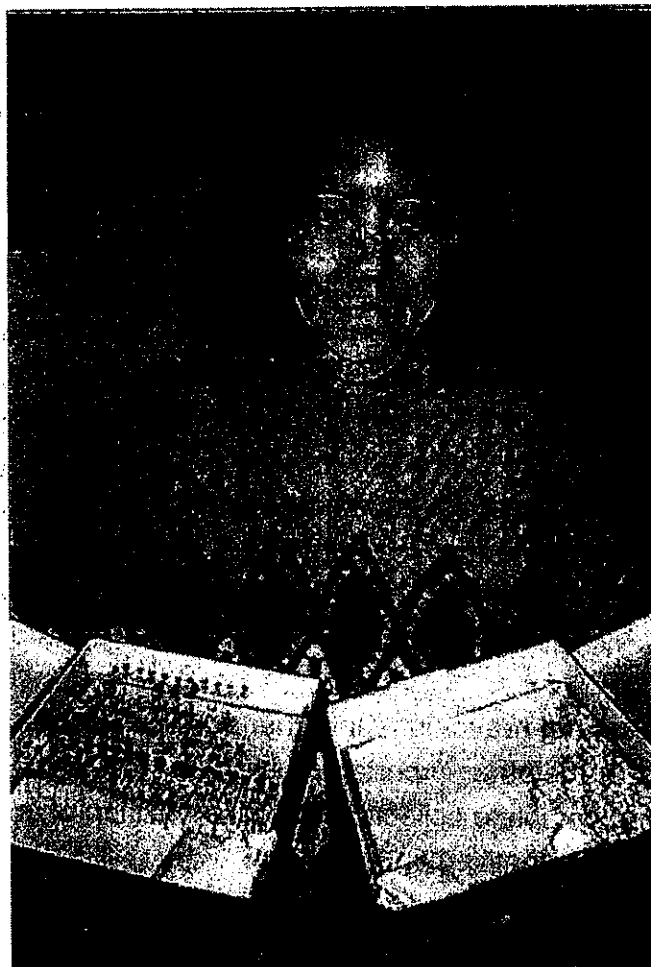
- The first complete collection and identification of insects attacking RW with 36 species identified;
- The identification of all fungi species found to attack RW: 23 wood decay and 10 of mold decay fungi;
- The first scientific record of an RW attacking insect in China;
- Effective decrease in PCP use in one industry, the biggest user of RW, from 5 – 10% to 2%;

- **Efficiency and operational aspects**

PD 3/96 Ver.2 (I) was implemented in normal conditions for a scientific institution and financial resources were spent under sound and safe control. All readings and local observations made by the evaluation mission give evidence to this. Facilities for the project were visited and all offer good conditions for project implementation. As pointed out for the last project, the scientific environment is adequate for research and post-graduation studies.

- **Effectiveness**

The implementing agency benefited from the ITTO Pre-Project for elaborating a well project design, which was effectively implemented, with some of the results being already in use by factories.



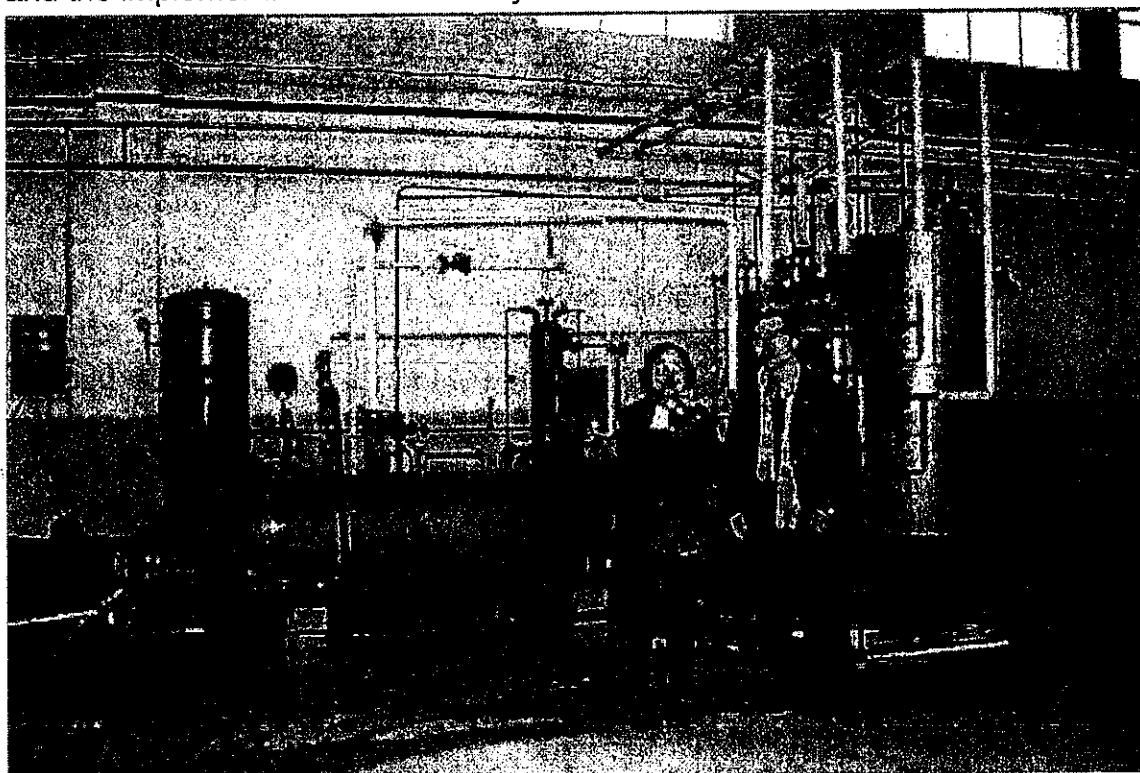
ITTO PD 3/96 Ver.2 (I) was decisive for the complete description of all 23 insects found to attack rubberwood in China. One of them was recorded for the first time in China under this project.

As a general output we may say that the ITTO project helped decisively in the development of independent and local knowledge of RW processing, making proper use of the already existing technologies in Malaysia and Thailand. Besides that, helped to pave the bridge in extension work between CRIWI, in Beijing, and the RW processing industries in the extreme southern part of China, distant 3.5 hours by normal flight.

▪ **Impacts and effects**

There were no unexpected factors for the project execution and, in that way; no adverse or positive impacts affected its normal work, especially because of its good planning and design.

The fact that the factory using RW is State owned can be understood as a facilitator in the process of technology development during the pilot scale treatments and the implementation in the factory.



The preservation plant at CRIWI facilities in Beijing was decisive for the success in surveying alternatives for rubberwood preservation

▪ **Conclusions**

- The results obtained in this project point to the achievement of development objective in the long term.
- This can be considered a technological project of positive interference, with impact and relevance to society in various ways like: the factories with improved technology, the labor and environment with less harmful working

conditions, the increase in use of internal wood resources to mitigate the high demand and others.

- The technology transfer to the productive sector is already in course, being accelerated by the fact that some companies are State owned.
- The overall post-project situation is improved as can be seen by the examples: the project team carries now know how on RW processing and can face similar problems which may eventually happen in other industries; the biological degradation of RW is better understood; CRIWI is in better condition for the development and introduction of RW further processing.
- As an overall assessment it can be said that this project had success in its implementation.
- We agree with project proposal on its relevance to ITTO: it complies with ITTA specific objectives "c" and "e", and with ITTA (1983) article 23 paragraphs 5 (a, d and e) and 6 (a to e).

