Project : PD 24/00 Rev.1(I)

Promotion of Sustainable Utilization of Rattan from Plantations in Thailand

PROJECT COMPLETION REPORT
2001 – 2005

ROYAL FOREST DEPARTMENT
FOREST MANAGEMENT AND FOREST PRODUCTS RESEARCH OFFICE
INTERNATIONAL TROPICAL TIMBER ORGANIZATION

June 30, 2005
Bangkok, Thailand

ITTO

ITTO PROJECT

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The **Royal Forest Department** has received the support from the governments of **Japan** through the **International Tropical Timber Organization (ITTO)** to undertake the research and development project on **Promotion of Sustainable Utilization of Rattan from Plantations in Thailand**. The project covers the period from the years 2001 to 2005. The project has now been completed successfully. Although it has taken the team over four years to complete the study, you will find the findings to be very valuable.

The 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.

(Mr. Thanee Viriyarattanaporn)

Director, Forest Management and
Forest Products Research Office

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PROJECT IDENTIFICATION

a) **Title :** Promotion of Sustainable Ut ilization of Rattan from Plantations in Thailand

b) **Serial Number :** PD 24/00 Rev. 1(I)

c) **Executing Agency :** Forest Management and Forest Products Research Office, Royal Forest Department.

d) **Host Government :** Thailand

e) **Starting Date :** July 2001

f) **Actual Duration :** 48 months

g) **Actual Project Costs :** 629,957 USD

PART I : EXECUTIVE SUMMARY

1. Background Information About the Project

1.1 Problem to be addressed

Rattan canes

In Thailand, most of the rattan canes have been harvested from natural tropical forests. Being one of the most important trade commodities for forest dwellers, the rattan has been severely over-exploited to the extent that is now in very short supply. Deforestation, traditional harvesting of rattan shoots and fruits for food as well as the lack of suitable harvesting method have also emphasized its diminishing rate. Many rattan trades tend to breakdown due to the lack of sustainable raw materials. People used to harvest rattan cane in the forest nearby their houses but now they have to spend a day or longer to find rattan in the deep forest. Promotion on research and development of rattan plantation is, therefore, needed to help conserving of the rattan species, its diversity and the tropical rain forests. However, a wide variety of farmers are non-technical people and lack of knowledge on cultivating and managing rattan farms. They also lack of methodology to develop means to produce rattan products in a value -added way.

Rattan shoots

Consumption of rattan shoot is the best alt ernative way of rattan utilization in Thailand. Edible rattan can increases farmers' incentive to establish rattan plantation. In stead of waiting 6- 7 years for cane production, farmers can utilize rattan shoots just within the second year of cultivati on. Rattan shoot has now become the popular dishes in Thailand, especially in the North and Northeast, as well as in Lao and Vietnam. The processing of rattan shoots has not yet been performed in any countries. As rattan shoots being needed more and mor e, it shows a high potential in both national and international markets. A suitable method to produce caned rattan shoots should, therefore, be developed.

1.2 Specific objective

Specific objective 1:

To study and develop techniques for managing rattan pl antations for sustainable production with a view to developing and disseminating guidelines and technologies on plantation management and harvesting of rattan

Specific objectives 2:

To promote an efficient way of rattan shoot and cane utilization by means of value-added products by developing guidelines for utilization of rattan and transferring technologies to support socio -economic development as well as establishment of community-owned enterprises.

1.3 Outputs

The main outputs were :

Output 1.1: Established three demonstration plots for studying management of rattan plantation on a sustainable basis.

Output 1.2: Developed guidelines for sustainable management of rattan that include proper techniques on plantation, silviculture, and harvesting to obtain high good quality and quantity of rattan shoots.

Output 1.3: Developed guidelines on management and harvesting techniques for sustainable productivity of rattan canes.

Output 1.4: Organized a 3-days national conference on plantation management and utilization of rattan on a sustainable basis in Bangkok (80 persons from individuals, government sectors, university instructors and community leaders).

Output 2.1: Studied on physical and woodworking properties of selected rattan species.

Output 2.2: Developed techniques for primary preservation and processing including bending and bleaching of rattan canes after harvesting.

Output 2.3: Developed rattan shoot processing techniques and establishing a cottage scale industry up to small cooperatives for the ra ttan shoot production at Sakon Nakhon province.

Output 2.4: Organized a short training course on processing and packaging of rattan shoot products at Sakon Nakhon province.

Output 2.5: Established a cottage scale industry at Ratchaburi province for the production of rattan furniture's parts and weaving to make value-added products.

Output 2.6: Organized a 45-days training course on rattan furniture and weaving including primary preservation of rattan cane at Ratchaburi province.

In addition, project had achieved some outputs that were not included in the actual plan as followed:

Output 1: Extended the project, finalized all activities and produced the quality technical report on "Rattan in Thailand" which contains general information of rattan in Tha iland and useful results from each sub-project.

Output 2: Completed and published all technical reports / manuals of the project.

Output 3: Researched on chemical composition in rattan shoot to get more information on anti-oxidation activities of polyphones.

Output 4: Strengthening the project activities in rural communities. (Follow up the communities' activities and enhance their skill and experience by organizing a workshop on application of modern design and technique for rattan furniture and weaving.)

Output 5: Establishing four-rattan plantations of commercial rattan cane species to be used as seed orchards and for future research activities at Sakon Nakhon, Narathiwat, Thrang and Songkhla province.

Output 6: Promoting the project PD 24/00 Rev. 1(I) via media (VCD).

1.4 Project Strategy

Strategy Implementation

The project comprised of four components namely management, utilization, training workshopand national conference.

Management : The establishment of demonstration plots on rattan plantation and intensive management has been successfully performed at Sakon Nakhon, Krabi and Narathiwat provinces. At Sakon Nakhon, the study had focused on plantation of 3 edible rattan species namely *Calamus viminalis*, *C. siamensis* and *C. tenuis*. Management system had aimed at increasing of shoot production for these 3 species within a unit area. Various treatments have been performed such as planting spaces, fertilizers and watering system.

At Krabi and Narathiwat province, the study had emphasized on the yield and the attempt to find out practical methods for sustainable management of rattan canes. The experimental plots at Krabi have been conducted in 13-15 years old plantation of *Calamus latifolius* and *C. longisetus* inter-planted with fast growing tree specie (*Azadirachta excelza*). At Narathiwat, the plot had been established in a natural forest where *Calamus caecius* grows naturally and some of them had been inter-planted within the area.

Plantations

Demonstration plots of commercial rattan species for cane production were established. Seed and data on growth and development were collected. At Sakon Nakhon province (3 ha), two rattan species were planted for the production of cane: *C. caesius* (small diameter) and *C. siamensis* (medium diameter). At Narathiwat, Thrang and Songkhla province (4 ha), *C. manan* (large diameter) and *C. caesius* (small diameter) were planted for the production of cane.

