

Technical Report

Application of Production and Utilization Technologies for Rattan Sustainable Development in the ASEAN Member-Countries [PPD 51/02 Rev. 1 (I)]



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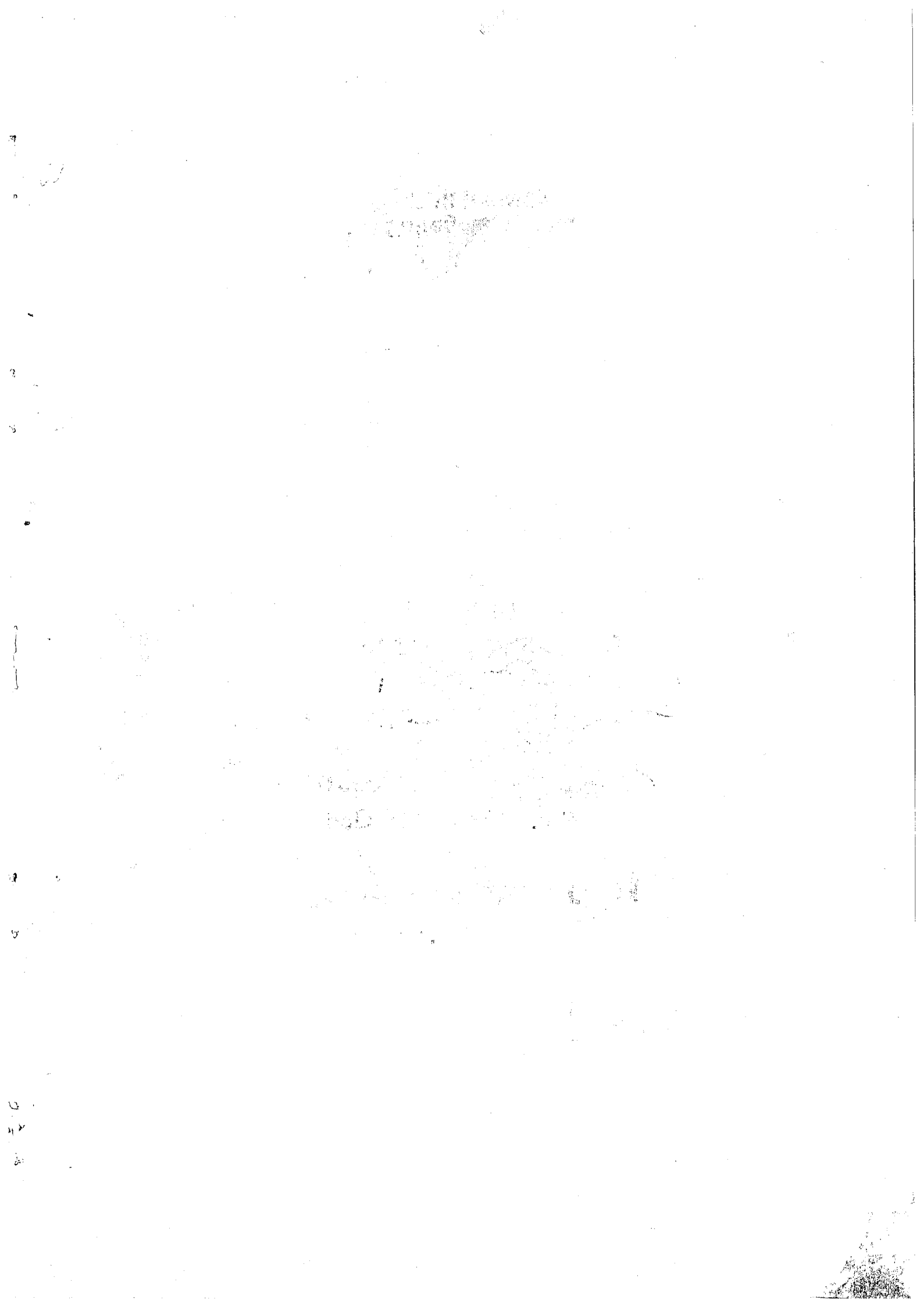
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PHILIPPINES**



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Acronyms and Abbreviations

ASEAN	Association of Southeast Asian Nations
ALRO	Agricultural Land Reform Office
BSU	Benguet State University
CCIP	Chamber of Cottage Industries of the Philippines
CDPEAP	Christmas Décor Producers and Exporters Association of the Philippines
CFEF	Confederation of Filipino Exporters Foundation
CFIP	Chamber of Furniture Industries of the Philippines
CFNR	College of Forestry & Natural Resources
CICT	Cottage Industry and Technology Center
CIFOR	Center for International Forestry Research
CNRES	Center for Natural Resources and Environmental Studies
CPD	Cooperative Promotion Department
DA	Department of Agriculture
DAE	Department of Agricultural Extension
DANIDA	Danish International Development Assistance
DENR	Department of Environment & Natural Resources
DOF	Department of Forestry
DOST	Department of Science & Technology
DTI	Department of Trade & Industry
ECCP	European Chamber of Commerce of the Philippines
ERDB	Ecosystem Research & Development Bureau
FAO	Food & Agriculture Organisation
FPRDI	Forest Products Research and Development Institute
FD	Forestry Department
FRI	Forest Research Institute
FRIM	Forest Research Institute of Malaysia
FSI	Forest Science Institute
FTPP	Forest Trees and People Programme
GOs	government organizations
IDRC	International Development & Research Centre
IEE	Institute of Ecological Economy
IHA	Indonesian Handicraft Association

INBAR	International Network on Bamboo and Rattan
IPGRI	International Plant Genetic Resources Institute
ITTO	International Tropical Timber Organization
IUCN	International Union for the Conservation of Nature
KU	Kasetsart University
Lao PDR	Lao People's Democratic Republic
LDD	Land Development Department
MSU	Mindanao State University
MMSU	Mariano Marcos State University
NAFRI	National Agriculture & Forestry Research Institute
NGOs	non-government organizations
NSCB	National Statistical Coordinating Board
NSB	Nature Society of Brunei
NTFPs	non-timber forest products
NVSIT	Nueva Vizcaya State Institute of Technology
PCARRD	Philippine Council for Agriculture, Forestry and Natural Resources Research and Development
PCCI	Philippine Chamber of Commerce and Industries
PCHI	Philippines Chamber of Handicrafts Industries
PNAC	Palawan National Agricultural College
POs	people's organizations
PSPC	Panay State Polytechnic College
R&D	research and development
RFD	Royal Forest Department
RECOFTC	Regional Community Forestry Training Centre
SCUs	schools, colleges, & universities
SSSI	Society Self-Supporting Institute
SWOT Analysis	Strengths, Weaknesses, Opportunities, & Threats Analysis
TAPI	Technology Applications & Promotions Institute
TCA	Tarlac College of Agriculture
UH	University of Hanoi
UNDP	United Nations Development Programme
UPLB	University of the Philippines Los Baños
VISCA	Visayas State College of Agriculture

Foreword

The global threat on ecosystems and environment brought about by forest destruction and deforestation particularly in tropical Southeast Asia has a strong influence in the major shift from timber oriented program to nonwood forest products or NWFPs such as rattan, among others. Rattan in tropical countries, particularly in the ASEAN region is considered second to timber in terms of economic importance. In the region, rattan for many years has become a major source of livelihood to many low income rural families and principal raw material to furniture and handicraft industries.