▪ **Recommendations**

Main suggestions and recommendations of the evaluation mission are listed under three headings, as follows:

- As further work:
 - To develop a simple laboratory method for screening test, to pre-select chemicals for RW preservation treatment;
 - To test (with the method suggested above) fungicides already in use for other applications in the fields of food, agriculture, leather and paints;
 - Trying to make an immediate effort to further decrease the PCP-Pentachloro phenol content of the formula in use by the industry (around 2%);
 - To develop a system for feedback information when a pilot scale treatment is on the way;
 - To make additional effort for the project results utilization by the private sector;
- For the project institution and team:
 - To accelerate the presentation of a follow-up project;
 - To strengthen still further the relationships with the productive sector, answering their needs.
- For ITTO: to hold a simple technical seminar in Asia for the exchange of experiences in RW at the technical level with the exchange of experiences.

This project studied and disseminated rubberwood-processing technologies to improve the efficiency and competitiveness of the rubberwood industries in China. The research work focused on (i) identification and classification of insect and fungi damaging rubberwood, (ii) selection of appropriate rubberwood preservation and drying technologies by means of modern treatment methods, and

(iii) development of fire-retardant of rubberwood plywood in order to increase utilization of rubberwood products.

The project produced the following main outputs:

- (i) Rubberwood processing technical report (in English), based on a survey of the rubberwood processing and utilization technologies in China and results of the research work.
- (ii) A manual on rubberwood processing technologies (in Chinese).
- (iii) A report of a study tour to Malaysia and Thailand: June 1997, the project team visited relevant government agencies in these two countries, as well as 15 rubberwood processing mills.
- (iv) A survey and classification of insect and fungi in Hainan and Yunnan Provinces: 23 species of decay fungi and 10 species of mould fungi were identified. Totally 36 species of insects were identified and classified.
- (v) Rubberwood processing technologies: (i) Preservation techniques of rubberwood were developed, in which the treatment was divided into separate processes, (ii) Three optimum drying schedules for boron preservative treated rubberwood and (iii) A product standard for the flame-retardant rubberwood plywood with the technique of producing flame-retardant rubberwood plywood.
- (vi) Research papers for international conferences: A paper entitled "A Series of Techniques for Producing Fire-Retardant Wood Products" was presented to the section 3 of the 28th International Research Group on Wood Preservation Conference (Whistler, Canada, 25-30 May 1997). A paper entitled "Drying Test of Some Fast-growing Planted Wood" was presented at IUFRO All DIVISION 5 Meeting (Pullman, USA, 7-12 July 1997).
- (vii) The consultant's report of a technical overview and recommendations on the rubberwood processing and utilization technology in China.

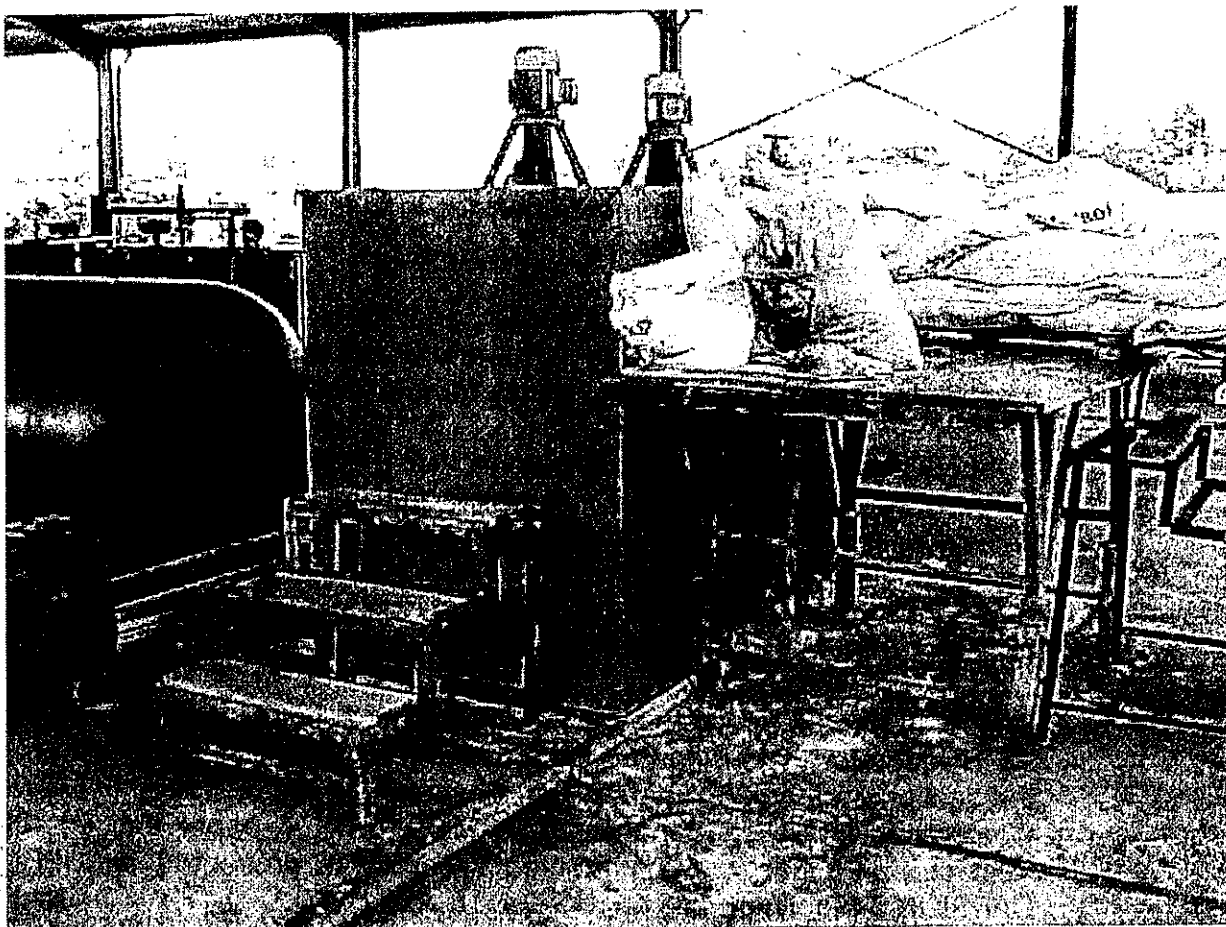
4.2 PART II: MAIN TEXT

BACKGROUND INFORMATION

▪ Project rationale

The following features characterize the pre-project situation as revealed by the Pre-Project ITTO PPD 6/94 Rev.1 (I): China's severe shortage of wood resources; huge potential of rubberwood – RW (**in this report it is used the abbreviation RW throughout in the text**) untapped or under exploited – China is already one of the greatest rubber producers in the world; the relatively indiscriminate use of Pentachloro phenol-PCP in the RW preservative formulation while it was banned or restricted in several countries; the Chinese RW industry with primary processing out

of date; well developed RW log processing and timber industrialization technologies in neighboring countries like Malaysia and Thailand; an important potential for the furniture industry development in China rubber plantations areas, specially Hainan. By a combination of basic studies of Chinese conditions in the RW utilization, with study tour to countries with good technology, and laboratory/pilot formulations, this



project was designed to solve concrete problems of the industry.