Utilization : Research was conducted at RFD research laboratories concerning physical and mechanical properties, shoot processing, protection, soil properties and photosynthetic performance. The research results were presented in a special technical report.

Training Workshop : The project had organized 3 training workshop related to the utilization of rattan namely;

The project on Processing and Packaging of Rattan Shoot during 15-21 December 2002 at Puparn Royal Development study Centre, Muang district, Sakon Nakhon province. This training course included lectures, food processing practices and field trip.

The project on Rattan Weaving and Furniture Making held at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province during 18 August – 2 October 2003. Thirty participants (15 participants for rattan furniture making and 15 participants for rattan weaving) were selected from Ratchaburi province and

northeastern part of Thailand. The training activities included lectures, workshop and a field trip.

The project on New Design of Rattan Furniture Making at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province. The project was held at 20 April – 5 May 2005 with 20 farmers from rural community.

National Conference : The project organized a 3-days national conference on plantation, management and utilization of rattan during 10-12 May 2004 at Best Western Fortune Hotel, Ratchadapisek road, Fortune Town, Dindaeng, Bangkok. This conference included presentation, workshops and field trip (70 persons from private persons, government section, university instructor and community leader). The objective of the national conference was to further enhance the development of the rattan sector and disseminate the knowledge on sustainable management and utilization.

1.5 Planned Project Duration and Overall Costs

DURATION :	4 years
STARTING DATE :	1 July 2001
PLANNED OVERALL COSTS :	Sources of financing USD
Government of Thailand	337,500 USD (in kind)
ITTO	292,457 USD
Total	629,957 USD

2. Project Achievements

2.1 Output Achieved :

a) Three demonstration plots for sustainable management of rattan were established at Sakon Nakhon, Krabi and Narathiwat provinces.

b) Four commercial rattan plantations for cane production; *C. caesius* and *C. siamensis* plantation at Sakon Nakhon province, *C. manan* and *C. caesius* plantations at Narathiwat, Thrang and Songkhla province.

c) Guideline for sustainable management and utilization of rattan were published (in Thai) as follows:

- Manual on plantation and management of rattan.
- Manual of Bottled-Rattan Shoot Processing.
- Manual of Rattan Furniture Making.
- Manual of Rattan Protection.

d) The project has already prepare and published:

- Rattan in Thailand (in English) .
- Proceeding of the national conference on rattan plantation, management and utilization during 10 – 12 May 2004 (in English and Thai).
- Final technical report on the research of rattan management and utilization.

e) Technical report of consultant, proceeding and report on study tour to Indonesia and Philippines will be created in Acrobat file format and promoted via CD and website of rattan project (www.forest.go.th/rattan) .

f) The study tour to Indonesia provided experiences on management system of rattan in Indonesia and recommendations to be introduced and applied to Thailand. The project also interested in the current system Indonesia that allow local communities to be able to harvest rattan from natural forests.

g) Project CD-ROM (English and Thai version), for the dissemination of project's activities to those interested organizations and countries.

h) A training workshop on Processing and Packaging of Rattan Shoot (30 participants) during 15-21 December 2002 at Puparn Royal Development Study Centre, Muang district, Sakon Nakhon province.

i) A training workshop on Rattan Weaving and Furniture Making to rural community (30 participants) during 18 August – 2 October 2003 at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province.

j) A training workshop on New Design of Rattan Furniture Making to rural community (20 participants) during 20 April – 5 May 2005 at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi.

k) The small cooperative for rattan furniture and weaving productions established by the trained group at Ratchaburi province. Currently, this group obtained a 4-stars certificate under One Tambon - One Product (OTOP) project being promoted by the government. The products were also presented at many trade fairs.

2.2 Specific Objectives Achieved

The techniques for sustainable management and diversified utilization of rattan have 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

The information and knowledge available on rattan plantation and utilization is limited and that the rural communities are not aware of appropriate technologies for the efficient and diversified utilization which can lead to the creation of new job opportunities for the communities and complement to the conservation of tropical forests. The project can transfer technology to the rural communities that will have an opportunity to improve their income generation through the training course and publications.

3. Target Beneficiaries Involvement

The direct beneficiaries of the project will be the rural community engaged in collection, processing, storage and sale of rattan products in Thailand. The rural communities will benefit with better income opportunities through rattan product and utilization. Also the forest department authorities will have practical guidelines for sustainable management and utilization of rattan. The project will generate greater awareness among the planners, policy makers and especially among the rattan workers and their organizations. Besides, rattan being and industry spread out in the country as a whole, the finding arrived at in the eastern region are likely have wider applications in other parts of the country as well. The attainment of the project objective will ease the pressure on the forest resources thereby benefiting the whole country. Furthermore, other member countries of ITTO, facing similar problems, will be benefited from the outputs 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 rattan; however, these were implemented in a limited area. The development objective needs more time to achieve the set objective.

b) Selection of project for establishing of small cooperatives is very important. Most of the people from rural area work on agriculture eager to participate in the project implementation with the hope of upgrading their living standard and creating more income. However, these people need more assistants on budget for investment and marketing skill.

c) After the project termination, RFD or ITTO should establish rattan plantation and arrange workshops on sustainable management and utilization of rattan. This implementation will help rural communities attain the development objectives. Information on rattan should also be provided to other rattan projects being implemented by other countries.

d) There were no apparent problems with internal cooperation among various Divisions in RFD.

e) The project team approach adopted in this project worked well for the smooth implementation of the project.

4.2 Operational Lessons

a) Project Organization and Management :

- The project had a project management team that comprised of a project leader, project assistants and technical staffs. The project management team had regularly met to make a plan and review all the work and its progress.

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

- The overall impressions of the technical and physical achievements of the project was largely positive. The development of participation of rural people was the establishment of women's organization and rattan co-operatives in remote areas.

b) Project Documentation

The project had collected information on rattan research available both from inside and outside the country and prepared a number of technical reports and proceedings to document the project results (see Annex I). These reports and proceedings were recorded in CD and also posted on the project website www.forest.go.th/RATTAN-ITTO/index.htm.

c) The Project Technical Committee (PTC) had a meeting to monitor the project once a year. Each times the chair of the meetings had to be changed due to the reconstruction of the function in RFD. No evaluation had been planned for the project.

d) Roles and responsibilities of the institutions involved in the project implementation are as follows;

Puparn Royal Development Study Centre, Sakon Nakhon province

- Provide the place for the training course on Processing and Packaging of Rattan Shoot.

Provincial Cooperative Officer, Sakon Nakon province

- Provide a lecturer on Establishment and Management of Housewife Group for the training course.

Sakon Nakhorn Provincial Trade Board, Sakon Nakon province

- Provide a lecturer on Preservative Food Marketing for the training course.

Industrial Promotion Regional Centre, Supan Buri Province

- Provide three lecturers for the training course on rattan weaving and furniture making.

Bangsai Arts and Crafts Center of Her Majesty Queen Sirikit, Ayutthaya province

- Follow up the rattan furniture technique and consultant group of Ratchaburi province.
- Provide a lecturer on the production cost calculation.