The importance of rattan has triggered the holding of Experts' Consultation on Rattan Development held in Rome in December 2000. The said consultation noted two significant things. One, is that rattan is economically, socio-culturally and ecologically important to a large number of people in the ASEAN. The other is that there is a severely dwindling supply of rattan from the wilds because of over-exploitation and loss of forest habitat. If this situation continues up to the foreseeable future, millions of ASEAN peoples will suffer loss of income, decline in status in life, decay in culture, and irreversible loss of genetic resources, without which agriculture and forestry will stagnate.

The said Experts' Consultation was primarily concern on the sustainability of rattan resources to sustain the increasing demand of the commodity by the different end-users in the rattan producing countries.

To address the immediate potential adverse impact of the gradual depletion of rattan in the ASEAN region, the Philippines with funding from ITTO has launched a one-year pre-project entitled "Application of Production and Utilization Technologies for Rattan Sustainable Development in the ASEAN Member-Countries."

The principal aim of the project is to assess the status of rattan resources in the ASEAN member countries including the aspects on socio-economics. This technical report comprises the summary of papers presented by the ASEAN country representatives during the regional conference held in Manila, Philippines on 22-23 January 2004.

The various papers presented were a subject of a workshop during the conference where the priority needs/concerns of the ASEAN countries were identified which shall be the basis of the sequel project, hopefully to be funded again by ITTO.

It is hoped that this technical report will be a valuable reference to all end-users of rattan in the ASEAN region including those interested parties outside the region.

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The Ecosystems Research and Development Bureau (ERDB) of the Department of Environment and Natural Resources (DENR) Republic of the Philippines wishes to thank the International Tropical Timber Organization (ITTO) for its funding support to this Pre-Project; and the Forest Products Research and Development Institute (FPRDI) of the Department of Science and Technology (DOST) as the principal collaborator during the project implementation . Special thanks also to Dr. Florentino O. Tesoro, Undersecretary for Regional Operations-DOST and Dr. C. Renuka, Kerala Forest research Institute-India who served as resource persons in the conference. Also thanks to Secretary Elisea G. Gozun, Dir. Romeo Acosta, Dir. Florence Soriano, Dir. Ediberto C. Argete, Assistant Dir. Neria Andin, Dr. Armando Palijon, and Dr. Mercedes U. Garcia for their support to the pre-project.

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Likewise, to the Philippines' focal persons who assisted the member country contact persons, namely: Dr. Merlyn Carmelita N. Rivera for Brunei and Malaysia; For. Maura D. Dimayuga for Cambodia; For. Gregorio E. Santos, Jr. for Indonesia; Dr. Feurdeliz L. Dalmacio and For. Moreno L. Santander for Lao PDR; Ms. Carolyn Marie C. Garcia for Myanmar; Dir. Celso P. Diaz and For. Mario DR. Ramos for Philippines; Dr. Magdalena Y. Giron for Thailand; and Dr. Aida B. Lapis for Vietnam, a grateful appreciation is extended to them for their collective and individual support on the successful implementation of the project.

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Executive Summary

This pre-project is a survey on the status of the rattan production and industry in 9 ASEAN member-countries: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam. Data and information were gathered and subjected to sustainability and SWOT analyses. Focal persons were appointed to oversee the data gathering in each country. Finally, a regional conference on rattan was held in Manila as a culminating activity.

On production, two countries have the most number of rattan species and almost the same: 312 for Indonesia; 311 for Malaysia; the Philippines is third with 96 species; then, Brunei Darussalam with 80 species; Thailand, 62; Lao PDR, 44; Vietnam, 30; and Cambodia, 11.

The countries differ in rattan commercial species, Malaysia has 30 species; Indonesia, 28; Philippines, 12; Lao PDR, 11; Thailand, 9; and 5 for Brunei Darussalam, Cambodia, Vietnam and Myanmar.

All ASEAN countries in the study established rattan plantations. Most of the plantations were established in logged-over areas, timber plantations, dipterocarp forest, old rubber/oil palm plantations and communal tree farms. The setting up of rattan plantations is motivated by lucrative returns on investments for rattans grown in large-scale plantations.

The development of genebanks and germplasm contribute to the conservation of rattan. Malaysia has genetic trials covering 478 genetic origins of 4 major commercial species. Lao PDR also started 8 species at their germplasm garden. The Philippines established genebanks with 45 and 25 taxa in Los Baños and Bukidnon, respectively.

Seeds can be collected from the established rattan plantations but most of the country reported that most of the rattan seeds came from the natural stands and wild. Rattan can be propagated not only by seed but also from wildlings and suckers. Wildlings grow from fallen seeds on the forest floor. Suckers actually grow out of the base and nodes of mature rattan cane. Tissue culture is rattan propagation technique which is being initiated by Malaysia and Philippines.

The seeds are kept moist and cool at times of transport from the source to storing place and then store at room temperature. Generally, rattan seeds are extracted either by maceration, scarification, slicing through the embryo cover, or by soaking overnight. Seeds

are then sown in a seed bed. Small seeds are broadcast 2.5 cm apart, large seeds 5 cm apart. It is important to water the seedbed at least two times a day. The common transplanting medium is soil and sand at 3:1 ratio and placed in plastic bags of different sizes. The nursery must be free of weeds. It is important to observe stringent nursery hygiene to minimize pest and diseases.

Lao PDR and Thailand reported on the growing of rattan shoots for food. The prospect for rattan shoots is much better than for rattan cane in Lao.

The common experience for the next 9 mo to 12 mo after outplanting, application of fertilizer (e.g. NPK) could be done. The soil properties differentiate the amount for fertilizer that could be applied for different ASEAN countries.

Practices necessary for the maintenance and protection of the rattan plantation include weeding, brushing, canopy opening/thinning, replanting, putting up signboards and prevention such as controlling the occurrence of possible pests and diseases.

Freshly cut rattan are cut into 4 to 6 pieces measuring 3 m to 4 m per piece and sorted according to species, size and presence or absence of defects. Malaysia specifically sort rattan into 5 diameter and 2 quality classes. These are bundled into 15 to 20 pieces for the large diameter canes and 50 kg to 60 kg per bundle for small diameter rattan. Transport of the canes from the forest may be by land vehicles or with the use of animals or these are dragged that result in damages of the skin or rind. The practiced exposes the cane to staining fungi that causes bluish to black stain on the surface and inner surface of rattan.

Traditional methods in cane treatment includes draining of water, skin-off/sundry methods, smoking and boiling in oil and are practiced in Lao PDR and Myanmar while other countries do the treatment at the depot or at the processing plant.

Complete processing of freshly cut rattan is done in Indonesia since the processing plant is in close proximity to the collection site. Freshly cut rattans undergo pre-treatment, grading, washing, drying, whitening, fumigation, scraping, selection, sorting and packing.