Project PD 03/96 Ver.2 (I) was effective in decreasing the PCP - pentachlorophenol content to 2%, in the rubberwood preservation formula one output already in use by Xilian Factory in Hainan Province.

▪ The objectives

Following a normal trend observed in this mission, the project proposal does not state what the objectives, specially the specific ones. Quoting from the proposal, the development objective was to further improve RW processing and utilization by adopting mature technology to give a contribution for better utilization of RW in the world. Continuing the quotation, the only one specific objective was to upgrade the efficiency and competitiveness of the RW processing industry in China, what could be divided into three specific ones:

- Development of improved RW preservation technology without PCP.

- Research and definition of drying schedules.
- Development of treatment for fire retardation.

Observing the activities already present in the proposal and what was intended in the project, we could suggest three other specific objectives, which were in the proposal but in an implicit form:

- Introduction of new RW treatment into the industry.
- RW insects survey and identification.
- RW fungi survey and identification.

▪ **Planned outputs**

The expected outputs of PD 3/96 Rev.2 (I) were described in the Project Proposal as two mixed groups of results:

- to establish preservation and drying techniques for RW based on borax and boric acid formulas; to prepare the guidelines for the manufacture of fire retardant RW plywood;
- to develop training courses for diffusion; visits to regional and international fairs and seminars; to run a workshop/seminar to disseminate the outputs of the project.

THE PROJECT IMPLEMENTATION

▪ **What was done: actual outputs**

The research team studied, developed and introduced to the productive sector RW processing technologies aimed to the increase of efficiency and competitiveness of the RW industries in the Country. The main areas of work were: **a)** identification and classification of insect and fungi damaging RW; **b)** the definition of drying schedules; **c)** selection and development of appropriate RW preservation methodologies and **d)** development of fire-retardant RW plywood to increase and diversify the utilization of RW products.

Activities were those expected for a project like this: literature surveys, study tours, insect and fungi field collection, intensive laboratory work in various fronts and equipments in laboratory scale (biology and chemistry benches, kiln drying, treatment plant, plywood plant and properties testing), pilot scale experiments (drying and preservation) and technology diffusion (seminars and technical visits).

The following main outputs and results were produced:

- A technical report on RW processing (in English);
- A manual on RW processing technologies (in Chinese);
- A report of a study tour to Malaysia and Thailand: June 1997,

- Presentation of two research papers in international conferences: on fire-retardant at IRG-WPC Conference (Canada, May 1997); and on drying testing at IUFRO (USA, July 1997);
- A technical report on the general overview and recommendations for RW processing and industrialization in China;
- The conclusion of a general screening of preservation treatments using alternative chemicals to PCP and different procedure;
- The definition of three drying schedules for boron preservative treated RW lumber;
- The conclusion of the first study to define a treatment for fire treatment of RW plywood;
- The realization of a RW technological workshop to diffuse project results, with great participation of most of the beneficiaries;

The project was really prone in products and the following results could be enrolled as non-expected or non explicit outputs:

- The first complete collection and identification of insects attacking RW, with 36 species identified;
- The identification of all fungi species found to attack RW, 23 wood decay and 10 of mold decay fungi;
- The first scientific record of an RW attacking insect in China;
- Effective decrease in PCP use in one industry, the biggest user of RW, the industry concentration was 5 – 10%, and the project was decisive to decrease this figure to 2%;

SCOPE OF THE EVALUATION

▪ Efficiency and operational aspects

All readings and local observations made by the evaluation mission are full evidence that the project was well implemented and there was good efficiency in the use of resources made available by ITTO. Facilities for the project were visited and all offer good conditions for project implementation. As pointed out for the last project, the scientific environment is adequate for research and post-graduation studies. An internal auditing states that the use of financial resources was appropriate and as planned.

▪ Effectiveness

For the evaluation of this project, besides the observations in Beijing, we visited the major RW processing company and the Province Bureau for Agriculture and Farms, both in Hainan Province. These two visits had the objective of adequate

observations of technology transfer. With all the information collected we can say that objectives were totally accomplished.

The implementing agency benefited from the ITTO Pre-Project existence for the elaboration of a well-designed project, which was effectively implemented, with some of the results being already in use by factories.

As a general output we may say that the ITTO project helped decisively in the development of independent and local knowledge of RW processing, taking in good account the already existing technologies in Malaysia and Thailand. Besides that, helped to pave the bridge in extension work between CRIWI, in Beijing, and the RW processing industries in the extreme southern part of China, distant 3.5 hours by direct flight.

One important observation made during the visit to the Hainan Island was the strong co-operation atmosphere between CRIWI team and the Hainan State Farms Xilian Woodworking Factory, and also with the General Bureau of State Farms of Hainan Province Hainan State. Besides the friendly relation, **Letters of Intent** from both will be annexed to a follow up project proposal to be submitted to ITTO. These instruments will give safe to the executing agency for the implementation stage.



Rubberwood residues on the Xilian Factory yard. Forest residues, from the field, processing and industrialization in general, shall increase as a matter of major concern for ITTO.

- **Impacts and effects**

There were no unexpected factors for the project execution and, in that way, no adverse or positive impacts affected its normal work, especially because of its good planning and design.

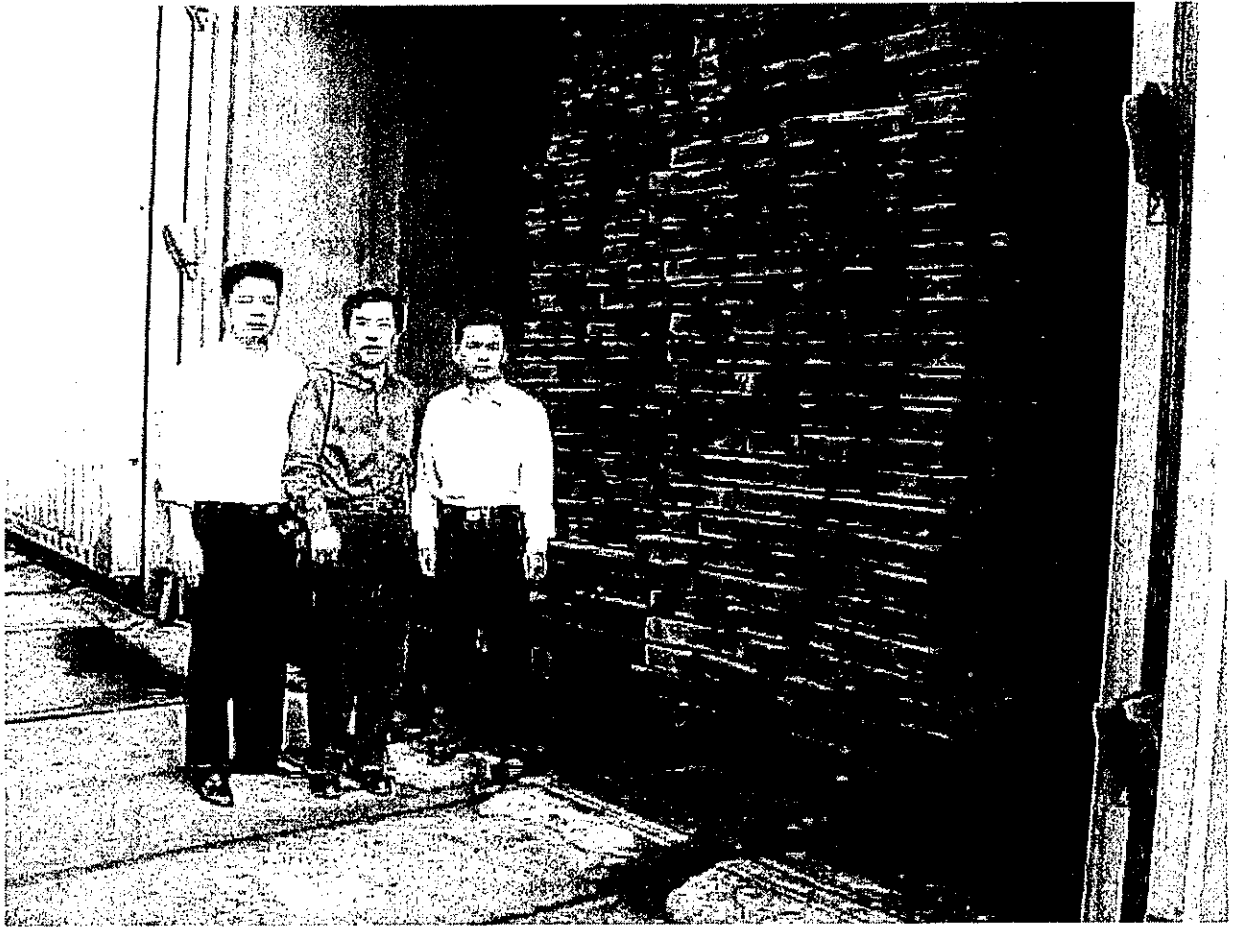
The fact that the factory using RW is State owned can be understood as a facilitator in the process of technology development during the pilot scale treatments and the effective technology implementation by the factory.