P.R.S. Industry Co., Ltd. in Bangkok.

- Provide a lecturer for the training course on New Design of Rattan Furniture Making.

Department of Export Promotion, Ministry of Commerce.

- Provide lecturer on Product Development for Export on the training course of New Design of Rattan Furniture Making.

King Mongkut's Institute of Technology Ladkrabang.

- Provide a lecturer on Present and Future of Rattan Marketing for the National conference.
- Provide a lecturer on Business and Marketing on the training course of New Design of Rattan Furniture Making.

Narathiwat Ruabber Research Center, The Office of Agricultural Research and Development Region 8

- Provide a lecturer on Planting Rattan in Rubber Plantation for the National conference.

Permission Division, Royal Forest Department.

- Provide a lecturer on Law and Regulation related to rattan for the National conference.

Thai Duern Pen factory, Angthong Province.

Chai Wiwat Co, Ltd. Angthong Province

Bang Chao Cha, Career PromotionCentre, Angthong Province.

Bangsai Arts and Crafts Center of Her Majesty Queen Sirikit, Ayutthaya province

- Provide the place for fieldtrip on the training workshop and National Conference.

Local Communities

Local communities in Ratchaburi, Sakon Nakhon, Lampang, Cheing rai and Nakhon Ratchasima province were involvedn the project implementation.

The consultation and negotiation was held in the small cooperative group at Ratchaburi province once every two or three months.

e) External factors which could have been foreseen

The rural community in Sakon Nakhon could not continue the project activity on bottled rattan shoot. The reason is that they have other activities to do on site where bottled rattan shoot is not po pularly consumed. At present, they can sell fresh rattan shoot easier than selling bottled rattan shoot. However, concerning on preservation, bottled rattan shoot might be necessary or needed when the demand is increased in the other areas.

5. Recommendations

The following recommendations are made to provide effectiveness and efficiency for similar projects in the future:

5.1 Promotion on rattan planting and sustainable utilization,

- Study more on management and maintenance of rattan.
- Planting rattan in public area and the national forest area such as old plantation in the degraded conserved forest.
- Enhance and support community forest by ITTO, Royal Forest Department, Forestry Industrial Organization, and Department of Agricultural Extension.

5.2 Plantation and Management

- Appoint a good and skillful leadership who has ability to lead an interdisciplinary project.

5.3 Identification and design

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

5.4 Implementation

- A well-planned project have to match the scheduled times.

5.5 All PTC members and governmental policy makers should have a chance to visit the project site during the mission review.

PART II : MAINTEXT

1. Project Content

1.1 Background

As Thailand has banned logging operation since 1989, the products of the forest at present are mainly NWFPs. These products include rattan that has been traditionally utilized as materials for weaving, furniture, carpet, blind and many others. Rattans generate employment, extra income subsistence for people, particularly those who live in rural areas. Rattan resources that used to be adequate in the past are currently being shortage due to deforestation and over harvesting. The lack of rattan raw materials causes Thailand to spend a great amount of money for cane importation. From 1995 -1997, Thailand had spent approximately US$ 2.5 million yearly for importing rattan cane. At present, the banning of the exportation of raw rattan canes in neighboring countries cause a great difficulty for Thai rattan industries. As there is still extensive demands on rattan raw materials in Thailand, the promotion for establishing commercial as well as small-scale rattan plantations needs to be taken into an urgent consideration. Pilot scale plantation of rattans should, therefore, be established and developed for sustainable high yield. There is also a need to develop high quality of rattan products to get more income by means of rattan utilizing as well as increasing of product's value in trading of the country.

1.2 Development Objectives

To develop and disseminate appropriate technologies on management of rattan plantation in Thailand to gain sustainable productivity as well as to seek for efficient and diversified utilization and proper marketing of rattan products in order to contribute to the socio-economic development of the rural communities and the conservation of rattan diversity and the tropical forest resources in Thailand.

1.3 Specific Objectives

a) To study and develop techniques for managing rattan plantations for sustainable production with a view to develop and disseminate guidelines and technologies on plantation management and harvesting of rattan

b) To promote the efficient utilization of rattan shoots and canes for value-added products by developing guidelines for utilization of rattan and transferring technologies to support socio-economic development as well as establishment of community-owned enterprises.

1.4 Outputs

The main outputs of the project were:

Specific Objective 1

The national management consultant (Mr. Choob Khemnark) has been hired for 1.5 months and already performed. The project has employed Mr. Kowit Sombun as a part-time national consultant for rattan plantations management. Duration of the employment is from 16 October 2002 to 30 June 2004. The total working hour is approximately 8 weeks. They provided advice on rattan silvicultural practice to the staff of research team.

The project has employed Mr. PHJ Nainggolan as an International rattan management consultant for 11 days from 8-18 May 2004. He was invited to present a paper on "Past, Present and Trend of Future Studied on Rattan" in 10 May 2004 during the national conference on "Plantation Management and Utilization of Rattan" (10-12 May 2004). He gave recommendation that the project should plant the high potential on economic value species such as *Calamus caesius, C. manan*, etc.

Manual on plantation and management of rattan was published in Thai language.

The determination of soil characteristics has been carried out at all study sites. Soil samples have been collected from each soil horizon for analyzing of both physical and chemical properties. Soil characteristics are being classified and analyze.

Data on growth, photosynthesis, transpiration and light requirement was measured at all study sites.

Output 1.1 : Establishment of demonstration plot for edible rattans was conducted in the northeast part at Forest Products Research Centre, Sakon Nakhon province. Three edible rattan species namely *Calamus siamensis, C. viminalis* and *C. tenuis* were selected for our research trials.

The demonstration plots in the south for studying of the sustainable management of rattan cane production was established at Krabi province and Narathiwat province. At Krabi the experiments were conducted with 2 rattan species; *Calamus longisetus* and *C. latifolius* in 13-15 years old rattan plantation. At Naratiwat, rattan specie that was used for the experiment was *C. caesius.*

Output 1.2 : Three experiments were set up to increase productiivities of 3 edible rattan species: *Calamus viminalis, C. siamensis* and *C. tenuis.* The 1st experiment has been dealet with effects of 2 spacing (1x1 m. and 1x0.5 m.) on shoot production of *C. viminalis* and *C. tenuis.* The 2nd experiment has been emphasized on managing systems for both shoot and cane production of *C. siamensis* and *C. tenuis.* The 3rd experiment has been set up on the management practices for fertilizer application (N:P:K = 25:7:7) and watering system with C. *viminalis.* One additional activity has been designed to perform at the plantations owned by the farmers. The plantations of these 3 farmers are all located in Sakon Nakhon province at Khumpiem, Nangtieng and Kudhaad villages

Output 1.3 : The project team went to Indonesia for the observation on management of rattan plantation, harvesting and processing during 25 May – 2 June 2004. The project staff gained a great idea of rattan plantation, harvesting and processing. The report was shown in the web-site of rattan project and written down on CD.