Secondary processing of rattan is usually done at the warehouse where they are scraped, sorted into large, medium or small diameter, straightened and allowed to dry on its ends. Large diameter rattans are washed, boiled in oil at 60°C to 100°C for 30 min, washed and dried. An effective method of keeping rattan from staining fungi and insects is through the

It appears that Indonesia, Malaysia and the Philippines are the only 3 countries in the ASEAN that have fully utilized existing or developed technologies in rattan processing. Although these countries have done so, it is necessary that further improvement be undertaken to address the problems confronting the industry. These include the need for an improvement in harvesting techniques and production of high quality raw materials. On the other hand, lack or poor information dissemination on advanced processing technologies is a basic problem of other ASEAN countries like Lao PDR, Cambodia, Brunei, Myanmar and Vietnam.

Based from the results of the study an extensive information campaign should be conducted to familiarize rattan gatherers, traders, manufacturers and stakeholders on the current production and utilization technologies. A training program on the application of these technologies have to be disseminated and demonstrated in countries where there is an abundant supply of rattan resources but wanting in terms of the current trends in processing. These technologies include raw material processing, improvement of product quality and product design. The subsequent adoption of these technologies shall generate employment thus, providing benefits to the villages or the communities of the countries concerned.



Calamus merzillii Becc. Inflorescence

Chapter I. THE STUDY

By Celso P. Diaz¹

1.1. Introduction

One of the most important natural assets of ASEAN member-countries is their rattan. Yearly, it brings to these countries millions of dollars in terms of exports. Domestically, rattan enables many of those who live in forest fringes to survive and those who live in the lowlands to lead better lives.

The map below (Figure 1) shows ASEAN both as a whole region and as comprised of countries with their own area-specific peoples, resources, and problems. Holistically speaking, there is no ASEAN without the countries; and there is no ASEAN country without taking as a whole its economic, social, cultural, scientific, technological, ecological, market, informational, and political attributes—none more important than the others. Importantly, all stakeholders must be active participants in the

drama of development. This perspective is reflected in the content, organization, and the manner by which the analysis was executed and presented in this paper.

Rattan grows in diverse environments: tropical rainforest, peat swamp, mangrove, and deciduous forests of Africa, Asia, Australia, as well as Papua New Guinea. There are about 650 rattan species in 13 genera in the world, and they are confined to the tropics. However, only less than 10% of these are being used commercially.

Rattans in Africa are widespread throughout West and Central Africa and are a common component of the forest flora. There are 20 species of rattan, representing four genera that are relatively easy to differentiate, particularly the morphology of climbing organs (Sunderland, 2000).



Figure 1. Map showing ASEAN region.

¹ERDB, College, Laguna 4031 PHILIPPINES

For several decades, timber has been considered the only forest product of status owing to its significant monetary value. Because of dwindling timber stocks, there has been a shift of commercial attention to non-timber species as an alternative raw materials particularly for furniture and domestic uses. Subsequently, the rattan stocks are now dwindling. Consequently, ASEAN member-countries must actively support and develop the rattan industry and apply on it the wisdom of science and technology.

The Rome meeting in 2000 underscored the relevance of rattan as a primary, supplementary, and subsistence source of income in the rural areas. Collecting rattan from the wild complements agriculture in providing seasonal labor and source of cash for home and farm. Rattan cultivation, as has been practiced at least for the last 100 years ago in Vietnam, is a productive option.

Currently, there are low economic returns to gatherers and growers. Knowledge on the taxonomy and biological aspects of rattan species is fragmentary. The genetic base of rattan is narrowing. Techniques in harvesting, postharvest handling, processing, and marketing need to be developed and/or improved. There is no standard grading mechanism or set of guidelines. The natural environment and the environments of policy and institutional supports need to be enhanced.

ASEAN needs to act now to develop rattan and make it sustainable. This study is part of that necessary action. It provides a common direction to assess the current status of rattan resources development in the region.

The overall objective of the pre-project study is to determine the ASEAN situation with regard to the Region's rattan resources and the sectors involved in the industry in each member-country. The specific objectives are to:

- (1) gather data and information on the economic, technological, social, and ecological aspects of the rattan industry in ASEAN member-countries;

- (2) conduct a situational analysis to determine the (a) sustainability of the ASEAN rattan industry, and (b) define the strengths, weaknesses, opportunities, and threats involving rattan in each ASEAN member-country.
- (3) recommend future actions to foster greater ASEAN cooperation and enhance the sustainability of the rattan sector within the Region and within each country.

1.2. Methodology

1.2.1. Project Inception

A project inception meeting was held to establish pre-project strategies and team members assignments. The project team discussed and scheduled the different activities that must be done to achieve the pre-project objectives. The key persons and focal institutions/agencies in the nine ASEAN participating-countries were identified. Coordination and collaboration arrangements between the project and participating-countries were established at this meeting. A clear and thorough discussion on the overview of the requirements and actions needed to assess the socioeconomic acceptability, financial and market feasibilities of rattan production, and utilization technologies in the ASEAN Region was an important part of the inception meeting. A strategy on how to conduct situational analyses of the commodity and the socioeconomic, production, harvesting, processing, utilization, and market dimensions of rattan in local communities, established markets, and plantations in the ASEAN Region was also conceptualized. One of the main outputs of this activity was the designation of each pre-project team member with his/her assignments. Finally, a comprehensive action plan program for the entire duration of the pre-project was developed.

Questionnaire Formulation

Survey instruments/questionnaires were formulated to facilitate effective primary data gathering in participating countries. The questionnaires covered the different sector/agencies involved in rattan research and development and other sectors benefited from rattan resources.

Coordination and Data Gathering

Throughout the duration of the pre-project, the staff worked with professionals and experts in the ASEAN member-countries to facilitate the data gathering and determine the latest situation of rattan resources development in the region.

Data gathering began immediately after the designation of contact persons in each ASEAN country involved with the Philippine counterpart focal persons. Primary data were gathered through surveys, personal interviews, focus group discussions and key informant interviews. Secondary data collection was done through visits to websites of rattan-producing ASEAN countries and review of literature, both published and unpublished.

SWOT Analysis

Strength. A strength is a positive component of any system, product, and service; it is a quality or an ability that the competing product, service, or system does outstandingly. Examples: rattan is very beautiful (product), rattan is the only or main source of income (service), and rattan is native to ASEAN (industry).

Weakness. A weakness is a lack, an inferiority, or a disability integral to the product, service, or system. A weakness may be natural, such as the small diameter of a rattan species; a weakness may be because of man's neglect, such as stain on the cane. And therefore, it must be noted that where a product, service, or system is weak, the competing product, service, or system is strong. Examples: rattan is prone to staining (product); rattan is biodegradable and therefore does not last as much as plastic or metal (service), and rattan is not well organized (industry).

Opportunity. An opportunity is a situation, event, circumstance, or position, that is seen as favorable to the product, service, or system in the present or future when taken advantage of. When you turn a negative into a positive, that's opportunity. When you take advantage of an opportunity, your product,

service, or system becomes a threat to the competing product, service, or system. The very places to be looking for opportunities are where there are problems, constraints, obstacles, or difficulties. Examples: Rattan has limited supply – that is an opportunity to produce more, say via plantations (service). Rattan easily deteriorates – that is an opportunity to introduce affordable technology that is portable so that it can be used right at the harvest-place (product). Rattan has little financial support from government – that is an opportunity to become an advocate and gain recognition from government circles (industry).

