

# **ITTO PROJECT**

**PD 56/99 Rev.1 (I):**

**PROMOTION OF THE UTILIZATION OF BAMBOO  
FROM SUSTAINABLE SOURCES IN THAILAND**

**PROJECT COMPLETION REPORT**

**2000 – 2004**

**ROYAL FOREST DEPARTMENT**

**FOREST MANAGEMENT AND FOREST PRODUCTS RESEARCH OFFICE**

**INTERNATIONAL TROPICAL TIMBER ORGANIZATION**

**(ITTO)**

**September 30, 2004**

**Bangkok, Thailand**

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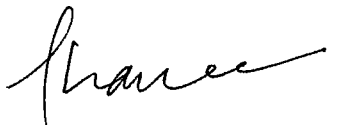
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## ACKNOWLEDGEMENT

The Royal Forest Department has received the support from the governments of Japan and the United States of America through the International Tropical Timber Organization (ITTO) to undertake the research and development project on Promotion of the Utilization of Bamboo from Sustainable Source in Thailand. The project covers the period from the years 2000 to 2004. The project has now been completed successfully. Although it has taken the team over three years to complete the study.

Needless to say that this project would have not been possible without generous support from ITTO. On behalf of the working team, I would like to convey our sincere gratitude for this. Special thanks are given to **Dr. Manoel Sobral Filho, Dr Emmanuel Ze Meka and Dr. Hwan Ok Ma, ITTO**, for their constant support during the entire course of the project.

For future projects and researches, my team will always be delighted to assist.



**Thanee Viriyarattanaporn**

Director, Forest Management and  
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## PROJECT IDENTIFICATION

- a) **Title :** Promotion of the Utilization of Bamboo from Sustainable Sources in Thailand
- b) **Serial Number :** PD 56/99 Rev. 1(I)
- c) **Executing Agency :** Forest Economics and Forest Products Research Office, Royal Forest Department.
- d) **Host Government :** Thailand
- e) **Starting Date :** October 2000
- f) **Actual Duration :** 42 months
- g) **Actual Project Costs :** 775,196 USD

## PART I: EXECUTIVE SUMMARY

### 1. Background Information About the Project

#### 1.1 Problem to be address

The Royal Forest Department (RFD) and International Tropical Timber Organization (ITTO) established the Pre-Project PPD 4/98 Rev.1 (I) Potential Non-Wood Forest Products. Four community forests were selected in the North, Northeast, South and West of Thailand to conduct surveys for potential forest products. Interviews were conducted with local people, technicians and government authorities to determine the potential of forest products. The result revealed that bamboo could be utilized, with the appropriated technology, for value-added production for such things as furniture parts, charcoal, and weaving. Bamboo shoot production should also be highlighted because it is a staple food of the people as well as an excellent product for income generation. Small-scale industry, which is practiced in China, should also be considered. RFD and ITTO realize the importance of bamboo, and therefore established the project PD 56/99 Rev. 1(I) Promotion of the Utilization of Bamboo from Sustainable Sources in Thailand, in order to meet the requirements of the pre-project.

#### 1.2 Specific objective

##### Specific objective 1:

To study the sustainable management of bamboo with the view of developing guidelines for improving sustainable harvesting.

##### Specific objective 2 :

To promote the efficient and diversified utilization of bamboo with the view of creating income sources for rural communities.

#### 1.3 Outputs

##### The main outputs were :

- Output 1.1 Establishment of two demonstration plots for sustainable management of bamboo.  
Areas : 5 ha / 5 species / plot  
Location : North (Chiangmai) and Northeast (Nakhon Ratchasima)
- Output 1.2 Development of guidelines for sustainable management of bamboo, including plantation and harvesting.
- Output 1.3 Technology transfer on bamboo plantation, management and utilization
- Output 2.1 Study on mechanical, chemical and wood working properties of five bamboo species.
- Output 2.2 Development of techniques for natural dyeing of bamboo handicrafts.

- Output 2.3 Establishment of a cottage industry for the production of bamboo furniture parts, including handicrafts in Chiangmai.
- Output 2.4 Development of a bamboo charcoal technique.
- Output 2.5 Development of processing techniques for bamboo shoots.

In addition, project has achieved other outputs which was not in actual plan as followed:-

- Output 2.6 Development of bamboo cement board and flooring.
- Output 2.7 Development of the bamboo sector.
- Output 2.8 The project has arranged the bamboo product design contest for young generation.

#### 1.4 Project Strategy

##### Strategy Implementation

The project is comprised of four components: management, utilization, training workshop and national conference.

**Management :** The project considers that bamboo planting is a key component in sustainable bamboo resource management. Five economical bamboo species were selected for planting at two demonstration sites. The first site was at the NWFP's Experimental Station in the Nakhon Ratchasima province. Its purpose was to study planting and harvesting techniques. In the future, it will serve as demonstration plots for training activities. The second site is at Mae Mae Community Forest in the Chiangmai province. At this site people participated in bamboo plantation establishment and management. This site will also serve as demonstration plots for those involved in bamboo plantation management.

**Utilization :** Research was conducted at RFD research laboratories concerning physical properties, chemical compositions, preservation, dying techniques, processing, charcoal making and bamboo products. The research results were presented in a special technical report.

**Training Workshop :** The project considers training as an important strategy to disseminate research results to communities and industries. A training course on bamboo weaving and furniture parts, charcoal making was offered to Mae Mae Community members, and the local community in Nakhon Ratchasima and Kanchanaburi provinces. It was taught by experts from Industrial Promotion Center, Rangsit University and RFD. A training workshop on sustainable management and utilization of bamboo was held in Nakhon Ratchasima province with the aim to disseminate the knowledge on bamboo cultivation and utilization to local people.

**National Conference :** A three-day national conference on bamboo was held in Chiangmai. The objective of the national conference was to further enhance the development of the bamboo sector and disseminate the knowledge on sustainable management and utilization.