The research activities on management of rattan canes has emphasized on 3 rattan species: *Calamus latifolius* and *C. longisetus* at Krabi province, and *C. caesius* at Narathiwat province.

C. latifolius and *C. longisetus* which were interplanted in *Azadirachta excelsa* plantation are now 17 years old. The 1 st and 2nd growth assessments have been completed and the fertilizer application has also been undertaken.

For *C. caesius*, which has been planted in natural secondary forest of Narathiwat province, the age of each clump is unknown. An experimental plot of 25x25 m^2. was set up to locate the positions of existing clumps within the study area and the 1st growth assessment has been completed. The 2nd growth assessment was conducted in February 2003. Survey of existing clumps within the area of 300x60 m^2., outside the 25x25 m^2. plot, has also been conducted. All clumps within the area were marked and numbers of canes per clump were used as criteria for setting up the class intervals.

Output 1.4 : The project had organized a national conference on rattan plantation, management and utilization during 10 – 12 May 2004 at the Best Western Fortune Hotel, Bangkok. The conference included presentation, workshops and field trip. About 70 persons (private sector, government sector, university instructors and community leaders) attended the conference. The proceeding of the conference was published in Thai and English version.

Specific Objective 2

The international processing consultant (Prof. Dr. Walter K.F. Liese) completed his visit from 15-28 February 2002. He had reviewed a literature concerning rattan utilization in regards to protection. He gave advice on research methodology to the project staff. He also gave a lecture on properties, protection and utilization of rattan to the RFD officers and also attended the first PTC meeting and made many valuable suggestions to the project.

The project had employed Ms. Areewun Ungcasirikul as a part -time national rattan marketing and business consultant. The duration of the employment was from 15 June to 15 September 2003. The total working time was 30 days.

For furniture and weaving, the project invited Mr. Chinnaworn Chotitawornrut, Mr. Kamphon Witisitt and Mr. Vieng Vareenin to teach on weaving and furniture making technique at the training course on Rattan Weaving and Furniture Making from 18 August to 2 October 2003. Mr. Watcharakorn Punchon as an expert on Advanced Rattan Furniture Making had accomplished his work during 1 July to 31 October, 2003 and already submitted the manual of Rattan Furniture Making (in Thai).

The National consultant on shoot processing (Mr. Sommai Plaklamyong) was hired and performed his first consultation from 26 September to 17 October 2001 for a 3-week duration. The second consultation was done from November to December 2002 for 3 weeks.

Output 2.1 : Research on the physical properties of rattan was completed and the result was published separately in the final technical report.

Output 2.2 : The project teams had attended the Regional Conference on Sustainable Development of Rattan in Asia at Philippine during 21-23 January 2004 and study tour for 3 days after the conference. The project team gained the idea of rattan cane utilization and the increasing of product values. The report was shown in the website of rattan project and in CD.

Research on the rattan cane preservation was completed and the result was published separately in the final technical report.

Output 2.3 : Research on the improvement of rattan shoot processing techniques was conducted. The products had already been checked for fungal and bacterial infection at the Department of Medical Science, Ministry of Public Health. The result showed that there was no infection after being kept for 3 and 6 months. Chemical properties of rattan shoot and canning product were analyzed at the Nutrition Division, Department of Health.

Since the end of December 2002, the trained participants from the Processing and Packaging of Rattan Shoot Training Course who live in Amphur Kut Bak has already set up a small women's group on making bottled-rattan shoot. This group had presented their products at the provincial Red-Cross Fair on the end of February 2003.

Output 2.4 : The project had organized a training workshop on Processing and Packaging of Rattan Shoot during 15-21 December 2002 at Puparn Royal Development study Centre, Muang district, Sakon Nakhon province. This training course includ lectures, food processing practices and field trip.

Output 2.5: The project had conducted a training course on Rattan Weaving and Furniture Making at Ratchaburi province. After the end of training workshop, about 20 trainees had set up a small cooperative group on rattan weaving and furniture making. The group can earn extra income from the value-added weaving and furniture products. At present, this group received a 4 stars level certificate of the One Tambon One Product (OTOP) system being promoted by the government and had presented their products in many trade fairs. The women's participation at the project site of this group had contributed their lesson learned from the project to the ITTO News Letter, Tropical Forest Update.

Output 2.6 : The project had conducted the training workshop on "Rattan Weaving and Furniture Making" during 18 August – 2 October 2003 at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province. The course included lectures, workshops and field trip. A proceeding of the training workshop was shown in the website of rattan project and in CD.

The project also provided necessary equipment to the group and employed Mr. Watcharakorn Punchon, an experienced and professional instructor, from Bangsai Arts and Crafts Center at Ayutthaya province to train the trainees to improve their skill on rattan furniture and weaving.

In addition, project PD 24/00 Rev. 1(I) with a 1-year extension from 1 July 2004 to 30 June 2005 has achieved other outputs which were not in actual plan as followed:

Output 1: The project employed the national management consultant (Mr. Kowit Sombun) to prepare a technical paper on "Rattan in Thailand" and to provide some recommendations on the establishment of rattan demonstration plots. The period of his employment is 45 days between November 2004 to May 2005. The technical paper on "Rattan in Thailand" contains general information of rattan in Thailand and useful results from each sub-project.

Output 2: The project had employed the editor (Dr. Songkram Thammincha) to edit the project reports, technical reports/manuals and proceedings of the national conference from January-May 2005.

Output 3: The project had employed Dr. Noojaree Prasitpan to study the chemical properties of rattan shoot from January 2005 to May 2005. Research on chemical composition in rattan shoot will provide more information on anti-oxidation activities of polyphenols. The report was shown in the website of rattan project and in CD.

Output 4: The project has already implemented and evaluated the successful of training course on "New Design of Rattan Furniture Making" to rural community (20 Persons) during 20 April – 5 May 2005 at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province. These will make rattan utilization become more effective by decreasing of rattan raw material used while obtaining more economic return in term of value added product. The proceeding of the training workshop was shown in the website and CD of rattan project.

Output 5: Establishment of rattan demonstration plots for cane production of commercial rattan species had been done. At Sakon Nakhon province (3 ha), two rattan species were planted for the production of cane: *C. caesius* (small diameter) and *C. siamensis* (medium diameter). Narathiwat, Thrang and Songkhla province (4 ha), *C. manan* (large diameter) and *C. caesius* (small diameter) were planted for the production of cane.

Output 6: The project has produced a promoted media (VCD) of project activities PD 24/00 Rev. 1(I).

Dissemination of the Project Output

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

Training Course

The project had organized a training workshop on Processing and Packaging of Rattan Shoot during 15-21 December 2002 at Puparn Royal Development study Centre, Muang district, Sakon Nakhon province. This training course included lectures, food processing practices and field trip. After training, the trained participants from the Processing and Packaging of Rattan Shoot who live in Amphur Kut Bak had established a group of woman's organization at household level (17 persons) for the bottled-rattan shoot production.