Threat. A threat is a situation, event, circumstance, or position, that is seen as unfavorable to the immediate or distant future of one's product, service, or system. A competing product, service, or system is a threat; so is a substitute product, service, or system, one which may not be similar to one's product, service, or system. Examples: plastic is a product threat; employment abroad is a service threat; and the current system is a threat to the sustainability system.

1.2.2. ASEAN Regional Conference on Rattan Sustainable Development

This was the culmination of all the activities in this pre-project. Each identified ASEAN focal person involved in this pre-project was invited to present a paper on the status of rattan resources in his or her own country, their uses, extent and management of natural stands and plantations and the appropriate silvicultural activities related to sustainability of the resource.

1.2.3. Conference Proceedings

An edited compilation of the proceedings of the ASEAN Regional Conference on Rattan Sustainable Development was prepared, taking into consideration all the papers presented, country reports, highlights and all the major issues and concerns raised during the conference. The compilation includes an action program which contains activities to be undertaken by ASEAN member-countries.



1. Rattan in the ASEAN Region

In the ASEAN Region, rattan is a prime source of foreign exchange after timber. The rattan sector involves more than a million people who collect, cultivate, process, trade, and market rattan products.

Since the 1980s, Indonesia has been the number one rattan-exporting country in the world, supplying 80% of the world's demand. The rattan industry contributed USD 300 million in 2001 to the Indonesian economy. Impressive as is, as earlier noted, two other countries make millions of dollars out of rattan and yet, they do not own any forest resources. In 1997, Hong Kong exported rattan products worth USD 53 million and Singapore USD 23 million.

1.1 Natural Stands: Species and Stocks

Table 1 shows a rich diversity of this natural resource that emerges from an enumeration of the taxonomically identified species.³ Two countries have the most number of rattan species and are almost the same: 312 for Indonesia and 311 for Malaysia. This is not surprising as these two countries have the largest forest areas in the ASEAN Region. The country with the third highest number of rattan species is the Philippines with 96 species which is not even half of those of either Indonesia and Malaysia. Surprisingly, almost the same number of rattan species exists in the Brunei Darussalam (80) and Thailand (62). The rest of the ASEAN countries have comparatively fewer species: 44 for Lao PDR, 30 for Vietnam, and 11 for Cambodia.

While there are no data available, experts familiar with the field situation in each country agree that in Vietnam, the wild stocks of rattan are probably

almost exhausted; in Lao PDR, wild stocks are substantial but declining; in Cambodia, over-harvesting of wild stocks is probably underway. Part of the explanation is that there is greater industrialization in Vietnam than in Lao PDR and Cambodia; there is smaller but more heavily exploited forests in Vietnam, as the ethnic minority groups remain quite dependent on harvesting forest resources. In all ASEAN countries in this study, the wild stocks are probably not far from exhaustion unless intervention is immediately implemented.

1.2 Commercial Species

The countries also differ much in the number of commercial species. This time with Malaysia as number one with 30 species and Indonesia with 28 species (Table 1). In 3rd place, is the Philippines with 12 species; in 4th place, Lao PDR with 11 species.

Of the top 5 commercial species, *Calamus manan* is common to Indonesia, Malaysia, and Thailand; *C. ornatus* to Brunei Darussalam, Indonesia, and the Philippines; *C. poilanei* to Cambodia, Lao PDR, and Vietnam; and *C. scipionum* to a variety in Brunei Darussalam, Malaysia, and the Philippines. There are species unique to a country, such as *C. erectus* to Thailand, *C. floribundus* to Myanmar, *C. gracilis* to Lao PDR, *C. platyacanthus* to Vietnam, *C. ramulosus* to the Philippines, *C. optimus* to Brunei Darussalam, *C. tumidus* to Malaysia, and *C. viminalis* to Cambodia.

1.3 Plantations of Rattan

All ASEAN countries in the study report have established rattan plantations (Table 2). As expected, Indonesia covers the largest area of rattan plantations, 334,000 ha; Malaysia with the 2nd largest rattan plantation area, 28,258 ha, but this is only less than one-tenth of that of Indonesia;

² ERDB, College, Laguna 4031 PHILIPPINES

³ The figures are from Joffre Hj Ali Ahmad et al 2004 for Brunei, Bambang Wiyono and Gregorio E Santos Jr 2004 for Indonesia, Sounthone Ketphanh et al 2004 for Lao PDR, Raja Barizan 2004 for Malaysia, U Win Myint 2004 for Myanmar, Celso P Diaz and Mario Dr Ramos 2004 for the Philippines, Chudchawan Sutthisrisilapa 2004 for Thailand, Do Thi Ngoc Bich 2004 for Vietnam, and Tom Evans 2002 for Cambodia.

Table 1. Taxonomically recognized and commercial rattan species.

COUNTRY	Taxonomically recognized species		Top 5 COMMERCIAL SPECIES
	Total	Commercial	
Brunei Darussalam	80	5	<i>Calamus optimus</i> , <i>C. ornatus</i> var. <i>ornatus</i> , <i>C. scipionum</i> . Text says 5 but only 3 in the actual list, and no common names.
Cambodia	11	5	<i>Calamus rudentum</i> , <i>C. poilanei</i> , <i>C. tetradactylus</i> , <i>C. tenuis</i> , <i>C. viminalis</i> (piidau). From list of Tom Evans et al, no common names either.
Indonesia	312	28	<i>Calamus caesius</i> (sega), <i>C. trachycoleus</i> (irit), <i>C. manan</i> (manau), <i>Calamus</i> spp. (pulut), <i>Calamus ornatus</i> (sega badak)
Lao PDR	44	11	4 main species: large-diameter <i>Calamus poilan</i> , medium-diameter <i>C. nambariensis</i> , and small-diameter canes <i>C. gracilis</i> and <i>C. solitarius</i>
Malaysia	311	30	<i>Calamus manan</i> (rotan manau), <i>C. tumidus</i> (rotan manau tikus), <i>C. scipionum</i> (rotan semambu), <i>C. caesius</i> (rotan sega), <i>C. trachycoleus</i> (rotan irit)
Myanmar	38	5	<i>Calamus latifolius</i> (yamata kyein), <i>C. longisetus</i> (kabaung kyein), <i>C. platyspathus</i> (kue-t-u kyein), <i>C. floribundus</i> (ye kyein), <i>C. guruba</i> (kyein ni)
Philippines	96	12	<i>Calamus merrillii</i> (palasan), <i>C. ornatus</i> var. <i>philippinensis</i> (limuran), <i>C. mindorensis</i> (tumalim), <i>C. ramulosus</i> (panlis), <i>C. scipionum</i> (Malacca cane)
Thailand	62	9	<i>Calamus longisetus</i> , <i>C. wailing</i> , <i>C. erectus</i> , <i>C. manan</i> (wai kor dum) <i>C. peregrinus</i>
Vietnam	30	5	<i>Calamus tetradactylus</i> (maay neeps), <i>C. tonkinensis</i> (maay ddawngs), <i>C. platyacanthus</i> (song maatj), <i>C. rudentum</i> (song ddas), <i>C. poilanei</i> (song bootj)

and the Philippines with 17,245 ha, ranking 3rd.