### Planned Duration and Overall Costs

The planned project duration and overall costs were as follows:

DURATION :	4 years
STARTING DATE :	1 October 2000
PLANNED OVERALL COSTS :	Sources of financing USD
Government of Thailand	322,200 USD
ITTO	452,996 USD
Total	775,196 USD

## 2. Project Achievements

### 2.1 Output Achieved :

a) Two demonstration plots for sustainable management of bamboo were established at Mae Mae community forest in Chiangmai and NWFPs Experimental Station at Nakhon Ratchasima.

b) Guideline for sustainable management and utilization of bamboo, including plantation and harvesting were published (in Thai) as follows:

- Bamboo Cultivation and Management
- Bamboo Charcoal Technique
- Bamboo Weaving
- Bamboo Furniture Making
- Bamboo Protection
- Bamboo Cement Board Manufacturing

c) A training workshop on bamboo charcoal production, sustainable management and utilization, furniture parts and handicrafts was conducted at NWFPs Experimental Station and at Mae Mae Community Forest.

d) A final technical report on the research of bamboo management and utilization was published.

e) A women's group, a cooperative, and a cottage industry for the production of bamboo furniture parts and handicrafts was established at Mae Mae Community Forest.

f) A bamboo charcoal technique were developed.

g) A feasibility study on the establishment of a bamboo shoot factory was published.

h) The results of a group discussion on the Sustainable Development of Bamboo Resource was prepared.



## **2.2 Specific Objectives Achieved**

The study on sustainable management and diversified utilization of bamboo has been successfully developed. These techniques can be transferred to rural communities, which in turn will help them generate extra income.

## **2.3 Situation at the end of the Project**

Prior to the project activities, information and knowledge available on bamboo was limited. The rural communities were unaware of the appropriate technology for the efficient and diversified utilization of bamboo and its proper management. Now these procedures are available and can be transferred to the rural communities through the training course and its publications.

## **3. Target Beneficiary's Involvement**

The ultimate target beneficiaries of the project were the rural communities who are currently engaged in the collection, processing, storage and sale of bamboo products in Thailand. The rural communities will benefit with better income opportunities through bamboo production and utilization. In addition, the forest department authorities will have practical guidelines for the sustainable management and utilization of bamboo. The project will generate greater awareness among the planners, policy makers and especially among the bamboo workers and their organizations. The findings at the national conference will have wide ramifications to the bamboo industry all across the country. The attainment of the project objectives will ease pressure on the forest resources, thereby benefiting the country as a whole. Furthermore, other member countries of the ITTO, facing similar problems, will also benefit from the findings of this project.

## **4. Lessons Learned**

### **4.1 Development Lessons**

a) The development objective could only be attained in the project area. This project developed the technology for sustainable management and utilization of bamboo, however, these were implemented in a limited area. The development objective needs more time to achieve the set objective.

b) The project suffered from the problem of under design. The project document did not give adequate information in regards to the equipment needed and there was a lack of marketing line/research in order to determine potential products. The focus seems to be on technical output rather than social planning.

c) Selection of the project for establishing cottage industry is very important. As the people from rural area always move to town, the village selected should be near to other villages so that they can unite into the network and when the people from handicraft group move away these group can transfer technology to the neighboring. The group can go on their business. People in poor and remote areas were eager to participate in the project implementation with the hope of an improved standard of living but they need more assistants for budget investment and improve their marketing skill.

d) After project termination, RFD and ITTO should establish a project phase II in order to arrange training workshops on sustainable management and utilization of bamboo. These workshops will help industries and rural communities attain the development objectives. This bamboo information should also be provided to other bamboo projects being implemented by other countries.

#### 4.2 Operational Lessons

##### a) Project Organization and Management

- The project had a project management team comprised of a project director, project leader and technical staff. The project management team met regularly to plan and review the work and its progress.

- The project had several national experts and short term international experts; each dealt with different aspects of the project. Each expert worked with the appropriate technical staff concerned. At the end of the expert's mission, there was a discussion to ensure the result of the study.

- The project had some unexpected effects, the local people derived some socioeconomic benefits from other NWFPs besides bamboo. Upon the recommendation of the staff from the pre-project, the local people began earning extra income by collecting medicinal plants and seedlings of rare species.

- The overall impression of the technical and physical achievements of the project have been largely positive. The participatory development of local communities took longer than anticipated and especially the establishment of a women's organization and bamboo co-operatives in the poor and remote areas.

##### b) Project Documentation

The project collected information on bamboo research available both in and out of the country and prepared several internal technical reports and proceedings to document the project results. These technical reports and proceedings were posted on the project website [www.forest.go.th/bamboo](http://www.forest.go.th/bamboo).

c) Project Steering Committee (PSC) monitored the project. The PSC met once a year, and altogether three times, but the donor representatives had no time to attend the meetings. The chair of the PSC meetings changed every time because of the reconstruction of RFD. No evaluation has been planned for the project.

d) Roles and responsibilities of the institutions involved in the project implementation.

##### *Department of Industrial Promotion*

- Provide lecturer for the training course on bamboo weaving and furniture parts.
- Follow up the weaving activities in the Mae Mae community.
- Provide consultant for bamboo weaving.

#### *Rangsit University*

- Provide lecturer on bamboo designing and marketing.
- Arrange the bamboo products contest for the students.
- Provide architect and engineer for establishment of bamboo house.

#### *Chiangmai University*

- Provide consultant for bamboo shoot processing.

#### *Chiangmai Regional Forest Office*

- Facilitate the collaboration between the project and local community in Mae Mae Community Forest.

#### *Local Communities*

Local communities of Mae Mae Community Forest in Chiangmai, and the Community Forest in Karnchanaburi and Nakhon Ratchasima were involved in the project implementation. The consultation and negotiation was held in the Mae Mae Community Forest once every two months.

e) In order to avoid the variations between plans and actual implementation, the project used researchers of the RFD to be permanent staff members of the project in areas of their own expertise.

f) External factors which could have been foreseen

The rural community in Mae Mae could not continue the project activity during rainy season because they pick tealeaves during this time.

There is very high humidity in Mae Mae community forest, which is conducive of stain and fungi attacks on the bamboo products.

g) External factors which could not have been foreseen

RFD's renovation of the workshop took longer than expected due to the delay of purchased equipment from foreign countries.

## **5. Recommendations**

The following recommendations can be made in order to improve the effectiveness and efficiency of similar future projects.

5.1. Identification and design - More information should have been formulated concerning the equipment needed and product development.

5.2. Implementation - A well-planned project will stick to the scheduled times.

5.3. Management - Appoint a person with good leadership skills, and with the ability to lead an interdisciplinary project.

5.4. All PSC members and government policy makers should be encouraged to visit the project site during the mission review.