The project had organized a training course on "Rattan Weaving and Furniture Making" during 18 August – 2 October 2003 at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province to rural communities. Thirty participants (15 participants for rattan furniture making and 15 participants for rattan weaving) were selected from Ratchaburi province and northeastern part of Thailand. The training activities included lectures, workshop and a field trip. After the end of training workshop, about 20 trainees had set up a small cooperative group on rattan weaving and furniture making. The project also provided necessary equipment to the group and employed Mr. Watcharakorn Punchon, an experienced and professional instructor, from Bangsai Arts and Crafts Center at Ayutthaya province to train the trainees at advance level to improve their skill on rattan weaving and furniture making. This make the products become higher in both quality and value.

The project had organized and evaluated the successful of training course on "New Design of Rattan Furniture Making" to rural community (20 Persons) during 20 April – 5 May 2005 at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province.

Conference

The project had organized a 3-days national conference on plantation, management and utilization of rattan during 10-12 May 2004 at Best Western Fortune Hotel, Ratchadapisek road, Dindaeng, Bangkok and shared the research results and guidelines on rattan management and utilization to the participants. After the conference, the project received invitations from Prae provinces to disseminate the knowledge learned from sustainable utilization and management of rattan to the villagers.

Study Tour

There were many groups of rural people and community leaders who visited Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province in order to observe the rattan weaving and furniture making.

Publications Contributed

The project contributed 500-2000 sets of the Manual on rattan management and utilization as requested namely, Rattan in Thailand (in English),

proceeding of the national conference on rattan plantation, management and utilization, and the Final Technical Report.

In addition, the project had created a web site, www.forest.go.th/rattan for the dissemination of the project activities, proceedings and internal technical reports for the public. Further more, the project has pub lished the research results in the final technical report for universities, institutes, industries as well as to other ITTO's member countries.

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

1.5 Project Strategy

Implementation Strategies

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

Management

A Demonstration Plot for Edible Rattans in Sakon Nakhon. Three experiments were conducted; spacing, intercropping and irrigation & fertilizer trials. The results of these spacing trials showed that the growth of rattan in a 1x1 m spacing plot was better than that in 1x0.5 m spacing plot in term of shoot size. In the intercropping trials, it was found that Wai Nam Pung (*C. siamensis*) and Wai Num (*C. tenuis*) initiated first shoots in January 2004 or about 8 months after planted and the length of canes were approximately 1.62 and 1.47 meters, respectively. Experiments on irrigation and fertilizer application showed that both manure and chemical fertilizer can increase shoot production from the average of 5.3 shoots/clump to 8.3 and 10.9 shoots/clump, respectively

Demonstration Plots for Rattan Canes Production at Krabi. Fatal rates of two rattan species (13 –15 years old) : *Calamus longisetus* and *C. latifolius* were compared. Results from the experimental plots on fertilizer application were reported.

Demonstration Plots for Rattan Canes Production at Narathiwat. The 3 levels of harvesting (removing of 1, 2, and 3 canes from the clump) from the experimental plots of *Calamus caesius* and the durability test were reported. It was found that removing of 2 canes per clump could produced more number of suckers and increased the cane length when compared with the other two levels. Durability of 3 rattan species (Wai Takha Thong, Wai Kao, and Wai Sadao) that grown in the experimental area were compared, it was found that Wai Sadao showed highest durability.

Soil Characteristic in rattan experimental plot of the project sites. A research on soil characteristics has been carried out at all study sites: Narathiwat (3 plots), Krabi (3 plots), and Sakon Nakhon (6 plots). Soil samples have been collected from each soil horizon and each subplot (by depth) for the analysis of both physical and chemical properties.

Growth and Photosynthetic Performance of Some Native Rattan Species. The research had been carried out in 3 experimental plots : (1) *Calamus viminalis* planted from seedling under different light environments (2) *C. viminalis* grown under rain trees compared to those grown under full sunlight and (3) *C. latifolius* and *C. longisetus* planted intercropping in *Azadirachta excelsa* plantation. Growth and photosynthetic performance as well as related parameter affected were discussed

Utilization Researches concerning physical and mechanical properties, shoot processing, protection, soil properties and photosynthetic performance had been conducted in many laboratories. Results were reported in a special technical report.

Training workshop The project had considered training activities as an important strategy to disseminate research results to communities and industries. A training workshop on Processing and Packaging of Rattan Shoot was offered to local people from Sakon Nakhon, Lampang, Cheingmai and Nakhon Ratchsima province. The course was performed by lecturers from the Provincial Cooperative Office and Sakon Nakorn Provincial Trade Board, Sakon Nakon province.

A training workshop on "Rattan Weaving and Furniture Making" (30 Persons) and "New Design of Rattan Furniture Making" (20 persons) had been conducted at Ratchaburi province. The course was leaded by lecturers from Department of Industrial Promotion, Supanburi province; Bangsai Arts and Crafts Center of Her Majesty Queen Sirikit , Ayutthaya province; P.R.S. Industry Co., Ltd., Bangkok; Department of Export Promotion, Ministry of Commerce, Bangkok; and King Mongkut's Institute of Technology Ladkrabang, Bangkok.

Pilot Project for Socio-economic Development The project had disseminated knowledge on rattan weaving and furniture making techniques to the people at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province. Later on, this group of people had set up a small cooperative group on rattan weaving and furniture making.

National Conference A 3-day national conference on plantation, management and utilization of rattan was held during 10-12 May 2004 at Best Western Fortune Hotel, Ratchadapisek road, Dindaeng, Bangkok. The objective of the national conference was to further enhance the development of the rattan sector and disseminate the knowledge gained the project on sustainable management and utilization to those interested people.

1.6 Work Plan

The Project Agreement between Royal Forest Department and ITTO was signed on the 26 December 2000 and 26 April 2001. After the project work plan was submitted to ITTO, ITTO had transferred the first installment of project funds to the project bank account in Bangkok on the 21 June 2001. The project was run effectively on the 1 July 2001. The project work plan had been revised for 7 times. The revised work plans are shown in Table 1. The project was implemented according to the planned.

Followed the 3rd PTC meeting, the project was extended for 12 months from the 1 July 2004 to the 30 June 2005. The revised work plans are as show in Table 2.

Table 1 Revised Project (VII) Work Plan.