4.3 PART III: CONCLUSIONS AND RECOMMENDATIONS

▪ Conclusions

Our conclusions will be put forward as follows, being related to the Terms of Reference, which we highlight in bold characters the meaning words. When the Terms had already been commented in other parts they are not included in this section:

- The results obtained in this project point to the achievement of **development objective** in the long term.
- This can be considered a technological project of positive interference, with **impact and relevance** to society in various ways like: the factories with improved technology, the labor and environment with less harmful working conditions, the increase in use of internal wood resources to mitigate the high demand and others.
- The **technology transfer** to the productive sector is already in course, being accelerated by the fact that some companies are State owned.
- The **overall post-project situation** is improved as can be seen by the examples: the project team now carries know how on RW processing and can face similar problems which may eventually happen in other industries; the biological degradation of RW is better understood; CRIWI is in better condition for the development and introduction of RW further processing.
- As an **overall assessment** it can be said that this project had success in its implementation.
- We agree with project proposal on its relevance to ITTO: it complies with ITTA specific objectives "c" and "e", and with ITTA (1983) article 23 paragraphs 5 (a, d and e) and 6 (a to e).



Rubberwood with considerably high dimensions are kiln dried using schedules improved by CRIWI team under ITTO financed project. In the picture Xilian Director and factory supervisor with ITTO project leader (centre)

▪ Recommendations

Main suggestions and recommendations of the evaluation mission are listed under three headings, as follows:

➤ As further work:

- To develop a simple laboratory method for screening test to pre-select chemicals for RW preservation treatment;
- To test (with the method suggested above or a normal procedure normally used by the team) fungicides already in use for other applications in the fields of food, agriculture, leather and paints;
- Trying to make an immediate effort to further decrease the PCP content of the formula in use by the industry : as a result of this project PD 3/96 Rev.2 (I), it is nowadays around 2%, but it could be very important to decrease it further; it should be remembered that many countries do not allow the PCP use at all;

- To develop a system for feedback information when a pilot scale treatment is on the way; this would help in the implementation of pilot scale tests and the corrections in the way.
- To make additional effort for the project results utilization by the private sector;
- For the project institution and team:
 - To accelerate the presentation of a follow-up project;
 - To strengthen still further the relationships with the productive sector, adopting a positive and active attitude to answer the industry needs.
- For ITTO: to hold a simple technical seminar in Asia for the exchange of experiences in RW at the technical level, taking care to make the meeting as much as possible effective in the exchange of experiences.

5 MARKET INFORMATION PROJECT: PD 25/96 REV.2 (M) CHINA'S CONSUMPTION OF FOREST PRODUCTS AND ITS DEMANDS FOR THEM FROM THE INTERNATIONAL MARKET BY THE YEAR 2010

5.1 PART I: EXECUTIVE SUMMARY

▪ Basic data and information

- Implementing Agency: Institute of Scientific and Technological Information of the Chinese Academy of Forestry- **ISTI**.
- Project leaders: Professor Shi Kunshan, Director of ISTI and Professor Lin Fengming
- Budget and Source of funding: total: US\$ 243,915
 Government of Japan: US\$ 177,915
 Government of China: US\$ 66,000
- Starting Date: March 1997
- Duration: planned, 24 months – actual, 29 months

China is a consumer of tropical timber and, for the Country's population; all movement in the market can be of significant changes, affecting the international trade flow of wood. The Chinese policy is moving towards privatization of the economy with big changes in the entire society. One of the main and already felt consequences, is the increase of living standard moving the demand for material upwards, including wood used for so many purposes with strong cultural roots. In another and really contrary direction, Chinese Government is pushing society for natural forest protection to avoid or mitigate the river floods, which affected China hardly a few years ago.

In this scenario, what is the consumption prediction for the next years? What to say about the forecast for 2010 to subsidize the government planning at the various spheres?

Although having a centralized and planned economy, China does not have an efficient process of gathering, processing and disseminating forest information. These functions were spread in various institutions, resulting in an inefficient system and inaccurate information. Besides that there was no stable link with ITTO to provide reliable data for the ITTO market information system.

▪ **The proposal: specific objectives and planned outputs**

PD 25/96 Rev.2 (M) was proposed as a way of filling the strong gaps in forest products information system for the whole Country. The proposal brings as the development objective: the increase of bilateral understanding, the promotion of trade and the achievement of forest sustainable development. The specific objectives were:

- to provide the basis for China's Government to make the mid and long term forestry plan and establish the related policy until year 2010, a general target established by the Government;
- to improve the transparency of international tropical forest products commerce.
- to provide the basis for Chinese Government's policy-making on production and trade of tropical forest products;

The wanted outputs to come out from the Project execution were:

- the creation or establishment of:
 - Tropical Forestry Products Information and Consultation Center of China;
 - The Database of China's Tropical Forest products; and
 - Information Network of China's Tropical Forest Product; and
- the organization of the International Symposium on Changing Tropical Forest Products Market.

▪ **What was done: actual outputs**

This project follows project ITTO PD 42/88 Rev.1 (M), started by surveying the existing forest products market information, and studying how could a new system be set up with the resource available in the project. In this way a network was established based on 13 people who would collect information, specially prices, species, and as possible volumes traded in a estimated basis. These people, living and working in the strategic places of intense market flow, would allow better and reliable information on the market. Although not totally right, these estimates can be further improved and corrected in its methodology for supplying progressively better data. Parallel to this it was established the Tropical Forest Products Information and Consultation Center of China and organized the International Symposium on

Tropical Forest Products Trade and Investment. During the project, the research team undertook some study tours in the Country and abroad.