## PART II : MAINTEXT

### 1. Project Content

#### 1.1 Background

After logging was banned in Thailand in 1989, the forest products came mainly from non-wood sources (NWFPs). Bamboo is one such important non-wood product that generates employment and additional income to the rural people at the subsistence level. Bamboo has traditionally been used as: a construction material, wood fuel, food, furniture, musical instruments, gun-handles, kitchen utensils, and for weaving. The natural stands of bamboo in Thai forests have declined in recent times from excessive cutting, improper harvesting, and inadequate technical expertise of wastage utilization. Recently, several private and public enterprises have tried to establish bamboo plantations. However, they have been hindered from a lack of technical expertise in management, utilization, processing and marketing the value-added products. Thus, there is a clear-cut need to develop and propagate better quality bamboo products in order to improve their marketability and consumer appeal. This in turn will help rural people to generate more income and improve their standard of living.

#### 1.2 Development Objectives

The objective of this project is to develop and disseminate knowledge on sustainable management of bamboo and technologies, in order to promote its efficient and diversified utilization in Thailand for the socio-economic development of rural communities. It will also contribute to the conservation of the natural tropical forests in Thailand.

#### 1.3 Specific Objectives

- a) To study sustainable management of bamboo with the view to develop guidelines for improvement
- b) To promote the efficient and diversified utilization of bamboo with the view of generating income sources for rural communities

#### 1.4 Outputs

The main outputs of the project were :

##### Specific Objective 1

The national processing consultant, Mr. Kowit Sombun, completed his visit and his technical report, which was very informative and interesting. He gave advice on bamboo silvicultural practice to the research staff team.

**Output 1.1** Two demonstration and research plots were established for the sustainable management of bamboo. One at Ban Mae-Mae Community Forest in Chiangmai and another at NWFPs Experimental Station in Nakhon Ratchasima. Each plot is 5 hectare in size and contains five species. The five bamboo species

selected were *Bambusa sp*, *Bambusa blumeana* Schult, *Dendrocalamus asper* Back, *Dendrocalamus strictus* Nees and *Gigantochloa albociliata* Munro respectively.

**Output 1.2** Guidelines were developed for the sustainable management of bamboo. The guidelines on planting and managing bamboo were published separately and disseminated to the public in the Thai language.

**Output 1.3** RFD has organized a training workshop on sustainable management and utilization of bamboo at NWFPs Experimental Station. The workshop was to facilitate the technology transfer of bamboo plantations, management and utilization. There were 30 participants and six observers as shown in the report of the training course on management and sustainable utilization of bamboo.

## **Specific Objective 2**

### **Consultant Employment**

The international processing consultant, Prof. Walter Liese from Germany, completed his first visit from March 31<sup>st</sup> to April 10<sup>th</sup>, 2001 and his second from the 12<sup>th</sup>-16<sup>th</sup> of July 2001. He reviewed literature concerning bamboo utilization in regards to protection. He gave advice on research methodology and made suggestions on bamboo utilization to the project staff. He gave a lecture on bamboo preservation to the RFD officials and also attended the first PSC meeting and made many valuable suggestions to the project.

The international charcoal consultant, Dr. Kenji Hosokawa, completed his visit during 11<sup>th</sup> - 22<sup>nd</sup> of December 2001. He reviewed the literature on bamboo charcoal technique and utilization. His technical report was very informative and interesting. He gave several recommendations for improving the existing charcoal kiln.

The international marketing consultant, Dr. Florentino Tesoro, completed his visit in September. He had studied the market and potential products in Thailand and gave recommendations on the equipment needed.

The project has hired a part-time national bamboo shoot consultant, Dr. Charin Techapun, for 6 months to conduct a feasibility study on the establishment of a bamboo shoot plant in Chiangmai. His technical report was both interesting and informative.

The project also hired Mr. Anuchat Buranapimp, who is a weaving consultant. His purpose was to help develop products that could meet the market demand by teaching and setting up the cottage industry. This was accomplished by teaching weaving for furniture parts and the dyeing technique.

**Output 2.1** Research was completed on the following: the mechanical and physical properties of bamboo, bamboo protection, and the improvement of bamboo charcoal techniques, bamboo flooring, and the affects of pretreated bamboo on bamboo cement board. The findings of these studies were published separately in the final technical report.

### **Output 2.2 Research on Natural Dyeing for Handicrafts**

The research on the development of techniques for natural dyeing of bamboo handicrafts was completed and the results were published separately in the final technical report.

### **Output 2.3 Establishment of Cottage Industry for Bamboo Production**

RFD conducted a training course on bamboo furniture parts and handicraft in Ban Mae-Mae, Chiangdoa, in the Chiangmai province. After the training course, the cottage industry was established in Mae-Mae under the assistance of the project staff. The organization is called the Mae-Mae Women's Bamboo Handicraft Group and the Sustainable Utilization of Bamboo Co-operatives were improved from the cooperative called hydro-power cooperative which was not active at the moment at this village as well. The village can earn extra income from these value-added handicrafts. The technical report on the women's participation at the project site of Mae-Mae Community Forest was published separately in the final technical report.

### **Output 2.4 Development of Bamboo Charcoal Techniques**

The project staff organized a study tour at Japan's Kyoto University to visit the Kamigamo Experimental Forest, and the wood research institute at Uji city. This tour included visits to charcoal factories at Kansai Corporation, KCP company, Kyotikutan and Kyo-chikutan. RFD gain a great deal of benefit from this study tour as reported in the Bamboo Charcoal Technique in Japan. The project organized a short training course on bamboo charcoal production technique during the 18<sup>th</sup>-20<sup>th</sup> of February 2003 at the NWFPs Experimental Station in the Nakorn Rachasima province. There were 20 trainees from Mae-Mae Community Forest and Ban Klangdon. They were trained in both the theory and practice of making a charcoal kiln to produce bamboo charcoal and vinegar. As recommended by a consultant, the project also developed an improvement in the technique of bamboo charcoal making. The results were published separately in the final technical report.

### **Output 2.5 Development of Techniques for Processing Bamboo Shoots**

The project attended the training course on bamboo handicraft techniques with its tools and small machines in Zhejiang Sichuan of China, which was organized by INBAR.

The project staff gained a great deal of benefit from the theory and on the job training studied during this tour. The tour visited several kinds of bamboo industries including shoot harvesting and processing. The results of which are in the international course on bamboo handicraft techniques and its tools and small machines was published in the proceeding. The project also conducted a feasibility study on the establishment of a bamboo shoot plant in Chiangmai. The report was published separately. The research results for bamboo shoot product development was very fruitful.