Outputs/Activities	Jul 2001 – June 2002												Jul 2002 – June 2003												Jul 2003 – June 2004												Jul 2004 – June 2005											
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Specific objectives 1:																																															
Output 1.1																																															
Activity 1.1.1:Identification of two project sites in the northeastern and southern part of Thailand.																																															
Activity 1.1.2: Establishment of a demonstration plot for edible rattans in Sakon Nakhon province and conduct experimental plots in 5-and10-year-old rattan plantations in Krabi province to study sustainable management for shoots and canes, respectively.																																															
Activity 1.1.3: Selection of 2 suitable rattan species in the northeast for harvesting and utilization of shoot and 3 suitable rattan species in the south for cane production: by surveying of markets to find out local and national (as well as international) needs for basic consumption																																															
Output 1.2																																															
Activity 1.2.1: To conduct a literature survey																																															
Activity 1.2.2: Conduct research on sustainable management of rattan shoots (plantation, management, silviculture, harvesting)																																															
Activity 1.2.3: Publication of guidelines on management of rattan plantation for sustainable shoot production (in Thai, English abstract)																																															
Output 1.3																																															
Activity 1.3.1: A literature review on sustainable management of rattan plantation from publications produced by INBAR, IPGRI, FAO and other sources																																															
Activity 1.3.2: Study tour to Indonesia on management of rattan plantation, harvesting and processing of rattan products (4 people), in corporation with INBAR, IPGRI and Forestry Research Institute Malaysia.																																															
Activity 1.3.3: Conduct research on silvicultural practices to find out suitable ratio of culm harvesting for sustainable production.																																															
Activity 1.3.4: Publication of guidelines on sustainable management of rattan.																																															
Output 1.4																																															
Activity 1.4.1: Preparation of conference program																																															
Activity 1.4.2: Identification and contracting of resource persons																																															
Activity 1.4.3: Preparation of conference material and equipment																																															
Activity 1.4.4: Organization and evaluation of conference																																															

Table 1 Revised Project (VII) Work Plan. (continued)

Outputs/Activities	Jul 2001 – June 2002												Jul 2002 – June 2003												Jul 2003 – June 2004												Jul 2004 – June 2005											
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Specific objectives 2:																																															
Output 2.1																																															
Activity 2.1.1: Literature survey on basic properties of rattan from INBAR and other sources																																															
Activity 2.1.2: To collect sample specimen for potential rattan species for commercialization																																															
Activity 2.1.3: To conduct research on physical and mechanical properties in terms of moisture content and specific gravity and report																																															
Output 2.2																																															
Activity 2.2.1: Literature survey on basic properties of rattan from INBAR and other sources																																															
Activity 2.2.2: Study tour to the Philippines on rattan management, preservation and utilization (4 people)																																															
Activity 2.2.3: To develop techniques for primary preservation (against stain fungi and powder post beetle) and bleaching of rattan canes																																															
Activity 2.2.3: To prepare a report on rattan canes processing																																															
Output 2.3																																															
Activity 2.3.1: To conduct a literature survey																																															
Activity 2.3.2: To develop techniques for processing, packaging and chemical properties of rattan shoot products																																															
Activity 2.3.3: Data processing																																															
Activity 2.3.4: Establishment of a home industry for rattan shoots in Sakon Nakhon province																																															
Output 2.4																																															
Activity 2.4.1: Preparation of training program. (20 persons/ 7 days)																																															
Activity 2.4.2: Identification and selection of participant (rural people)																																															
Activity 2.4.3: Preparation of training material																																															
Activity 2.4.4: Evaluation of training course																																															
Output 2.5																																															
Activity 2.5.1: Preparation of equipment machinery for rattan processing																																															
Activity 2.5.2: To promote the small cooperatives for rattan cane productions in Ratchaburi.																																															
Output 2.6																																															
Activity 2.6.1: Preparation of training program. (20 persons/ 30 days)																																															
Activity 2.6.2: Identification and selection of participant (rural people)																																															
Activity 2.6.3: Preparation of training material and equipment																																															
Activity 2.6.4: Implementation and evaluation of a training course.																																															

Table 2 Revised Work Plan of 1 year extension from 1 July 2004- 30 June 2005

Outputs/Activities	Jul 2004 – June 2005											
	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June
Specific objectives 1:												
Output 1 To continue and finalize all activities and produce the quality technical report on "Rattan in Thailand" which contains general information of rattan in Thailand and useful results from each subproject.												
Activity 1.1.1:Measurement of growth, photosynthesis, transpiration and light requirement of *Calamus viminalis* planted under *Combretum quardangulare* trees in the wet season.												
Activity 1.1.2: Produce quality report on "Rattan in Thailand".												
Output 2 To complete and publish all technical reports/ manuals of the project.												
Activity 2.1: Setup a working group to produce quality manual and technical report .												
Activity 2.2: To prepare and publish all technical report /manual.												
Activity 2.3: Engaging editor to edit report, technical report/manual and proceeding.												
Output 3 Research on chemical composition in rattan shoo t to get more information on anti-oxidation activities of polyphenols.												
Activity 3.1: Collecting specimen samples of rattan shoot at Sakon Nakhon province.												
Activity 3.2: Studying chemical properties of rattan shoot.												
Output 4												
Activity 4.1: Organize a workshop on "new design of rattan furniture making " to rural community who has the basic in rattan weaving and furniture making. (rural people 20 persons, 15 days)												
Output 5 To establish four rattan plantation of commercial rattan cane species to be used as seed orchard and for future research activities.												
Activity 5.1: Establish plantation of commercial rattan species at Sakon Nakhon province, Songkla province.												
Output 6 To promote the project PD 24/00 Rev. 1(I) via media such as CD-ROM												
Activity 6.1: Modify and produce multimedia such as CD-ROM to promote rattan project PD24 /00 Rev.1(I)												

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	94,000	277,500
Subcontract	40,400	-
Duty travel	44,460	-
Capital item	53,700	60,000
Consumable	22,550	-
Miscellaneous	8,900	-
ITTO Admin. Monitoring	28,447	-
Refund of Preproject costs	-	-
Grand Total	**292,457**	**337,500**

The project human resources are as shown in Table 4

Table 4 Project human resources inputs

Human Resources	Number
Project Consultant	1
Project Leader	1
Assistant project leader	1
International processing consultant	1
International management consultant	1
National rattan weaving and furniture consultant	5
National rattan management consultant	2
National rattan shoot processing	1
Physical and mechanical properties staff	2
Chemist (Serve as project leader)	1
Rattan protection staff	2
Workshop and conference participants	150
Driver	2
Labors	5
Technicians and research assistants	5
Lecturer : Processing and Packaging of Rattan Shoot	3
Rattan Weaving and Furniture Making	6
New Design of Rattan Furniture Making	4
National conference on plantation, management and utilization of rattan	6
Office assistant	2
Secretary	1

1.8 Project Rational

Rattan is economically important as an income generation for the households in community forest. Utilization of rattan has been known for a long time but appropriate technology on effective utilization of rattan still limited, especially for people who live nearby the forest. Wisely used of rattan will not only be beneficial for the livelihood but also encourage the forest conservation in Thailand. Technical knowledge on cultivating and managing plantation is needed for the rural people who deal with rattan. They also lack the methodology and means to develop and produce rattan products in a value-added way

Information on the basic properties of important Thai rattans particularly in relation to their industrial application is also limited. There are difficulties faced by the users in processing and mechanically fabricating rattans due to its physical characteristics. These are the variation in dimensions, crookedness of the culms, non-uniformity of internodes and unevenness of taper. Since many rattan species has been inefficiently utilized, and some of them remain unutilized, research effort is needed to determine the properties of such species and to develop for appropriate utilization technology.