The project produced the following main outputs:

- "China's Production and Consumption of Tropical Forest Products and its Demand to the Year 2010", a research report already in use as basis for China's Ministry of Forestry to make the mid and long-term forestry plan and the related policy;
- the organization of a 13 people "Information Network of China's Tropical Forest Products", in the important places of the Country, with the aim of gathering market information using the same methodology;
- Establishing the "Tropical Forest Products Information and Consultation Center of China";
- Developing "The Database of China's Tropical Forest Products" which will improve China's statistics on tropical forest products and improve the information provided by China to ITTO system;
- The organization of an International Symposium on Changing Tropical Forest Products Market.

▪ **Efficiency and operational aspects**

The project benefited from a very experienced team based on the Institute for Scientific and Technological Information, with good working conditions and good personal links with the productive sector. The result was a very efficient project implementation in all means. The research team is relatively small, with mature forestry experience combined with new technology of information processing.

Resources and funds use was all within planned, as follows from the internal auditing.

▪ **Effectiveness**

Project design was adequate and allowed a smooth implementation. All the specific objectives were attained, producing the outputs as planned and within the scheduled time.

▪ **Impacts and effects**

There were no unpredicted aspects as an effect of a good combination between a skilled team with a well-designed project. Nothing happened to affect the project execution.



The Evaluation Mission, 3rd and 5th from the left, in visit to the Market Information Center, one of the effective outputs from PD 25/96 Ver.2 (M); the survey network and the Center are very active in collecting, treating and diffusing Chinese forest products trade data.

▪ Conclusions

The various conclusions can be listed:

- The information provided by the outputs will contribute in the long term to attain the project development objective.
- Project's outputs and specific objectives were all achieved.
- Various beneficiaries are already feeling the project impact and relevance: Government planners, ITTO market information organizers, traders, timber consumers, exporters and others.
- The information dissemination as mentioned above is effective through the Symposium, the Databases distribution, the Center consultation and the contacts with the Government officers.
- Post project situation is positive as can be devised by the tangible outputs like the Center, the Network and the Databases.
- As an overall assessment of the project we can say it was a success in all planned and executed activity, proving to be of very useful results in practice.

The key lessons learned are: the needs of the society, here the related part of the forest sector, found the skilled team for the implementation of a well designed project with good results for all, and a good application of ITTO funds.

- According to our understanding, the project contributed to ITTA Objectives and ITTO Action Plans, as stated in the project proposal.

▪ **Recommendations**

Suggestions and recommendations follow under three headings:

➤ As further work

- To connect with Customers through computing system.
- To build up models for data gathering and statistics for internal market of timber.
- To start studies on tropical timber international trade transports: availability; efficiency; and opportunities.
- To review the English edition of the publication "China's Production and Consumption of Tropical Forest Products and its Demand to the Year 2010"

➤ For the project institution and team:

- To seek the strength and sustainability of information system built up under this project.
- To approach CRIWI for new studies on forest products residues: availability; localization; characterization and potential uses.

➤ For ITTO:

- To strengthen the support of projects on the China's consumption of forest products as its market movements can make great changes in the tropical timber international trade.
- To make further efforts to make available the results of this project for the international tropical timber trade.

5.1 PART II: MAIN TEXT

BACKGROUND INFORMATION

▪ **Project rationale**

Although the importance of China market demand of forest products is by sure unquestionably important there was no market information system available to supply safe data for the Government planning, for the productive sector, or for the ITTO market information system. In addition, a central planned economy would suggest the existence of a complete data collection and organization for the governmental action, and is really important in central planned economies.

Nevertheless, at least for the forest sector, the statistics although existing, they were unsafe and coming from different institutions they could even be contradictory.

China is a consumer of tropical timber and, for the Country's population; all movement in the market can be of significant changes, affecting the international trade flows of wood. The Chinese policy is moving towards privatization of the economy with big changes in the entire society. One of the main and already felt consequences is the increase of living standard moving the demand for material upwards, including wood, used for so many purposes with strong cultural roots. In another direction, Chinese Government is pushing society for natural forest protection to avoid or mitigate the river floods, which affected China hardly some years ago.

In this scenario, what is the prediction of consumption in the next years? What to say about the forecast for 2010 to subside the government planning in the various spheres? All the government agencies and system is preparing a macro plan based on that year.

▪ **The proposal: specific objectives and planned outputs**

The proposal brings as the development objective: the increase of bilateral understanding, the promotion of trade and the achievement of forest sustainable development. The specific objectives were:

- to organize a system to gather, treat and diffuse the information on the forest sector, providing the basis for China's Government to make the mid and long term forestry plan and establish the related policy until year 2010, a general government target,
- to improve transparency of international tropical forest products trade, especially from the China side consume of tropical forest products, allowing the producers to prepare themselves for the market.
- to provide the basis for Chinese Government's policy-making on production and trade of tropical forest products, by knowing and investigating, *inter allia*, the forest policy of major actor in the production side, major trends in the market.
- to create, organize and establish with conditions of self sustaining:
 - a) The Tropical Forestry Products Information and Consultation Center of China;
 - b) The Information Network of China's Tropical Forest Product.
 - c) The Database of China's Tropical Forest products; and
- to organize the International Symposium on Changing Tropical Forest Products Market as a special event for the exchange of information between producers and consumers in the commerce of forest products in general.

▪ **What was done: actual outputs**

This project follows project ITTO PD 42/88 Rev.1 (M), started by surveying the existing forest products market information, and studying how could a new system be set up with the resource available in the project. In this way a network was established based on 13 people who would collect information, specially prices, species, and as possible volumes traded in a estimated basis. These people, living and working in the strategic places of intense market flow, would allow better and reliable information on the market. Although not totally right, these estimates can be further improved and corrected in its methodology for supplying progressively better data. Parallel to this it was established the Tropical Forest Products Information and Consultation Center of China and organized the International Symposium on Tropical Forest Products Trade and Investment. During the project the research team undertook some study tours in the Country and abroad.

- The project produced the following main outputs:
- "China's Production and Consumption of Tropical Forest Products and its Demand to the Year 2010", a research report already in use as basis for China's Ministry of Forestry to make the mid and long-term forestry plan and the related policy.
- the organization of a 13 people "Information Network of China's Tropical Forest Products", to gather market information with the same methodology in the important places of the Country.
- Establishing the "Tropical Forest Products Information and Consultation Center of China".
- Developing "The Database of China's Tropical Forest Products" which will improve China's statistics on tropical forest products and improve the information provided by China to ITTO system.
- The organization of an International Symposium on Changing Tropical Forest Products Market.

SCOPE OF THE EVALUATION

▪ Efficiency and operational aspects

The implementation of Pd 25/96 Rev.2 (M) markedly was benefited from a very experienced team based on ISTI - the Institute for Scientific and Technological Information, with good working conditions and good personal links with the productive sector. The result was a very efficient project execution in all means. The research team, although relatively small, with mature forestry experience combined with new technology of information processing.

Resources and funds use was all within planned, as follows from the internal auditing.

- **Effectiveness**

The visit to the Tropical Forest Products Information and Consultation Center of China and the demonstration of databank functioning allowed the Mission to evaluate the good results provided by PD 25/96 Rev.2 (M). Project design was adequate and allowed a smooth implementation. All the specific objectives were attained, producing the outputs as planned and within the scheduled time.