Brunei Darussalam reports an almost nonexistent rattan industry, but it cites 900 ha planted to rattan; with Thailand slightly outsizeing it with 1,018 ha.

The first cultivation of rattan occurred in 1850 somewhere in Central Kalimantan; this is considered the pioneering venture.

There are three ways of interplanting rattan in the ASEAN countries studied: (a) in timber plantations as in Brunei Darussalam, (b) logged-over areas, (c) old industrial plantations e.g., in West Sumatra.

The setting up of rattan plantations is due to lucrative returns on investments for rattans grown in large-scale plantations which in turn can spur the growth and diversification of the macroeconomic environment of processing industries using this resource. According to experts, "Thailand has lost its rattan resources." That explains why the Royal Forest Department started rattan plantation establishment in 1968 in Rangae District.

Worthy of special note is the smallholder cultivation of small-diameter clustering species *C. tetradactylus* in North Vietnam which began over 100 years ago and is thus, one of the oldest rattan cultivation systems in the world.

Table 2. Rattan plantations established in ASEAN countries, 2004.

COUNTRY	AREA (ha)	LOCATION	DESCRIPTION
Brunei Darussalam	900	Andulau Forest Reserve, Labi Hills Forest Reserve, Ladan Hills Forest Reserve	Interplanted in timber plantations.
Indonesia	118,802	Central Kalimantan, East Kalimantan, Java, Berau	Dipterocarp forest and logged over areas.
Lao PDR	150	Edible shoot plantations mostly by local people	
Malaysia	23,157	Sabah	Interplanted with palms and trees.
Philippines	17,395	DENR, 15 regions, Surigao, Mindoro Oriental, Agusan del Sur.	In timber concessions, logged over, tree plantation forest.
Thailand	13,446 21,846	Rangae District, Narathiwat Province, Sukinin District, Narathiwat Province, Muang District, Ranong Province, Muang District, Suratthani Province, Tha Sae District, Chumporn Province	
Vietnam	25,000		

1.4 Germplasm and Genebank

Another important effort on rattan conservation is the development of genebanks and germplasm. In Malaysia, 33 genetic trials were established covering 478 genetic origins of 4 major commercial species, progeny trials and established 16 species in the arboretum. Indonesia planted 20 species at the Bogor Botanical Gardens. A germplasm garden of 8 species was started in Lao PDR.

In the Philippines, a genebank of 45 taxa was established in Los Baños, Laguna and in Bukidnon with 25 taxa.

2. Propagation

2.1 Seed Sources and Seed Processing

Table 3 shows that most of the seeds are sourced from the wild or bought from aborigines or natives of the areas where the rattans are. The exception is Brunei Darussalam which imports seeds.

The country reports contained techniques on how to properly collect and process the seeds for storage. Thus: The seeds must be collected only

Table 3. Rattan seed and seedling sources in ASEAN countries, 2004.

COUNTRY	SEXUAL PROPAGATION: RATTAN SEED & SEEDLING SOURCE
Brunei Darussalam	Seeds from local and foreign sources.
Indonesia	<i>C. caesius</i> and <i>C. trachycoleus</i> : Seeds from a natural stand harvested from 3-4 times (at least 10 meters long). <i>C. inops</i> : Seeds from 10-yr old stand. <i>C. zollingeri</i> and <i>C. sp. (lambang)</i> : from 50 meters in length.
Lao PDR	Seeds sourced from wild or from nurseries of villagers.
Malaysia	Seeds purchased from aborigines or collected from standing trees (natural or plantation).
Philippines	Fruits collected from natural stands and wild.
Vietnam	Seeds sourced from the wild.

from rattan stands that have been harvested from 3 to 4 times, with canes at least 10 m long. Hardness confirms that the seeds are mature. They must be kept moist and cool at all times during transport, then processed upon arrival in their destination to ensure high germination rate.

In the Philippines, seeds may be collected between October and March each year. In Thailand, it has been found that seeds stored in a plastic bag sealed tightly in nearly vacuum condition and kept at room temperature is viable for a month. If the seeds are stored at 10°C to 14°C, they will remain viable for many months.

2.2 Seed Treatment and Germination

To prolong the seed viability, seeds/fruits are sorted in polyethylene bags (polybags) under humid conditions and sprayed with water twice a day. With this condition, they can be kept for 1 mo to 2 mo.

To contain low germination percentage of rattan seeds, pretreatment is necessary. Generally, rattan seeds are extracted either by maceration, scarification, slicing through the embryo cover, or by soaking ranging from overnight (in Malaysia) to 10 days (Lao PDR). While the seeds are soaked, water must be changed everyday or place them under running water (Thailand). To hasten and improve germination after soaking, prick off the hilar (the small cap that covers the embryo) with a sharp pointed knife or scalpel. As tested in the Philippines, removing the hilar reduces germination time greatly, from 365 days to 2 days for *C. merrillii*, from 210 days to 15 days for *C. ornatus* var. *philippinensis*.

2.3 Seedbed, Seed Sowing and Germination

ASEAN experience shows that rattan seeds should be sown immediately after pretreatment; otherwise, they lose fast their vitality. Seeds should be dressed with fungicide before sowing to prevent fungal infection.

It is customary to grow the seeds on seedbed. Small seeds are broadcast 2.5 cm apart, large seeds

5 cm apart. Seeds are pressed into the soil until they are shallowly covered.

It is important that the seedbed be watered at least 2 times a day, in the morning and evening. The seedbed is normally rectangular. The seedbed must be sited in an East-West direction and a canopy provided to avoid strong and direct sunlight hitting the seeds or seedlings. The germination medium may be a mixture of topsoil and fine sawdust.

Without a seedbed, rattan seeds can be alternatively planted in transparent plastic bags where they will germinate (Indonesia), or embedded in coconut fibers in a box (Lao PDR). The growing medium in the plastic bags should be an equal ratio of garden soil and humus.

When shoots and roots are 1 cm to 3 cm long, the seedlings are ready for potting.

3. Sources of Planting Stocks

Planting materials are taken from the following sources:

3.1 Suckers and Wildlings

Only three among the ASEAN countries studied i.e., Malaysia, the Philippines, and Thailand reported that rattan can be propagated not only from seeds but also from wildlings as well as from suckers. Wildlings grow from fallen seeds on the forest floor. Suckers actually grow out of the base as well as the nodes of the mature rattan cane, as is the experience in the Philippines particularly for *Calamus merrillii*. For each rattan mother plant, 2 to 7 suckers may grow.

It is best to collect suckers during the rainy season as there is no extra effort needed to keep the suckers moist during transport. Collect only the suckers that are 15 cm tall or less and with well-developed root systems.

For wildlings, or plantlets that grow from seeds that fall on the forest floor, collect only those that are 30 cm tall or less. Similar with suckers, it is best to

collect wildlings during the rainy season. If the nursery is far from the collection site, cover the roots with moss or the leaf sheath of banana to avoid excessive transpiration.

3.2 Tissue Culture

Only Malaysia and the Philippines reported tissue culture as an alternative propagation technique for rattan. The technique uses embryo or tissue from the shoot apex region.