There is a need to provide short-term training on production of commercial rattan products. The treatment of rattans is one of example. The procedures are relatively labor intensive on traditional devices, which are of low technology for production capacities. Usage of efficient mechanism is still limited and most of local manufacturers have to rely on existing ethnic designs or copying from other sources. Extension services of the current technology should be provided via workshops, dialogue or demonstrations. These should be periodically be upgraded to improve existing skills with a view to promoting both the quality and traditional identify of the products and diversified utilization of rattan.

Given the fact that rattan has proven to be a vital resource in terms of its contribution to particularly the rural economies and ecological stability of Thailand, its utilization must be sustainable reached because the socio-economic and environmental conditions of the people with the forest lands are weak and unsustainable. Further improvement of sustainable management of rattan and the production of rattan products in both quality and quantity can be obtained by immediate attention, solutions and practical suggestions to the several problems associated to the sustainable utilization of rattan

1.9 Preparatory Activities

RFD and ITTO has established PPD 4/98 Rev.1(I) Promotion of Tropical Non-Wood Forest Products (NWFPs) in Thailand. Four Community Forest areas in the northern, northeastern, western and southern parts were surveyed. The result revealed that rattan should be utilized for value-added production. Therefore, the project selected rattan to be the project activities.

1.10 ITTO Context

The following sections (1.10.1 to 1.10.4) were excerpted from the project - document of PD 24/00 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.

i) 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 timbe resource base.

2. Review current and potential productivity of major tropical forest types.

7. Encourage and assist members, as appropriate, to establish andmanage 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 fore st 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 24/00 Rev.1(I).

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

2.1 Relevance to national policy

Forest conversation is a national policy currently implemented vigorously by the government. There were a number of measures adopted in recent year designed to address the issue. Among them are following:

(a) The logging were banned since 1989 until present.

(b) The banning of export of logs and lumber.

(c) The launching of the national forestation program.

(d) 15% of the country shall be design as protected forest.

(e) Generate income for the urban area.

This project also conforms to current national policies of the Thai Government which relate to:-

The 8th National Economic and Social Development Plan (NESDP VIII: 1997 - 2001): Objectives of the Plan (3) & (4) to enhance about sustainable use and development of the remained natural resources, economy, high-potential and better life quality.

The Thai Forest Sector Master Plan: Forestry sector policy objectives (1.3) & (1.4) to meet the national need 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

Support the NESDP VIII in increasing extra income for the rural people by interpolating NWFPs source in forest plantation, in farm and in community forest or in Tree Farming program which was launched in 1996.

2.3 Technical and Scientific Aspects

Practical guidelines for improving management of rattan shall be developed. These guidelines will include prescriptions on plantation, silvicult ure and harvesting for commercially important rattan species.

The laboratory work will focus on the basic properties on physical and mechanical properties, preservation and drying of commercial rattan species for commercialization of furniture parts and weaving. A study of physical and chemical treatment of selected rattan species for strength and durability will also be conducted. Further, utilization and processing techniques of rattan shoots shall be studied. No study of this kind has been conducted in Thailand.

2.4 Economic Aspects

The benefits will be got after completion of the project. The rural communities will be significantly developed knowledge and technologies to increase quality of rattan products. They will be aware of appropriate technologi es for the efficient and diversified utilization of rattan which can lead to the creating of new job for the communities and complement to the conservation of tropical forests. It can upgrade the living standard and increase the income of the rural people. The expected benefits will be directed to the farmer, forest dwellers, traders, employment generation and foreign exchange for the country.

2.5 Environmental Aspects

With the realization of the project objectives, less timber is expected to be extracted from the forest. In addition, the communities close to the forest resources will have better economic opportunities through rattan farming and rattan utilization. Since these local communities depend so much on the forest resources for their livelihood, the pr essure on the forest will be considerably eased. All of these will have positive environmental impact.

2.6 Social Aspects

The rattan is economically important for living and income generation of households in community forest. It is utilized by the community in various ways. For example, rattan culms are used as weaving utensils as well as production of basketries and furniture. Moreover rattan shoots are used as food. In the Northeast of Thailand, people in some provinces know rattan as an edible plant for consuming its fruit and shoot. Normally they collect the rattan from the wild, but there is an increasing of the depletion of natural forest. So the rattan in natural forest is very scarce. Now a day the farmers start to plant rattan for their own use s and for the market. But the knowledge of the productivity of rattan is very limited. The Non-Wood Forest Products Research of the Royal Forest Department felt it is necessary to get the general information on the cultivation, propagation, investment and income in order to increase rattan canes and rattan shoots production and to provide greater job opportunity to the people in rural area. It can upgrade the living standard of the farmer and create income for the rural population. Besides this, rattan plantation will not only reduce the pressure of forest invading but also create the forest area.

The local communities will be major participants in the realization of the Project objectives. They shall be taught the practical methods of rattan farming and utilization. They are expected to be the main suppliers of rattan culms, the rattan industry (furniture weaving products and handicrafts), a women dominate industry. This traditional industry has an important role in terms of overall employment as well as of the larger proportion of women employment in the rural communities. The project will assist the establishment of a rattan co-operative in Ratchaburi province for the production of rattan furniture and weaving products and in Sakon Nakhon province for the rattan shoot production. 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, rattan can be used as an alternative raw material for furniture, equipment, utensils and so on. This is an ideal time to provide the information on the techno logy of rattan 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 3rd Project Technical Committee Meeting on 19 March 2004 suggested that the project should extend for 1 year from 1 July 2004 to 30 June 2005 to strengthen and finalize the project activities, improve and publish the technical reports/manuals especially making a special report entitled "Rattan in Thailand". Following the conclusion from National Conference on Rattan during 10-12 April 2004, the project should follow up the study on chemical composition in rattan shoot to find out an incentive substance for promotion purpose and organize one training course on "New design of rattan furniture making". These will make rattan utilization more effective by decreasing of raw material used while obtaining more economic return in term of value added product. Due to the lack of rattan raw materials in Thailand, the project plans to establish some rattan plantations to be used as demonstration plot to encourage the people t o grow rattan such as *Calamus caesius, C. manan*, etc. 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 rattan products. They gain better income opportunities through rattan production and utilization.

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

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 research on sustainable management of the rattan 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 studying sustainable management of the plantation and improve the cottage industry in the project site continue.

4.3 Assumptions

There was a lack of information and skills to develop the appropriate technologies for efficient and diversified utilization of rattan raw materials. This was solved by employing a consultant and adopting the technologies developed from INBAR and other countries through the study tours to Philippines and Indonesia. 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 three demonstration plots for the sustainable management in order to provide guidelines on management and utilization. Part of the plantation will be maintained to serve the people who want to plant rattans as well as for RFD's future research.