In addition, project has achieved other outputs which was not in actual plan as followed:-

#### **Output 2.6 Development of Bamboo Cement Board and Flooring**

The project hired a marketing consultant to study the market for potential bamboo products in Thailand. According to his recommendation, the project has done the necessary research on bamboo cement board and flooring and the results were published in the final technical report separately.

#### **Output 2.7 Development of the Bamboo Sector**

The project held a national conference on the development of the bamboo sector during the 24<sup>th</sup>-26<sup>th</sup> of March 2004 in the Chiangmai province. There were 300 participants who attended the conference. The participants were comprised of policy makers, researchers, farmers, industries and universities. They gave several good recommendations for the development of the bamboo sector.

The project staff also attended the world bamboo conference in India.

The project has produced a promotion video of their activities in Phase I.

**Output 2.8** The project has arrange a bamboo product design contest for the young generation. It is envisaged that the young generations are interested in utilizing bamboo for different products from their own creative ideas that meet with the present economic and marketing situation. They are interested in the environment and accept the benefit from the forest as an essential asset for human well beings.

#### **Dissemination of the Project Output**

The project transferred the knowledge on sustainable management and utilization of bamboo through the following activities:

##### ***Training Course***

The project organized a training course on bamboo furniture parts, handicrafts, bamboo charcoal production techniques and sustainable utilization and management of bamboo at Mae-Mae community forest and NWFPs Experimental Station. The participants were comprised of rural people from Nakhon Ratchasima, Chiangmai and Karnchanaburi provinces. After the training course, the project assisted in the establishment of a bamboo cottage industry in the Mae-Mae Community Forest. Also with the assistance of the project, a women's organization and co-operatives were setup in this area.

Further more the participants from Karnchanaburi and Nakhon Ratchasima provinces, produced bamboo furniture to be sold in the village , which will provide extra income for their families. The participants from Chiangmai, which were interested in bamboo charcoal production, have established a charcoal stove to produce bamboo charcoal products. These activities demonstrate the people's great interest in bamboo production.

### *Conference*

The project organized the national bamboo conference in Chiangmai and shared the research results and guidelines on bamboo management and utilization to the participants. After the workshop, the project received invitations from Prachinburi, Chiangrai and Prae provinces to disseminate the knowledge learned from sustainable utilization and management of bamboo in the form of a training course.

### *Study Tour*

There were many groups of students, academics, rural people and community leaders who toured the NWFPs Experimental Station in order to observe the bamboo utilization and plantation project.

### *People Participation*

The project participated and gave technical information of bamboo cultivation in many districts such as Nakhon Ratchasima, Karnchanaburi and Chiangmai provinces.

### *Publications Contributed*

The project contributed 2,000 sets of the guidelines on bamboo management and utilization as requested. There is a need to produce in order to meet the high number of requests.

In addition, the project has created a web site, [www.forest.go.th/bamboo](http://www.forest.go.th/bamboo) for the dissemination of the project activities, proceedings and internal technical reports for the public. Further more, the project has published the research results in the final technical report for universities, institutes, industries as well as to other ITTO country members.

In conclusion, within the timeline, the project has disseminated the output successfully.

## **1.5 Project Strategy**

### **Implementation Strategies**

The project was comprised of 4 components: management, utilization, conference and training.

**Management** The project considers that bamboo planting is a key issue in the sustainable bamboo resource management. Therefore, 5 economical bamboo species were selected to plant at 2 demonstration sites. The first site was at the NWFPs Nakhon Ratchasima province, which is in the Northeast. Its purpose was to study planting and harvesting techniques. In the future, it will serve as demonstration plots for training purposes. The second site was at Mae Mae Community Forest in the Chiangmai province. People here participated in establishing and managing a bamboo plantation. These will also serve as demonstration plots when people train in this area of expertise.

**Utilization** Research was conducted at many research laboratories concerning bamboo chemical and physical properties, its protection, dying techniques, processing and charcoal making etc. The research results will be presented in special technical reports.



**Training workshop** The project considers training as an important strategy to disseminate research results to communities and industries. A training course on bamboo weaving, furniture parts and charcoal making was offered to Mae Mae Community members and the local community in Nakhon Ratchasima and Karnchanaburi provinces. The course was taught by experts from the Industrial Promotion Center, Rangsit University and the RFD. A training workshop on sustainable management and utilization of bamboo was held in Nakhon Ratchasima province with the aim of disseminating the knowledge on bamboo cultivation and utilization to local people.

**Pilot Project for Socio-economic Development** The project disseminated the knowledge on bamboo management, bamboo weaving, furniture parts and charcoal techniques to Mae-Mae community forest. It also established a cottage industry and a women's association.

**Final National Conference** A three-day national conference on bamboo was held in Chiangmai. The objective of the national conference was to further enhance the development of the bamboo sector and disseminate the knowledge gained the project on sustainable management and utilization.

### 1.6 Work Plan

The Project Agreement between the Royal Forest Department and the ITTO was signed on the 21<sup>st</sup> of June 2000. A project work plan was prepared and submitted to ITTO. ITTO transferred the first installment of project funds to the project bank account in Bangkok on the 19<sup>th</sup> of September 2000. The effective start date of the project was on the 1<sup>st</sup> of October 2000. The project implementation followed what had been planned. The work plan was revised 5 times. The revised work plans are as shown in Table 1.

The Project were extended 12 months from the 1<sup>st</sup> of October 2003 to the 30<sup>th</sup> of September 2004.