Although tissue culture is costly, the expense may be compensated by the fact that a high proportion of the plantlets produced are the exact duplicates of the original mother plant. The large-cane species *C. manan*, *C. subinermis* and *C. merrillii* have been tissue-cultured in Sabah. So far, the best prospects for tissue culture lies with *C. merrillii* as observed in Malaysia. In the Philippines, tissue culture has been successfully used on *palasan*, *limuran*, *panlis*, *ditaan*, *tagiktik*, *sumulid*, *lambutan* and *kumaboi*. Of these, tissue-cultured *palasan* and *limuran* propagules have been successfully established in nurseries and in the field (Philippines).

Propagation of rattan through suckers or tissue culture still needs further research to ensure success in producing a large number of planting stocks.

4. Potting, Transplanting and Nursery Care

The common transplanting medium is soil and sand at 3:1 ratio and placed in plastic bags of different sizes. Black plastic bag is used in Brunei Darussalam and Malaysia. The seedlings are carefully lifted from the seedbed and potted when they are about 2 mo to 3 mo old, with initial 2 to 3 open leaves.

It is important to observe stringent nursery hygiene to minimize pest or disease outbreak. It is important that unhealthy seedlings are culled out and disposed of. The nursery must be free of weeds. Apply fungicides if necessary to minimize incidence of either leaf blight or leaf spot disease. At all times,

the seedlings must be protected from direct sunlight. Moreover, control the growth of weeds to prevent overtopping the seedlings.

For the next 8 mo to 12 mo, water the seedlings twice a day. Also fertilizer is applied.

Before outplanting, the seedlings are hardened by exposing them gradually to direct sunlight so that they can adjust to field conditions (Philippines).

5. Plantation Establishment

5.1 Site Requirements

The first site requirement for establishing a rattan plantation is the presence of trees for the rattans to climb while growing. Initially, rattan requires some shade when it is still young and a sturdy support as it matures.

Specific sites for plantation establishment are logged-over areas, timber or tree plantation areas, mature rubber plantation areas, oil palm plantations, communal tree farms, reforestation projects, brushlands with soft-stemmed trees, second-growth forests, and slash-and-burn (kaingin) areas with fruit trees. If the area does not have enough trees, earlier planting of fast-growing and nitrogen-fixing trees is recommended. Preferred sites are secondary or logged-over forests of low to noncommercial significance.

In a timber plantation, it is important to match the cutting rotation of the rattan species to the timber species with which it is interplanted. Thus, rubber trees that are around 15 years of age can be used. The mature rattan canes are harvested when the support trees reach 25 yr to 30 yr old and when the rattan has around 3 to 4 stems with 10 m to 14 m in length of selected species.

5.2 Site Preparation

For logged-over forest areas. The method is called the stripline system. Planting strips are spaced 20 m apart and the width of each strip is 5 m. The planting arrangement and alignment along the planting strip is quincunx, i.e., 5 seedlings are

outplanted in a rectangular pattern where 4 seedlings are planted at the corners while 1 seedling is planted at the center of the rectangle. There are 3 planting lines along each planting strip; the 2 outlying lines are each 1 m away from the edges of the strip, and 1.5 m apart from the center planting line. Each planting spot, along each line and along each strip, is marked with a wooden stake. The planting density is 495 seedlings/ha. The site preparation involves the total clearing of all vegetation (trees, bushes/brushes, climbers), except for commercially known timber species of large pole and over in size), along the stripline. The buffer zones of undisturbed forest cover in-between strips is 15 m wide. The debris from clear-cutting or total clearing of the planting strips are placed and piled in the buffer zones to rot in due time. No burning of debris is done.

For Interplanting sites. Only one planting line is laid out in-between (center line) and along the rows of planted trees. Since the understory of the established timber plantation is more or less clear of heavy underbrush, clearing of the planting line and the planting spots along the line is not much work, except in blank areas, where the underbrush may be thick.

Before any field preparation work can be carried out for large-scale planting, the area should be properly surveyed, boundaries demarcated and subdivided into blocks of appropriate size. The blocks may range from 10 ha to 40 ha depending on the size and nature of the land, topography, and planting density. Regular size and shape of the block facilitates field operations and overall project management. Information such as gradient, aspect, the presence of ridges and rivers can help managers decide the size of planting blocks and the need to construct roads, culverts, or bridges. Field preparation involves a number of operations such as under-brushing, lining, and line-planting clearing, selective felling, and cutting of trees.

The site is cleaned if necessary by clearing stands and plants that bother rattan growth or are of less commercial value. Clean wild shrubs/coppice around the plantation area. It is important that the

area provides enough sunlight to support the growth of rattan.

For field-forest planting, the baseline is determined depending on the direction of the planting line or the terrain. The baseline also serves as pathway for workers to carry seedlings during planting and to canes after harvesting. Lining is carried out to mark the planting rows and planting points. Pegs or spikes made of bamboo are inserted at the planting points to assist in aligning the planting distance between points. Planting lines are aligned perpendicular to the baseline. The common practice on undulating and flat areas is to have the planting line in an east-west direction to maximize the benefit of sunlight. On very steep slopes, the planting lines should follow the contour. Along the planting line, the optimal width is 1.5 m to 2 m and needs to be cleared as planting path. Trees within the planting path and immediately outside (except those of commercial importance) should be felled and removed if found to obstruct movement of workers planting or cast heavy shade over the seedlings. Pruning of tree branches to allow more light, about 50% more, to reach rattan seedlings along the planting lines may also be necessary. Felling and pruning of tree branches require good judgment so that they are neither excessive nor inadequate. The workers should also be skilled in identifying the trees so that commercial tree species are conserved. These activities are quite labor-intensive. Mechanical felling using chainsaws is preferred over the application of tree poisons.

Conduct soil analysis to determine the site's specific water and fertilizer needs.

Clear the area of grasses, vines, shrubs, and other unwanted vegetation without disturbing or damaging the host trees. Clearing or under-brushing should be done during the dry season.

Stake and dig the area at 2 m x 2 m for solitary types and 5 m x 5 m for clustering types. Holes must be wide and deep enough to accommodate the soil-balled seedlings. Holes should be made 1 m away from the bole of the nearby trees. A maximum of 400 seedlings/ha may be planted.

Prepare the site during the rainy season, except in flooded areas.

Clear the forest floor into strips of 2 m to 4 m wide following north-south direction or contours of the site. Spacing depends on species and other factors: budget, management practice, or characteristic of species e.g., for clustering rattans, the spacing should be wider.

5.3 Rattan Plantation for Edible Shoot Production

Two countries reported on the growing of rattan for food. Lao PDR submitted data on the area used for the production of edible rattan shoot, i.e., a total of 150 ha. Though no area was mentioned, Thailand reported sales of rattan seedlings for shoot production, with one farmer selling up to 10,000 seedlings/mo.

Interestingly, in Lao PDR, the prospects for rattan shoots for food is much better than for rattan canes because of the presence of a large domestic market. Planting is spreading rapidly in the country without needing special policy support because, unlike cane, rattan plantations on shoots of *C. tenuis* offer rapid and proven returns in the open market.

In the export market, the only competition of Lao PDR is Thailand. Culturally, tastes differ, as can be seen in the species of preference: *C. tenuis* in Lao PDR and *C. siamensis* in Thailand.