- **Impacts and effects**

The skilled team combined with the well-designed project avoided unpredicted aspects to happen and affect the project execution.

5.2 PART III: CONCLUSIONS AND RECOMMENDATIONS

- **Conclusions**

Following the same pattern of the other projects under evaluation, the various conclusions follow the terms of reference for this evaluation, being highlighted in bold the meaning words related to the Terms (when already commented in other part the Term is not included in this section:

- The information provided by the outputs will contribute in the long term to attain the project **development objective**.
- Project's **outputs and specific objectives** were all achieved.
- Various beneficiaries are already feeling the project **impact and relevance**: Government planners, ITTO market information organizers, traders, timber consumers, exporters and others.
- The **information dissemination** as mentioned above is effective through the Symposium, the Databases distribution, the Center consultation and the contacts with the Government officers.
- **Post project situation** is positive as can be devised by the tangible outputs like the Center, the Network and the Databases.
- As an **overall assessment** of the project we can say it was a success in all planned and executed activity, proving to be of very useful results in practice. The **key lessons learned** are: the needs of the society, here the related part of the forest sector, found the skilled team for the implementation of a well designed project with good results for all, and a good application of ITTO funds.
- According to our understanding, the project contributed to **ITTA Objectives and ITTO Action Plans**, as stated in the project proposal.



The State Timber Corporation, visited by evaluators, is beneficiary of ITTO projects PD 24/95 Ver.1 (I) and PD 25/96 Ver.2 (M); the results meet their needs.

■ Recommendations

Although the results obtained by PD 25/96 Rev.2 (M) were unquestionably of good level, the evaluation mission, coming with other experiences and observing from the outside of the execution team, could list some suggestions and recommendations which follow under three headings:

➤ As further work

- To connect with Customers through computing system.
- To build up models for data gathering and statistics for internal market of timber.
- To start studies on tropical timber international trade transports: availability; efficiency; and opportunities.
- To review the English edition of the publication "China's Production and Consumption of Tropical Forest Products and its Demand to the Year 2010"

➤ For the project institution and team:

- To seek the strength and sustainability of information system built up under this project.
 - To approach CRIWI for new studies on forest products residues: availability; localization; characterization and potential uses.
- For ITTO:
- To strengthen the support of projects on the China's consumption of forest products as its market movements can make great changes in the tropical timber international trade.
 - To make further efforts to make available the results of this project for the international tropical timber trade.

(iv) FINAL CONCLUSIONS ON THE MISSION AND SUGGESTIONS

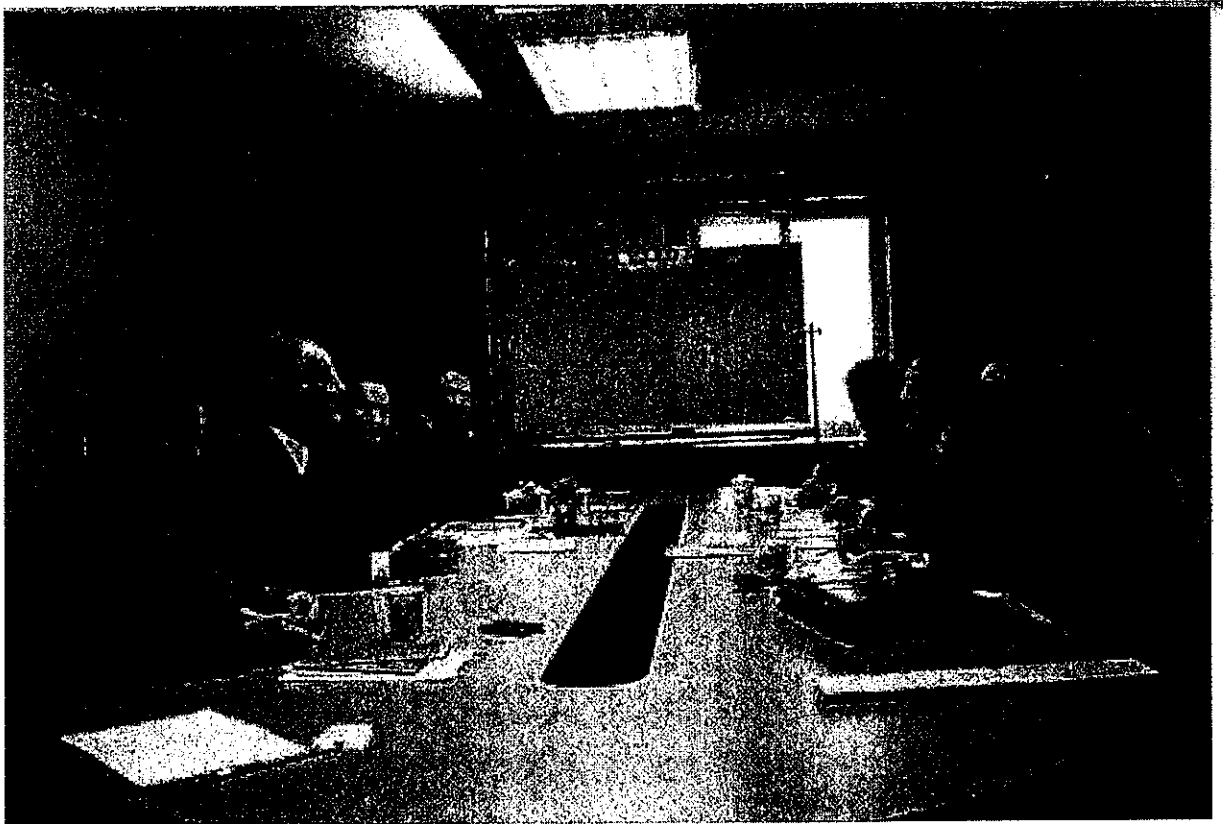
GENERAL FINDINGS ABOUT THE PROJECTS IMPLEMENTATION

The experience of evaluating five ITTO projects in The Popular Republic of China was for this Mission an unique opportunity of observing the projects' action and implementation in a different country like China with a very exclusive government system and recent history. As we execute projects in general it was possible to make interesting observations on this mission. In broad terms, we point out in the following paragraphs the main findings and observations of the evaluation mission in China:

- All the projects received due attention by institutions involved, which worked hard for the outputs.
- Minor changes during execution were normal for research.
- The Chinese forestry sector is well organized making a multiplication effect of the resources spent in research and development, included the ITTO ones.
- The State companies, in process of privatization, are efficient partners for the technology development, and the Institutes make good use of this condition, achieving their targets.
- It is in course a Country's big move, which will affect all areas of Chinese economy, including the Forestry Sector, with reflection in the international market. In a resumed appreciation, main components are:
 - an increase in the living standard of the population as a result of the economic opening of the political system,
 - a great increase of forest products demand; the use of timber and wood derivatives, in general, has strong roots in the Chinese culture,
 - the strong and hard floods of main big rivers in China brought the conclusion that was necessary to keep the river forest protection

- the strengthening of the need to preserve natural resources and forests;
 - in a political situation like China one Government decision, to preserve natural resources, for instance, is fast in becoming efficient; in that way, the decision to keep forest for the sake of river protection is really obeyed, decreasing the forest products supply;
 - the fast increase of external trade;
 - the diversification and specialization of the product demand;
 - the progressive privatization of production;
 - an increase in the demand for technical orientation and applied research by the companies;
 - a progressive call for the companies to support R&D with consequent pattern change of the Government funding.
- It was observed in general with some of the project teams, that some of them do not understand clearly the terms used in project formulation like, for example: specific objective and output, objectively verifiable indicator, development objective and others.