**Table 1 Revised Work Plan (V)**

Outputs/Activities	Oct 2000 – Sep 2001			Oct 2001 - Sep 2002			Oct 2002 - Sep 2003					
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
<b>Specific objectives 1:</b>												
1. Preparation of TOR for management consultant												
2. Provision of Project vehicle												
<b>Output 1.1</b>												
Activity 1.1.1: Identification of two demonstration plots in the north and northeast of Thailand												
Activity 1.1.2: Establishment of two demonstration plots for sustainable management of bamboo: site preparation												
Activity 1.1.3: Selection of 5 suitable bamboo species for each plantation site by surveying of markets to find out local and national (as well as international) needs for basic consumption, production and marketing												
<b>Output 1.2</b>												
Activity 1.2.1: A literature review on sustainable management of INBAR, FAO and other source												
Activity 1.2.2: Conduct research on sustainable management of bamboo (plantation, management, silviculture, harvesting)												

**Table 1 Revised Work Plan (V) (continue)**

Outputs/Activities	Oct 2000 – Sep 2001			Oct 2001 - Sep 2002			Oct 2002 - Sep 2003																		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
<p>Activity 1.2.3: Publication of guidelines on sustainable management of bamboo (in Thai)</p> <p><b>Output 1.3</b></p> <p>Activity 1.3.1: To conduct a training workshop on sustainable management and utilization of bamboo in Thailand</p>																									
<p><b>Specific objectives 2:</b></p> <p>1. Preparation of TOR for processing consultant</p> <p>2. Provision of training equipment</p> <p>3. Provision of machinery and laboratory Equipments</p> <p><b>Output 2.1</b></p> <p>Activity 2.1.1: Literature review on basic properties of bamboo from INBAR</p> <p>Activity 2.1.2: To collect sample specimen for potential bamboo species for commercialization</p> <p>Activity 2.1.3: To conduct research on bamboo properties in term of mechanical, chemical, physical, protection, drying and seasoning</p> <p>Activity 2.1.4: To prepare a report on bamboo properties in term of mechanical, chemical, physical, protection, drying and seasoning</p> <p><b>Output 2.2</b></p> <p>Activity 2.2.1: To develop on natural dying technique of bamboo handicraft</p> <p>Activity 2.2.2: To prepare a report on natural dying techniques of bamboo handicraft parts</p> <p><b>Output 2.3</b></p> <p>Activity 2.3.1: To organize short training courses on bamboo furniture parts and handicraft</p> <p>Activity 2.3.2: To conduct short training courses on bamboo furniture parts and handicraft</p> <p>Activity 2.3.3: To establish a small bamboo cooperative</p> <p>Activity 2.3.4: To set up a housewife Organization for Bamboo handicrafts in Chiangmai</p> <p><b>Output 2.4</b></p> <p>Activity 2.4.1: To conduct a literature Survey</p> <p>Activity 2.4.2: research Study tour to the forest institute and Kyoto University in Japan (4 people)</p> <p>Activity 2.4.3: To develop bamboo charcoal technique</p> <p>Activity 2.4.4: To conduct short training courses on bamboo charcoal technique in 2 project sites (1week)</p> <p><b>Output 2.5</b></p> <p>Activity 2.5.1: Study tour to South China on preservation bamboo shoot and packaging of bamboo shoot products(4 people), in corporation with INBAR</p> <p>Activity 2.5.2: To conduct a feasibility study on establishment of a bamboo shoot plant in Chiangmai</p> <p><b>Output 2.6</b></p> <p>Activity 2.6.1: To establish bamboo house</p> <p>Activity 2.6.2: To do research on bamboo products processing</p>																									

### 1.7 Required inputs.

The required project financial inputs (with the modifications approved by ITTO and ITTC Yokohama 2000 Session) were from the ITTO and the government of Thailand (Table 3)

**Table 3 Project financial inputs.**

Budget Component	Total	
	ITTO	GOV. OF THAILAND
Project personnel	115,650	277,200
Subcontract	41,800	-
Duty travel	41,530	-
Capital item	92,000	45,000
Consumable	33,000	-
Miscellaneous	10,000	-
ITTO Admin. Monitoring and evaluation	28,930	-
Refund of Preproject costs	89,886	-
<b>Grand Total</b>	<b>452,996</b>	<b>322,200</b>

The project human resources are as shown in Table 4

**Table 4 Human Resources**

Human Resources	Number
Project Director (Co-ordination) (Also serve as physical and mechanical expert)	1
Project Leader	1
Assistant project leader (Also serve as chemist)	2
International processing consultant	1
International charcoal consultant	1
International marketing consultant	1
National bamboo weaving consultant	1
National bamboo management consultant	1
National bamboo shoot processing	1
Physical and mechanical properties staff	3
Charcoal processing staff	2
Chemist (Serve as assistant project leaders)	2
Bamboo protection staff	3
Biologist	1
Workshop participants	54
Driver	1
Labors	4
Students from Rangsit University	35
Lecturer : Bamboo weaving and furniture parts	5
: Bamboo charcoal production technique	4
Office assistant	3

## 1.8 Project Rational

Bamboo resources, which used to be adequate and sustainable in the past, have quickly declined due to over cutting, improper harvesting methods and a lack of technical expertise in its efficient utilization. Illegal cutting of bamboo in forest areas has also become more restricted. In this last decade, a number of public and private enterprises interested in the establishment of bamboo plantations on their own lands has substantially increased. However, many farmers lack the technical knowledge needed in cultivating and managing bamboo farms. They also lack the methodology and means to develop and produce bamboo products in a value-added way.

Information on the basic properties of Thai bamboos, particularly in relation to their industrial application, is limited. There are difficulties faced by the users in processing and mechanically fabricating bamboo due to its physical characteristics. They vary in dimensions such as the crookedness of the culms, the non-uniformity of internodes and the unevenness of the taper. Since many bamboo species remain unutilized, research efforts are needed to determine the properties of each species and develop the appropriate utilization technology.

The processing of bamboo shoots has not yet developed to the extent as the Chinese bamboo shoot industry has, which produces an annual total output of 250,000 tones of caned shoots in over 700 factories.

There is also a need to provide short-term training in the production of popular bamboo products. The treatment of bamboo for an example, the procedures are relatively labor intensive on traditional devices with old technology and low production capacities. The usage of jigs and efficient mechanisms is still limited and most local manufacturers have to rely on existing designs or copies from other sources. Extension services of the current technology should be provided via workshops, dialogue or demonstrations. These should be periodically upgraded to improve existing skills with the view of promoting the quality of the products and the diversified utilization of bamboo.

Given the fact that bamboo has proven to be a vital resource in terms of its contribution to the rural economies and ecological stability of Thailand, its utilization must be sustainable. This is because the socio-economic and environmental conditions of the people with the forestlands are weak and unsustainable. Further improvements to the sustainable management of bamboo and the production of bamboo products can be obtained by the immediate attention to several of problems it currently faces.

## 1.9 Preparatory Activities

RFD and ITTO has established PPD 4/98 Rev.1(I) Potential Non Wood Forest Products. Mae Mae Community Forest was selected and studied. The result revealed that bamboo in this area should be utilized for value-added production. Therefore, the project selected this commune to be the project site.