4.5 Appropriateness of project inputs

Project inputs were appropriate and adequate.

5. Project Results

5.1 Technical report and guideline on sustainable management and utilization

a) The project has published the guidelines on sustainable rattan plantation and management. These will assist farmers and illustrate the establishment of the demonstration plots of the rattan plantation at Sakon Nakhon Narathiwat, Thrang and Songkhla province. It is also expected to be used as a technology transfer site upon the completion of the project.

b) The project has published the final technical reports on Rattan management and utilization (see Annex III), Rattan in Thailand, and Proceeding of a national conference on plantation management and utilization of rattan. The purpose of this report is to disseminate the knowledge on sustainable management and utilization of rattan.

c) A feasibility study on the rattan shoot processing and packaging in Sakon Nakhon was published. Two types of rattan shoots were used. The villages have a high potential of establishing and running a cottage industry of rattan shoot by using the appropriate technology.

d) The project had prepared manual on Manual on Rattan Furniture Products, Rattan Shoot Processing and plantation and management of rattan, which was published separately (see Annex II).

5.2 Socioeconomic Development

The project had organized the training workshop for rural communities on Processing and Packaging of Rattan Shoot at Sakon Nakhon province, Rattan Weaving and Furniture Making at Ratchaburi province and New Design of Rattan Furniture Making at Ratchaburi province. After training, the project continued supporting, providing assistance and creating collaboration works with the small co-operatives and communities owned enterprises founded by the project.

- The trained participants from the Processing and Packaging of Rattan Shoot who live in Amphur Kut Bak, Sakon Nakhon province had established a woman's organization at household level (17 persons) for the bottled-rattan shoot production.

- About 20 trainees of training workshop on Rattan Weaving and Furniture Making at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province had set up a small cooperative group on rattan weaving and furniture making. The project also provided necessary equipment to the group and employed Mr. Watcharakorn Punchon, an experienced and professional instructor, from Bangsai Arts and Crafts Center at Ayutthaya province to train the trainees at advance level to improve their skill on rattan weaving and furniture making. This make the products become higher in both quality and value. At present, this group received a 4 stars level certificate of the One Tambon One Product (OTOP) system being promoted by the government and the products were presented in many trade fairs.

Later, the project decided to organize short training course on New Design of Rattan Furniture Making at Baan Kumpangsan Moo 7, Jombung district, Ratchaburi province for the rural people and this trained group. The project had emphasized on the development of rattan cane utilization and the increasing of product values. The cooperative group can earn extra income from the value-added weaving and furniture.

The project has presented a paper analyzing the social/technical/economic aspects of the small rattan cooperative established at Baan Kumpangsaen, Moo 7, Jombung District, Ratchaburi Province in order to draw lessons from this cooperative as an example for the development of future community-based rattan enterprises to the ITTO News Letter, Tropical Forest Update.

5.3 National Conference

The project held a national conference on plantation, management and utilization of rattan for 3 days at Best Western Fortune Hotel, Ratchadapisek road, Fortune Town, Dindaeng, Bangkok. The results of group discussion at the conference can be used for the National Action Plan in future.

5.4 Project Website

The project had created a website at www.forest.go.th/RATTAN-ITTO/index.htm, which comprised of project context and all papers published.

The researchers, community forests, universities and others are expected to be able to take advantage of these research from website. The government may be able to improve the socio-economic level of the local people by transferring technologies learned from RFD to those people.

6. Synthesis of the Analysis

a) Specific Objective (s) Achievement:

Realized

b) Outputs:

Realized

c) Schedule:

Delayed, not seriously

d) Actual Expenditure:

As planned

e) Potential for replication:

Modest potential

f) Potential for sealing 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 rattan. 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 and plantations. In addition, a training course on sustainable management and utilization for other rural communities should be arranged in order to attain the development objectives. Rattan information should be provided to other rattan 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 leader, project assistant and technical staff. The project management team met regularly to plan and reviews 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 overall impression given by the technical and physical achievement of the project is largely positive. The participatory development of the rural people in remote areas required a time to establish a women's organization and a rattan 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/rattan .

• The project prepared guidelines of rattan management and utilization 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 Technical Committee (PTC) monitored the project, which met once a year, four times in total. However, one problem was that 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 to improve future effectiveness and efficiency of similar future projects.

- Identification and Design – better project formulation, including a clear project strategy and definition of the required inputs.
- 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 PTC 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 wellplanned activities on a strict executive timetable.

- It was recommended by the participants of the national conference of rattan, that RFD, ITTO or other organization should continue the research of rattan utilization, organize rattan conference and conduct rattan plantation. Its purpose is for the transfer of technology and product development in order to attain the set development objectives.

Responsible for this report:

Name : Ms. Pannee Denrungruang **Position held** : Project Leader
Date : 30 June 2005

ANNEX

Annex I : List of Internal Technical Reports and Proceeding.

1. Internal Technical Report No. 1 : Management of rattan species .
2. Internal Technical Report No. 2 : Rattan Marketing (in Thai and English).
3. Internal Technical Report No. 3 : Rattan Processing .
4. Internal Technical Report No. 4 : Rattan Shoot Processing .
5. Internal Technical Report No. 5 : Plantation, Management and Utilization of Rattan.
6. Internal Technical Report No. 6 : Study Chemical Properties of Rattan Shoot from Plantation in Thailand.
7. Internal Technical Report No. 7 : Rattan Plantation and Management.
8. Proceeding No. 1 : The training course on Processing and Packaging of Rattan Shoot (in Thai and English) .
9. Proceeding No. 2 : The training course on Rattan Weaving and Furniture Making (in Thai and English) .
10. Proceeding No. 3 : The training course on New Design of Rattan Furniture Making (in Thai and English) .
11. Proceeding No. 4: Study tour in Philippines .
12. Proceeding No. 5: Study tour in Indonesia .

Annex II : List of Publications and Guidelines

1. Rattan in Thailand (in English)
2. The national conference on rattan plantation, management and utilization during 10 – 12 May 2004 (in Thai and English).
3. Manual on Rattan Furniture Products (in Thai).
4. Manual on Rattan Shoot Processing (in Thai).
5. Manual on plantation and management of rattan (in Thai).
6. Manual on Rattan Protection (in Thai).

Annex III : List of Final Technical Reports

1. Demonstration plots for rattan cane production in Krabi.
2. Demonstration plots for rattan cane production in Narathiwat .
3. Demonstration plots for rattan shoot production in Sakon Nakhon
4. Photosynthetic of the project site.
5. Soil properties of the project site.
6. Rattan shoot processing techniques and its application.
7. Protection of rattan cane.
8. Physical and mechanical properties of rattan.
9. Analyzing the social/technical/economic aspects of the small rattan cooperative established at Baan Kumpangsaen, Moo 7, Jombung District, Ratchaburi Province.