The pretreatment of seeds for rattan shoot production may differ from that for cane production. In the former, the instructions are: Peel off the outer cover of the seed and expose under the sun for 3 days. Soak in water overnight, then air-dry. Mix seed with finely shredded coconut coir dust and place in plastic bag. Allow to germinate for 2 mo. After 3.5 mo, transfer germinants individually to plastic bags and place in the nursery. Water and weed if necessary.

When the seedlings are 9 mo to 12 mo old, they are taken out of the shade and hardened.

The area should be cleared and plowed a week before planting. The best time to plant is during the rainy season when the soil is moist. The planting site should be quite rich with a mix of sand and loam. If possible, the plantation should be close to the water source. This is recommended because *C. tenuis* likes to grow in moist places.

Use a spacing of 0.5 m to 1 m x 2.5 m. When the plantation is 1 mo old, apply fertilizer and manure.

Shoots can be cut in about 8 mo from planting and every 2 weeks later. There after, on the average in a single clump, shoot are harvested once a month. With proper irrigation, production is year-round; otherwise, production is limited to 7 mo (during the rainy season).

5.4 Outplanting for Cane Production

In both the logged-over area and tree plantation sites, the method of outplanting is the same. In summary, the instructions are as follows:

Transplant seedlings not less than 30 cm in height and hardened for a month or two. A combination of land and water transport may be necessary to deliver the seedlings to the site. From the roadside or riverbank, transport the seedlings immediately. Carry the seedlings using customized flatboard-lined backpacks to minimize damage to the young plants. Those that cannot be transported immediately should be placed under temporary netting-covered storage sheds.

At the site, carefully depot seedling from plastic bag so that the earthball will not break and disintegrate when the seedling is being inserted into hole. Dig planting hole 4 cm to 5 cm deeper than height of earthballed root system and at least 4 cm wider than the diameter of the earthball. The bottom of the hole should first be backfilled with a layer of topsoil of about 3 cm thick, and then the depotted seedling is carefully placed on top of it and in the center of the hole. The top surface of the earthball should be about 1 cm lower than the ground surface. Then, completely backfill the hole with loose soil and heel-in to compact it.

Prepare the holes. Plant young rattans, around 9 mo to 11 mo old, in the field. Tear plastic bag and put seedlings into the planting hole, fill up with soil and compact it. Stick a stake on the soil and fasten the seedling to it to prevent damage by strong wind. Plant 5 m x 5 m and 1 m away from the creeping tree.

Before planting, seedlings need to be hardened off in the nursery or field. A few days or a week before, place the seedlings under direct sunlight or transport to the planting site. Transport seedlings after watering them thoroughly and in a ventilated covered vehicle to prevent damaged by wind.

Plant at the onset of the rainy season to ensure high survival. A 3-man team is required for planting, one for digging the hole, one for carrying the seedlings, fertilizer and placing the seedling, and one for planting. The planting hole should be at least twice larger than the diameter of the plastic bag and slightly deeper than the height of the bag.

Before transplanting, the plastic bag is wet with water. Once soil is in place, a planting hole of sufficient size is dug at the center to accommodate the root system; after the seedling is placed in the hole, the hole is filled up with soil, firmed up, and watered lightly. Water twice a day, in the morning and afternoon. Weed if necessary before monthly fertilization.

There are three methods of planting rattan: line, group, or strip planting. In *line planting*, seedlings are planted singly. In *group planting*, more than 1 seedling is planted per point. In *group planting*, 3 to 5 seedlings are planted 1 m apart. Strip planting is recommended for old secondary forests to reduce damage to the forest. Minimal planting density should be 400 seedlings for solitary and 200 seedlings for clustering per hectare; the planting strips should be 5 m to 10 m and forest strips 30 m to 40 m. The minimum distance between seedlings within the planting line should 1 m for solitary and 2 m for clustering species. For strip planting, trees are felled along the strips. An optimum of two planting lines per planting strip is sufficient. In the secondary forest, the

recommended planting distance is 3 m x 4.6 m giving a population of 725 plants/ha. A lane 1.8 m wide is cleared of all undergrowths on either side of the planting line, to facilitate field operations. In the case of the clustering or multiple-stemmed species under secondary forest, the planting distance is 6.7 m x 3.4 m with 1.8 m on either side of the planting line cleared of all undergrowth. The planting density is 439 plants/ha.

Seedlings should be transplanted at the onset of the rainy season to ensure survival. Only robust and healthy seedlings should be selected for transplanting. The seedlings should also be at least 15 cm tall and contain 4 to 5 leaves. Transport the seedlings to the planting site with utmost care and least disturbance. Potting medium such as plastic bags should be removed without breaking the earthball before placing the seedlings into the holes. Plant the seedlings such that root collar is on ground level.

There are two patterns of planting: row and cluster. For cluster planting, 3 to 5 trees/cluster are planted at 5 m x 10 m or 10 m x 10 m. For row planting, the spacing is 1.8 m x 10 m.

First, dig a hole, the size being bigger than the plastic bag which holds the seedling. Carefully remove the plastic bag in order not to damage the root system. Place the seedling in a straight position, being careful that the root collar is at the same level as the soil surface. Lightly compact the soil around the seedling.

5.5 Interplanting in Different Types of Plantations

The interplanting of rattan with already established trees is both necessary and advantageous. It is necessary because, as already mentioned, rattan needs a sturdy trunk to climb as it grows as well as shade against the harsh sunlight in the tropics. It is advantageous because the interplanting results in two crops grown in the same site, doubling the harvest from the plantation without doubling the area.

There are at least nine different types of plantations into which rattan can be inter-planted.

- (1) logged-over areas
- (2) timber or tree plantations
- (3) rubber plantations, preferably old or abandoned ones
- (4) oil palm plantations
- (5) communal tree farms
- (6) reforestation projects
- (7) brushlands with soft-stemmed trees
- (8) second-growth forests
- (9) slash-and-burn areas with fruit trees

In all types of plantations, it is necessary to consider that the harvesting of rattan canes can constrain the rattan gatherers or workers of the original plantation.

The survival and stem growth of some rattan species planted under rubber may be better and more cost-effective than those grown under forest trees. This is because the prevailing conditions in a rubber plantation are almost ready-made for immediate establishment of rattan seedlings.

With commercial rubber plantations, a rattan is established following the agroforestry concept. This is aimed at increasing the yield of land and supplementing the income of smallholders/rural folks. The income is estimated to be more than sufficient to cover the costs of replanting rubber. The survival and stem growth of rattan has been reported to be better than those planted under forests, indicating that the establishment of rattan in a rubber plantation is more cost-effective than planting in forest areas. Rattan seedlings are usually planted in quincunx, in the middle of 4 rubber trees, the planting distance depending on the rubber spacing. Another approach is to plant rattan in every alternate row of rubber trees. At each planting point, single or group (2 to 3 seedlings) planting may be done. The density is 400 plants/ha.

In the 3rd year or at about 1.5 m in height, the rattan develops cirri/flagella. As the stem grows longer, the newly produced cirri/flagella will grow towards taller branches. To avoid any working hazard to

rubber tappers, drooping cirri should be cut. Similarly, dried fronds or those hanging from the stem along the planting lines should be cut to allow better passage to workers. The climbing organs (cirri/flagella) need to be assisted to climb the nearest available support, in this case the rubber tree, in the process of staying erect towards the light. Pathways should be cleaned frequently; this can be done simultaneously with cleaning and weeding of the rubber plantation.