## 1.10 ITTO Context

The following sections (1.10.1 to 1.10.4) were excerpted from the project-document of PD 56/99 Rev. 1(I)

### (1) Compliance with ITTO Objectives

The project is consistent with the objectives, established in Article 1 for the ITTA 1994: to promote and support research and development with the view of improving forest management and the efficiency of wood utilization as well as increasing capacity to conserve and enhance NWFPs values in timber producing tropical forests. It will also have peripheral beneficial effects on the attainment of other objectives listed in the ITTO as the project will promote the collection, processing, utilization and marketing of NWFPs on a sustainable basis and therefore become an integral part of sustainable forest management in Thailand.

a) To provide an effective framework for consultation, international cooperation and policy development among all members with regard to all relevant aspects of the world timber economy.

c) To contribute to the process of sustainable development.

f) To promote and support research and development with the view of improving forest management, and the efficiency of wood utilization, as well as increase the capacity to conserve and enhance other forest values in timber producing tropical forests.

g) To develop and contribute towards mechanisms for the provision of new and additional financial resources and expertise needed to enhance the capacity of producing members to attain the objectives of this agreement.

h) To promote the increase and further processing of tropical timber from sustainable sources in producing member countries, with the view of promoting their industrialization and thereby increasing their employment opportunities and export earnings.

### (2) Compliance with ITTO Criteria

The project is submitted in accordance with the criteria set in Article 23 of ITTA as follows:

a) The project is related to the production and use of industrial forest products.

b) It should yield benefits to the tropical timber economy as a whole and be relevant to both producing and consuming countries.

c) It should be related to maintaining and expanding the international trade in tropical timber.

d) It should offer reasonable prospects for positive economic returns in relation to cost.

### **(3) Relation to ITTO Action Plan and Priorities**

The project is consistent with the organization's priorities in the field of reforestation and forest management in the ITTO Libreville Action Plan.

**Goal 1 :** Support activities to secure the tropical timber resource base.

1. Review current and potential productivity of major tropical forest types.
2. Encourage and assist members, as appropriate, to establish and manage forests for multiple use in close cooperation with local forest owners and communities living in forest areas.

**Goal 2 :** Improve the tropical timber resource base.

1. Develop the concept of forest biological health and sustainable production potential, particularly at forest stands and landscape levels. Incorporate these into guidelines for forest management plans.

The project is also consistent with the organization's priorities in the field of forest industry in the ITTO Libreville Action Plan.

**Goal 1 :** Promote the increase and further processing of tropical timber from sustainable sources.

1. Assist in the promotion and transfer of new and/or improved techniques and technologies.
2. Assist in human resource development and institutional strengthening by designing and consulting national and international events such as specialist workshops and seminars and by the provision of fellowships.
3. Encourage and assist members as appropriate to :
  - Formulate research and development proposals which assist with the piloting and commercialization of new processing and manufacturing technologies
  - Organize workshops/seminars on the use of new and/or improved techniques, technologies and the development, testing and adoption of guidelines

**Goal 3 :** Improve the efficiency of processing of tropical timber from sustainable sources.

3. Commission and publish analytical studies that identify critical knowledge and information gaps as a precursor to research and development activities on improved efficiency at all stages.
4. Assist in the promotion, transfer and adoption of new and/or improved techniques and technologies through publications and other media such as workshops, seminars and fellowships.

#### **(4) ITTO aspects**

As stated before, the objectives of the project are consistent with ITTO objectives and the priorities of the ITTO Action plan. Since the success of the project will also benefit the other ITTO member countries, it is requested that appropriate funding be provided through the Special Account of ITTO.

## **2. Project Context**

The following text was excerpted from the project Document of PD 56/99 Rev.1(I).

The national development objectives and plans to the relevant sector are described below.

### **2.1 Relevance to national policy**

Forest conservation is a national policy being currently implemented vigorously by the Government. There have been a number of measures adopted in recent years designed to address this issue. From among them, the following could be highlighted :

- a) Logging was banned from 1989 until the present time.
- b) The export of logs and timber was banned.
- c) The launching of the national forestation program.
- d) Fifteen percent of the country's forests have been set aside for production.
- e) Generate income for the urban area.

This project also conforms to the current national policies of the Thai Government, which relate to the following regulations.

The 8<sup>th</sup> National Economic and Social Development Plan (1997-2001). Objectives of the Plan (3) & (4) are to enhance the sustainable use and development of the remainder of all natural resources to benefit the economy and a better quality of life.

The Thai Forest Sector Master Plan: Forestry sector policy objectives (1.3) & (1.4) are to meet the national needs from domestic sources and to help to increase the income of the local communities and strengthen the national economy.

### **2.2 Relevance to NESDP VIII**

The project will support the National Economic and Social Development Plan VIII in increasing extra income for the rural people. This will be accomplished by interpolating NWFPs sources in forest plantations, farm and community forests and in the tree farming program which was launched in 1996.

### **2.3 Technical and Scientific Aspects**

Practical guidelines for improving management of bamboo shall be developed. These guidelines will include prescriptions on plantations, silviculture and harvesting for commercially important bamboo species.

The laboratory work will focus on basic properties such as physical, chemical, mechanical, preservation and dyeing of five commercial bamboo species for commercialization in furniture parts, weaving and charcoal making. A study of physical and chemical treatment of selected bamboo species for strength and durability will also be conducted. Further, utilization techniques of bamboo charcoal and processing techniques of bamboo shoots shall be studied. No study of this kind has ever been conducted in Thailand ever before.

A study on weaving techniques and improvements will also be conducted because technical aspects have not yet received adequate attention in the case of handicrafts. Many studies have focused on the socio-economic aspects of bamboo development.

In order to develop guidelines and conduct the proposed project activities, it will be essential for the project to study previous research results and to cooperate with the INBAR in China. The Chinese bamboo industry is famous for its quality, variety and efficiency in material-use. The project needs to learn significantly from the Chinese experience. Further, it will be important for the project to learn the advanced research methods in modification and preservation of bamboo and bamboo charcoal techniques from the Forestry and Forest Products Research Institute (Wood Technology and Chemistry Divisions) and the Wood Research Institute at Kyoto University in Japan.