Project	Specific Objective	Output	Objectively Verifiable Indicator	Development Objective
Project 1
Project 2
Project 3
Project 4
Project 5
Project 6
Project 7
Project 8
Project 9
Project 10



The Evaluation Mission and CRIWI Director Kelin Ye (on the right) in visit to The International Network for Bamboo and Rattan. INBAR was suggested by the Mission to take part in Bamboo and Rattan follow up projects, still to be proposed, to make them more linked to general and practical applications.

▪ RECOMMENDATIONS FOR ITTO

As a contribution to the improvement of ITTO, the evaluators would like to propose the following:

- To seek a closer relationship with INBAR for a faster development of the two special NTFP- non-timber forest products, bamboo and rattan, defining a simple and common joint program.
- To study the formation of a project design bench with the objective of checking the project design and the adequacy between strategy and institution conditions, from the proposal. For doing this, ITTO could use the support of experts engaged in ITTO projects in a free basis. The suggestion is to build up a database of researchers involved with ITTO projects that could help in the appreciation of a project design. This suggestion is developed a bit further in the **Annex 2**.
- To prepare models of project formulation in the three ITTO areas for orientation of the institutions, in general, when preparing their proposals.

- To prepare creative forms of project formulation training, identifying, for instance, in one country, one best prepared technician and train further this person to give courses of project formulation.

	1984	1985	1986	1987	1988
1984	1000	1000	1000	1000	1000
1985	1000	1000	1000	1000	1000
1986	1000	1000	1000	1000	1000
1987	1000	1000	1000	1000	1000
1988	1000	1000	1000	1000	1000

ANNEX 1

INSTITUTIONS AND PEOPLE CONTACTED DURING THE MISSION

State Forestry Administration

Department of International Cooperation

Su Ming – Director

Shen Suhua – Director

Chinese Academy of Forestry

Zhang Jiurong – Professor

He Guangsen – Director

Yang Sulan – Senior Engineer

Research Institute of Wood Industry - Chinese Academy of Forestry

Kelin Ye – Director

Fu Feng – Researcher

Jiang Xiaomei – Professor

Jiang Mingliang – Researcher

Li Yudong – Deputy Director

Ruiqing Gao – Deputy Director

Yisheng Zhang – Professor

Man Zhen Xiong – Senior Engineer

Yin Yafang – PhD, Assistant Professor

Zhang Lifei – Professor

Liu Peng – Professor

Cheng Fang – Director

Yang Jiaju – Professor

Institute of Scientific and Technological Information - Chinese Academy of Forestry

Shi Kunshan – Director

Lin Fengming – Professor

Qi Lin – Deputy Director

Li Weidong – Deputy Director

Meng Yongqing – Deputy Director

Xu Zhisheng – M. S. of Forestry

Lu Wenming – Professor

Institute of Botany - Chinese Academy of Sciences

Jinxing Lin – Principal Research Professor

Hu Yuxi (Hu Yushi) – Professor
He Xinqiang –
Guo Zhongchen – Director

International Network for Bamboo and Rattan

Ian Hunter – Director
Chen Xuhe – Deputy Director
Maxim Lobovikov – Program Manager
Huang Shineng – Program Manager
Jin Wei – Assistant Manager
Wu Junqi - Program Manager

China National Forest Products Industry Corporation

Xu Kai Fa – Assistant to Chief Executive Manager

Bureau of State Farms of Hainan Province.

General Industrial Department

Lin Ze Chuan – Vice-Director

Xilian Factory Company

Yao Yong Wen –Director
Wang Yan Chuan – Assistante Director
Cai Yang Shon – Factory Manager

ANNEX 2

TWO PROPOSALS FOR ITTO:

Yaoundé, 1st of June, 2001.
Floriano Pastore Jr.

The first proposal: The ITTO Tropical Forest index

AN INDEX FOR TROPICAL FOREST PROTECTION, MANAGEMENT AND DEVELOPMENT:

The establishment of an index, similarly to the various United Nations indices, that would allow the comparison between countries as far as the general protection, management and development of tropical forests (TF) are concerned.

The following parameters could be evaluated under absolute and relative conditions. In this last case, should be related to one or more of the following: 1) the total area of the country; 2) the total area of tropical forest; and 3) the total population; or to parameters combining these ones (the following parameters to be evaluated are related to the tropical forest segment):

1. Forestry institutional (government) development;
2. Data, statistics and forest sector transparency;
3. Total area under protection;
4. Quality of the protection;
5. Total area under management;
6. Quality of the management;
7. Local population living on the forest resources;
8. Degree of local timber industrialisation;
9. Quality of the industrialisation processes;
10. Social spread of benefits in the production chains of forest resources.

The second proposal: THE ITTO EXPERTS DATABASE:

(Already included in the report of the ex-post evaluation of five ITTO projects in China, presented in Yaoundé, on the 30th of May, 2001.)

The formation of an ITTO ad hoc consultants database (**ACD**) including all the technical staffs of ITTO funded projects. These consultants could be asked to analyse a project's design and strategy in the very beginning of the proposal, even before the analysis by the Experts Panel. The ad hoc consultants would analyse the projects within their speciality, after the ITTO staff has had a general look on the project format to see if the project is complete and correctly formulated.

The ACD would not expend more than one day of work in the analysis. This consultancy work should be free of charge to ITTO, as hypothetically had already

agreed upon by the consultant institution when signed the ITTO project the ad hoc consultant is engaged with. These consultants could (or not) be invited to act as consultant during project execution and ex-post evaluation stages. It should be added that all project analysis and evaluation should carry on the signature of the evaluator or analyser. This suggestion could be extended to Experts Panel.

ANNEX 3

The ex-post evaluation of five projects in China - An article for ITTO Tropical Forest Update

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Anh Won-Yung, Seoul University, Korea, anhs@su.cr

From its beginning in 1986, ITTO has provided around US\$ 60 million for the implementation of some 200 projects and special activities like seminars and technical meetings. As ITTO kept herself as a small body, this is unquestionably a very impressive result. However, what are the changes for the tropical forests and for the tropical timber world economy all this intense effort is bringing about? There is a need to know and it is being established a trend in ITTO Council to have the ex-post evaluation of projects as a strong tool to provide that kind of answer, becoming an important instrument to feed back information for the project cycle improvement.

In this article we describe the ex-post evaluation of five ITTO projects in the Peoples Republic of China, following a decision taken by the Forest Industry and Forest Management and Reforestation joint Committee Session, held in Yokohama, in November, 2000.

For its market importance in the international scenario and for the political route China decided to take, this Country's movements are being observed and studied all around the world. From the central planned and state economy, China is gradually moving to a private and market economy, combined with strong estate planning. This, not completely defined, model may produce all kind of intrinsic difficulties, as the examples of individual freedom constrains known to happen there. Nevertheless, the recent history of the big Country is unequivocally being well written.

Some important components and trends that directly relates to the forestry sector can here be mentioned. First of all, the progressive freedom and strong increase of the economy leads to the growth of demand with specialisation and diversification of the market. Second comes the fact that the recent floods of the main rivers increased the consciousness for natural resources conservation; which here, in fact, brought about the decrease of the internal offer of forest products. Even though China keeps the tradition of widespread wood utilization. Among others, these are the components orienting the market and inducing a move to the international market for the supply of forest products.