#### **2.4 Economic Aspects**

Taking into account the vast areas of bamboo in Thailand, the economic, social and environmental benefits that could be derived through proper utilization are enormous. For example, in 1994 an area of about 60,000 hectares of bamboo forest [*Phyllostachys heterocycla* var *pubescens* (Mazel) Ohwi] situated in the Anji county of China, generated a total production of about 110 million USD from 1,200 factories processing culms and shoots.

This project will help the rural communities to earn a subsidiary income from their activities. It is also likely to help the cooperators in the bamboo industry, as their income levels are likely to grow as well. By developing the appropriate techniques for bamboo charcoal, Chiangmai could satisfy the regional demand for this product and the surplus production could be sold on the national market.

#### **2.5 Environmental Aspects**

With the realization of the project objectives, less timber is expected to be extracted from the forests. In addition, the communities close to the forest resources will have better environmental opportunities through improved management practices of bamboo resources and bamboo charcoal utilization. Since these local communities depend so much on the forest resources for their livelihood, the pressure on the forest will be considerably less. These solutions will have a positive environmental impact.



## **2.6 Social Aspects**

The local communities will be major participants in the realization of the project's objectives. They will be taught the practical methods of bamboo farming and utilization. They are expected to be the main suppliers of bamboo culms to the industry for furniture, weaving products and handicrafts. This is predominately a women's industry. This traditional industry has an important role in terms of overall employment, as well as for the larger proportion of women employed in the rural communities. The project will assist in the establishment of a bamboo village in Chiangmai for the production of bamboo furniture parts, weaving products and handicrafts. The output from this project would provide feedback to the national policy, NESDP VIII and the economy of the country.

## **3. Project Design and Organization**

### **3.1 Adequacy of results in the identification phase**

The project proposal is based on the recommendations derived from the pre-project. As Thailand has banned logging, bamboo can be used as an alternative raw material for housing, equipment, utensils and so on. This is an ideal time to provide the information on the technology of bamboo reforestation and utilization because of Thailand's lack of knowledge on the proper techniques.

### **3.2 Conceptual Foundation**

The project concept was well defined in the project document, however, the research on sustainable management needed a longer period other than what had originally been scheduled.

### **3.3 Time and Other Resources**

The project had to extend 12 months because of PSC's recommendations to organize the national bamboo conference and improve the technical report. No additional financial inputs were required.

### **3.4 Roles and Responsibilities**

There were no problems of roles and responsibilities of other organizations because RFD was responsible for most of the work. Only some parts of the activities were other parties involved. Throughout the project, good co-operation was practiced by all the participants involved.

### **3.5 Beneficiary Involvement**

a) The direct beneficiaries of the project are the rural communities who are engage in the collecting, storage and sale of the bamboo products. They gain better income opportunities through bamboo production and utilization.

b) RFD: To provide guidelines for sustainable management and utilization of bamboo.

c) Policy makers: To develop and evaluate strategic and forest management policies at the national level.

#### **4. Project Implementation**

##### **4.1 Difference between planned and actual project implementation**

a) The procurement of equipment is currently under processing because the RFD has renovated the workshop. In addition, PSC has agreed to hire the marketing consultant to assess market conditions. Before the purchase of the equipment can be completed, the consultant will identify potential products and the equipment necessary for its manufacture.

b) The research on sustainable management of the bamboo plantation needed a longer period other than the 3 years originally scheduled.

c) The project has achieved more output than actual plan.

##### **4.2 Actions which could have avoided variations**

a) There should have been a marketing consultant for the project to identify potential products at the beginning.

b) There should have been a second phase for studying sustainable management of the plantation and improve the cottage industry in the project site.

##### **4.3 Assumptions**

There was a lack of information and skills to develop the appropriate technologies for efficient and diversified utilization of bamboo raw materials. This was solved by employing a consultant and adopting the technologies developed by INBAR and other countries through the study tours to China and Japan. Other sources of information, such as publications, were studied in order to address this problem.

##### **4.4 Sustainability after project completion**

The project has established two demonstration plots and a training unit for the sustainable management in order to provide guidelines on management and utilization.

##### **4.5 Appropriateness of project inputs**

Project inputs were appropriate and adequate.

#### **5. Project Results**

##### **5.1 Technical report and guideline on sustainable management**

The project has published the technical report on the experiment of sustainable management of bamboo and the guidelines on sustainable management. These will assist farmers and illustrate the establishment of the demonstration plots of the bamboo plantation at Nakhon Ratchasima. It is also expected to be used as a technology transfer site upon the completion of the project.

## **5.2 Technical report and guidelines on sustainable utilization**

a) The project has published the technical report on bamboo properties in terms of mechanical, physical, and chemical compositions. Also included in the report is dying techniques and the protection of bamboo. The purpose of this report is to disseminate the knowledge on sustainable utilization of bamboo.

b) A feasibility study on the establishment of a bamboo shoot factory in Chiangmai was published. Three types of bamboo shoots were used. The villages have a high potential of establishing and running a cottage industry shoot factory by using the appropriate technology.

c) A technical report on the techniques for the improvement of bamboo charcoal was also published. A demonstration kiln was established at the technology transfer site.

d) A technical report on bamboo flooring and pretreated bamboo affecting bamboo cement board was published. The equipment for this project was setup at the bamboo training center in the Rachburi province.

e) The project prepared guidelines on furniture making, weaving, protection, charcoal production, bamboo cement board manufacturing and bamboo planting and management, which was published separately.

## **5.3 Socioeconomic Development**

At the project site, Mae Mae Community Forest, the training workshop on bamboo furniture parts and handicraft was organized. At NWFPs Experimental Station at Nakhonratchasima, the workshop on bamboo charcoal production technique was organized. After training, both trainee and lecturer followed up their activities. The project assisted the villager to establish a cottage industry and set up the Mae Mae bamboo handicraft women's group. The project also improved the in-active co-operatives which was called hydro-power cooperative into Sustainable Utilization From The Forest Co-operatives and include bamboo activity in the new cooperative. The Mae Mae bamboo handicraft women's group is one of the activities in these co-operatives. The villager can now earn extra income from the value-added handicrafts. The project needs to continue in order for it to make a stable source of income for the rural people. The project has published the technical report on women's participation at the Mae Mae Community Forest project site.

## **5.4 Bamboo Promotion for the Younger Generation**

The project held a bamboo products design contest for the younger generation at the university. The aim of the contest was to promote bamboo products utilization amongst the younger generation.

## **5.5 Bamboo House for Demonstration**

A bamboo house was constructed at the Mae Mae Community Forest in the Chiangmai province for demonstration.

## **5.6 Training Center**

The project has also established a training center for bamboo management and utilization, which can be used for training the farmers or industries. However, it needs more input in order to improve the transfer of technology.

## **5.7 National Conference**

The project held a national conference on Bamboo in 2004 called The Sustainable Development of Bamboo Resources. The results of the group discussion at the conference can be used for the National Action Plan in the future.

## **5.8 Project Website**

The project has produced a website at [www.forest.go.th/bamboo](http://www.forest.go.th/bamboo), which is comprised of the project context and all internal papers.

Researchers, community forests, stakeholders, universities and others are expected to be able to take advantage of this research. The government may be able to improve the socio-economic level of the local people by transferring this technology learned from the RFD.

## **6. Synthesis of the Analysis**

### **6.1 Specific Objective (s) Achievement**

Realized

### **6.2 Output**

Realized

### **6.3 Schedule**

Delayed, not seriously

### **6.4 Actual Expenditure**

As planned

### **6.5 Potential for replication**

Modest potential

### **6.6 Potential for scaling up**

Modest potential

## PART III: CONCLUSION AND RECOMMENDATIONS

### 1. Development Lessons

- The development objective could only be attained in the project area. This project developed the technology for sustainable management and utilization of bamboo. However, these goals cannot be realized by only implementing them in limited areas. The development objectives need more time in order to be accomplished. A national budget allocation is needed in order to follow up the activities. In addition, a training course on sustainable management and utilization for other rural communities should be arranged in order to attain the development objectives. Bamboo information should be provided to other bamboo projects being commenced in other countries.

- The project suffered the problem of under design. The project document did not give adequate information on the equipment needed. In addition, there was a lack of marketing research in order to determine potential products. The work plan had to be revised in order to fit the activity. In formulating the project proposal, the capital item should have adequate information on the equipment needed and should identify potential products properly.

- There were no apparent problems within the organization.

### 2. Operational Lessons

#### *Project organization and management*

- The project had a project management team comprised of project director, project leader and technical staff. The project management team met regularly to plan and review the work and the progress.

- The project had several national experts and short term international experts, each dealing with different aspects of the project. Each expert worked together with the technical staff concerned. At the end of the expert's mission, there was a discussion in order to ensure the result of the study.

- The project had some unexpected effects, such as the local people deriving socio-economic benefits from other NWFPs besides bamboo. Upon the recommendation of the staff from the pre-project, the local people began earning extra income from collecting medicinal plants and seedlings of rare species.

- The overall impression given by the technical and physical achievement of the project is largely positive. The participatory development of the community in remote poorer areas required a longer time to organize, especially the establishment of a women's organization and a bamboo cooperative for the local communities.

### *Project documentation*

- The project prepared several internal technical reports and proceedings to document the project's results. These technical reports were posted on the project website at [www.forest.go.th/bamboo](http://www.forest.go.th/bamboo) .

- The project prepared several guidelines of bamboo management and utilization. These guidelines were translated from technical reports into a simpler consumer language with pictures for demonstration. This will ensure a better understanding by the local community at its grass roots.

### *Monitoring, evaluation and project planning*

The Project Steering Committee (PSC) monitored the project, which met once a year, three times in total. However, one problem was that the donor representatives had no time to attend the meetings. The chair at these meetings changed every time because of the reconstruction of the RFD. No evaluation has been planned for the project.

### **3. Recommendations for Future Projects**

The following are recommended in order to improve future effectiveness and efficiency of similar future projects.

- Identification – better project formulation, including a clear definition of the required input.
- Design – the project should be defined in narrower terms.
- Implementation – Well-planned projects should be implemented on scheduled time line.
- Organization and management – Appoint a person with good leadership skills and the ability to lead an interdisciplinary project. All PSC members and government policy makers should be encouraged to visit the project site during the review of the mission.

Project management can be improved with well-planned activities on a strict executive timetable.

- It was recommended by the participants of the national bamboo conference, that RFD should continue the second phase of the Bamboo Technology Transfer Center. Its purpose is for the transfer of technology and product development in order to attain the set development objectives.

### **Responsible for this report:**

*Wanida Subansenee .*

**Name** : Mrs. Wanida Subansenee

**Position held** : Project Leader

**Date** : 30 September 2004

## ANNEX

### **Annex I : List of Internal Technical Reports and Proceeding**

1. Internal Technical Report No. 1 : Review of Bamboo Management
2. Internal Technical Report No. 2 : Bamboo Utilization and Protection
3. Internal Technical Report No. 3 : Bamboo Charcoal
4. Internal Technical Report No. 4 : Bamboo Marketing in Thailand
5. Internal Technical Report No. 5 : Feasibility Study on Establishment of a Bamboo Shoot Plant in Chiang Mai
6. Proceeding No. 1 : The International Training Workshop on Bamboo Handicraft Techniques, Its Tools and Small Machines
7. Proceeding No. 2 : Study Tour on Bamboo Charcoal Techniques in Japan
8. Proceeding No. 3 : Bamboo Product Design Contest for Younger Generation
9. Proceeding No. 4 : The Training Course on Bamboo Furniture Parts and Handicrafts
10. Proceeding No. 5 : The Training Course on Bamboo Charcoal Production
11. Proceeding No. 6 : National Conference on Bamboo 2004
12. Proceeding No. 7 : The Training Course on Management and Sustainable Utilization of Bamboo

### **Annex II : List of Publications and Guidelines (in Thai)**

1. Bamboo Charcoal Technique
2. Bamboo Weaving
3. Furniture Making
4. Bamboo Protection
5. Bamboo Planting and Management
6. Bamboo Cement Board Manufacturing

### **Annex III : List of Final Technical Reports**

1. Bamboo Protection
2. Chemical Composition of Five Bamboo Species in Thailand
3. Physical and Mechanical Properties of Five Bamboo Species in Thailand
4. Improvement of Bamboo Charcoal Techniques
5. Bamboo Flooring from Pai Tong
6. The Effects of Bamboo Pretreatment on the Properties of Bamboo Cement Board
7. Bamboo Dyeing
8. Sustainable Management of Bamboo
9. Women's Participation in the Project Site Mae-Mae Community Forest, Chiangmai Province