This whole process needs reliable statistics. Although central planned, the "old economy" could not provide good data for the forestry sector. The main objective of Project PD 25/96 Rev.2 (M) - **China's consumption of forest products and its demand for them from the international market by the year 2010** -, was to start the building of that permanent information feeding system which is in great part the dream of every government planner. And to a great extend the project succeeded. From 1996 to 1998 the project team constructed an information network composed of 13 persons team based on all important timber consumer city in China. This people is deeply involved with the productive sector and act as a part time contracts with the project. This system is the main feeder of the Market

Information Centre, also an output of PD 25/96, located at the executing agency, Institute for Scientific and Technological Information - ISTI of the Chinese Academy of Forest - CAF. One of the main tools for the information spreading of this Centre is the Database of tropical Forest Products, an additional output of this ITTO project. With no fears of mistakes, is fair to say the financing of ITTO US\$ 178 thousand (by the government of Japan, with a complementary amount of US\$ 66 thousand by China's Government, was very well used, proving the condition for real positive changing in the country's reality.

The actual growing demand for forest products is also a good environment for the introduction of lesser known species - LKS, the object of work of Project PD 24/95 Rev.1 (I) - **The identification, properties and uses of the tropical timber imported to China from Latin America**, implemented by the Research Institute of Wood Industry - CRIWI.

The need to diversity the species and mainly to increase and diversify the number of suppliers, made the CRIWI team to go to Brazil and Peru to conduct an intense work of exchange, resulting in the collection of samples of 208 wood species. These species were described anatomically and, with the published data got from the existing publications, became the "the Latin American Tropical Wood Database System" in CD form. In addition to this three other outputs were produced within Project PD 24/95 Rev.1: the Handbook "Tropical Timber in the Latin American Region" (in Chinese), a booklet on those timbers for intense commercial diffusion and a training course for companies and government technical staff. A closer relationship of CRIWI team with great state timber corporations made amplified the Project results with plain achievement of objectives. The overall cost was US\$ 192,000, with ITTO contribution (from the Japanese Government) of US\$ 112,000.

From the fifties onward China started a consistent and intense programme of rubber plantations which set the country today as the fourth rubber producer in the world. The permanent renew of the plantations is becoming an important option for internal timber supply to face the Chinese growing demand. But preservation treatment and drying processes for rubberwood were out of date in comparison to the neighbours Malaysia and Thailand. PD 3/96 Rev.2 (I), **Development and extension of rubberwood processing and utilization technology**, implemented by CRIWI/CAF, had as main purpose a concentrated effort of modernization of the techniques already in use by the industry. The adaptation of existing technology to the country's was driven to decrease the use of PCP – pentachlorophenol banned in various countries but still in use in China. The decrease of this chemical production at a very fast rate has increased the prices from US\$ 0.60/kg to US\$ 1.90/kg of this project were in a larger number and supplanted the objectives. Besides the basic work of fungi and insect identifications the team worked closely to the Xilian Factory in Hainan Province, the biggest producer of RW timber in the Country. The PCP content of the formula decreased from level of 5-10% to 2 % nowadays. The seminar hold by the CRIWI team in the Province capital was effective to diffuse the

technologies and opened the doors for improvement of more than 30 companies. An specific study under this project PD 3/96 Rev.2 (I) evaluated the technical feasibility of producing rubberwood plywood with fire retarding agent.

Bamboo and rattan are very familiar to China and many of the Asian Countries. While the climby species know by the generic name of rattan find their main use as furniture and housing components, bamboo is much more versatile with more than 1500 documented uses after the International Network of Bamboo and Rattan - INBAR. These two group of species constitute the most important NTFP - non-timber forest products. Their importance resides on several factors inter alia: they are fast growing species and may be used for land stabilisation; farmers can grow them for permanent income source; their processing technology vary in broad spectra from the artcrafts level to the fast and automated process; they decrease the pressure on the natural forest. China's knows well these factors and make good use of bamboo and rattan. But their uses, most of the time, follow an expontaneous pattern as normally happens, to productions based on traditional non technical knowledge.

The Institute of Botany of the Chinese Academy of Sciences implemented two ITTO projects covering these two groups of species: In PD 20/95 Ver.2 (I)- **Chemical modification of bamboo culms and their resistance to weathering**, the executing agency succeeded in providing good studies on the anatomy and chemical treatment of 5 important commercial species. The objectives of applying 5 different chemical treatments and evaluate their effect on the weathering were reached. The objectives of diffusion of the technology to the productive sector was not effective because this kind of work depends on specialised team to be done. Besides that the selection of the chemical treatment has to take into account the end use of the treated bamboo. The radial penetration is not effective as in wood and the increase in weigh is not high. On the other hand, the penetration of chemicals through the longitudinal direction is effective but there are dimension restrictions due to the culm length.

The second project, PD 21/95 Rev.2 (I) - **Comprehensive studies of the structure and properties of rattans for effective utilization** produced good results. Two products were made available for the public: the first is a classification key for rattan commercial species based on macroscopic and anatomic descriptions; the second, is a table relating trade and scientific names, and the uses by country in west Africa and Southeast Asia. The Institute of Botany was asked to translate both outputs to English to allow the diffusion to users by ITTO, as suggested by the evaluators.

As main observations, it can be said that the ITTO projects under evaluation by this mission received due attention by the executing agencies with sound and positive results already in use by the beneficiaries. The still strong role of State in the productive sector has a beneficial effect as far as the technology diffusion is concerned, for the effectiveness of the decision flow. The final result is a more efficient application of research funds. Although the objectives were, in general,

attained, the evaluators made recommendations for improvement of projects results that should be paid attention for, and ITTO should look for their possible implementation specially those targeted for better spreading of results among the member countries.

Some of the general recommendations resulted from the evaluators to ITTO are registered here, opening the issues for discussions and suggestions. One is the identification of project documents examples in each main field of ITTO project activity, to be diffused as models with clarification of the main terms of proposal elaboration. A second suggestion would be the desirable approximation between ITTO and INBAR for a definition and operation of a simple and common action program. A third and last, but surely greatest in importance, is the proposal of formation of a "project design bench" with the objective of checking the project design and the adequacy between strategy and conditions for the implementation, still during the proposal stage. For doing this, ITTO could use the support of experts engaged in all projects on a free basis. In short, this suggestion would lead to the building up of an **ITTO researchers database**.

Recommendation	Responsible	Priority	Comments
1. Identification of project documents examples in each main field of ITTO project activity, to be diffused as models with clarification of the main terms of proposal elaboration.	Technical Services	High	Review project documents and identify key examples for diffusion.
2. Desirable approximation between ITTO and INBAR for a definition and operation of a simple and common action program.	Management	Medium	Initiate discussions with INBAR to find common ground for a joint program.
3. Formation of a "project design bench" with the objective of checking the project design and the adequacy between strategy and conditions for the implementation, still during the proposal stage.	Technical Services	High	Identify and engage experts from member countries to form a design bench.
4. For doing this, ITTO could use the support of experts engaged in all projects on a free basis.	Technical Services	High	Develop a framework for the design bench to ensure it operates effectively.
5. In short, this suggestion would lead to the building up of an ITTO researchers database.	Management	High	Develop a database to store information on researchers and their expertise.