With plantation trees. At the Ecoforest Village, rattan seedlings are established between trees of *Pterocarpus macrocarpus* and *Dalbergia cochinchinensis* (4 m x 4 m). The rattan is harvested at 4 yr of age.

With fruit trees. At the Ecoforest Village in Thailand, rattan is grown together with banana, mango, and jackfruit. There are 3 rattan seedlings planted/ hole.

5.6 Fertilization

The common experience is that for the next 9 mo to 12 mo after outplanting, the seedlings should be given proper care, ie, with the application of NPK fertilizer, the ratios differing in different countries: 12-12-17 in Brunei Darussalam, 15-15-15 in Lao PDR, 11-8-8 in Malaysia, and 14-14-14 in the Philippines (Table 4).

Because of the differences in soil properties in the different ASEAN countries, the fertilizer rates are also necessarily different. Thus:

In Brunei Darussalam: Apply complete fertilizer [NPK (12-12-17) and 2 mg TE] at a dosage of 100 g 30 cm away from the stem-base in 4 holes dug around the seedling, approximately following the 4 cardinal directions. Apply 25 g to each hole.

Lao PDR: After 45 days, add NPK (15-15-15) at 1 soup spoon/20 L of water every 15 days, increasing to 2 spoons at 4 mo of age. Stop fertilizing 2 mo before transplanting.

Table 4. Fertilization of rattan plantations in ASEAN countries, 2004.

COUNTRY	PLANTATION MANAGEMENT: FERTILIZATION
Brunei Darussalam	NPK (12-12-17) and 2 mg TE) at a dosage of 100 grams
Lao PDR	NPK (15-15-15) at 1 soup spoon/20 L of water every 15 days, increasing to 2 spoons at 4 months of age. Stop fertilizing 2 months before transplanting.
Malaysia	Slow-release fertilizer (eg, Agrobien, NPK 16-8-9 + 3 Mg), 100 grams per plant. Christmas Island rock phosphate, 100-150 grams/plant, is also applied in the planting hole. In the logged-over forest area, fertilize only once, at planting time. Apply fast-release fertilizer starting with 5 gm per plastic bag only after 1 month from transplanting to avoid injury to roots. Spray foliar fertilizer (Bayfolan, NPK 11-8-8 +TE) with 2-3 mL/L water/100 seedlings. Increase amount as seedlings grow.
Philippines	NPK (14-14-14) at 10 grams 1 month after outplanting and 6 grams after every 6 months for 3 years.
Thailand	Apply fertilizer at 3 and 9 months, 60 gm/tree of rock phosphate about 0.5 meter around the seedlings.

Malaysia: Apply on the planting hole slow-release fertilizer (e.g., Agrobien, NPK 16-8-9 + 3 Mg), 100 g/plant. Christmas Island rock phosphate, 100 g/ to 150 g/plant, is also applied in the planting hole. In the logged-over forest area, fertilize only once, at planting time. Apply fast-release fertilizer starting with 5 g/plastic bag only after 1 mo from transplanting to avoid injury to roots. Spray foliar fertilizer (Bayfolan, NPK 11-8-8 +TE) with 2 to 3 mL/L water/100 seedlings. Increase amount as seedlings grow. Fertilizer application is necessary in the first 3 yr, after which seedlings appear not to respond to fertilizer.

Philippines: Apply complete fertilizer (14-14-14 NPK) at the rate of 10 g 1 mo after outplanting and 6 g after every 6 mo for 3 yr.

Thailand: Apply fertilizer at the age of 3 mo and 9 mo, after the seedling has already established itself, when a new shoot tip occurs or after weeding in the early rainy season. Fertilizer is bestrewn and mixed together with the topsoil around

the seedlings. In practice, 60 g/tree of rock phosphate is applied about 0.5 m around the seedlings.

6. Plantation Maintenance and Protection

Practices necessary for the maintenance and protection of the rattan plantation include weeding, putting up signboards, replanting, canopy opening/thinning, and prevention and control of pests and diseases.

Weeding. Complete weeding along each planting strip should be done 1 yr after outplanting, and thereafter every 6 mo, until the rattans establish themselves and develop their own canes. Ring-weeding with a radius of 25 cm to 50 cm around the clump for the first 3 yr is recommended. Do this 3 mo after outplanting and every 4 mo thereafter. Cover the soil with mulch to conserve soil moisture.

Signboards. It is important to put up signboards in strategic locations, along roadsides and riverbanks

and such, to keep people aware of the existence of the plantation and discourage illegal entry or any other illegal activity. The plantation should be constantly monitored to ensure their sturdy growth and development and to detect any impending infestation by pest or infection by disease-causing organisms.

Replanting. In the initial years, the seedlings need much looking after to increase their survival rate, improve growth and speed up establishment. Replanting should be done along with the first weeding.

Canopy opening/thinning. About 9 mo after planting, unwanted trees are removed, opening 3 m around the clump to increase light intensity up to 60% to 70% for optimum growth. Repeated opening of the canopy is done when the seedlings are 3, 9, 18, and 30 mo of age.

Prevention and control of pests and diseases. During the growing period, it is necessary to monitor the planting sites to determine the need to eradicate any disease or pest attacking the crop. The attack of small insects can be controlled by insecticides such as Malathion or Dicofol, of leaf blight or leaf spot disease by Methamidophos.

7. Harvesting

7.1 Harvesting Shoots for Food

Three of the 9 ASEAN countries studied reported on the growing and harvesting of rattan shoots for food: Indonesia, Lao PDR, and Thailand. It is interesting to note that Lao PDR and Thailand are exporting rattan shoots to Southeast Asian communities in France, the United States and elsewhere. Note that culture determines people's taste, and that is the reason the rattan species popular for food in one country may not be so in another.

In Indonesia, the popular rattans utilized as vegetable belong to the genus *Daemonorops*.

In Lao PDR, the people have the habit of harvesting rattan at a tender age for their food, a practice that is widespread throughout the country. The gatherers look for young rattan of about 1 m to 2 m high, then cut the shoot to about 1 m long. This puts the supply of rattan in danger of quick depletion. Even the shoots valuable species for furniture are harvested early: *C. poilanei*, *C. platyacanthus*, and *C. solitarius*. Of the large canes, a gatherer could harvest 40 to 50 shoots daily, earning about USD 4 to USD 5; of the large canes, he could harvest up to 200 shoots, earning about USD 8 to USD 10. The smaller shoots cost higher, but the consumers prefer them for their better taste.

Interestingly, under the initiative of the Royalty, Thailand in 1997 embarked on a program of producing food from rattan, turning this species into a food bank, probably the first of its kind in the world. The total plantation area as of November 2003 was 6,216 ha.

7.2 Harvesting Canes for Furniture and Handicraft

Season of Harvesting

Harvesting of rattan may be year round or anytime of the year in the case of Myanmar (Myint 2004), Thailand (Sutthisrisilapa 2004) as well as in the Philippines, specifically in Samar Province (Diaz and Ramos 2004). Rattan licensees practice rotation cutting and each block is replanted with rattan seedlings such that those that these could be harvested in addition to the ones that were left at the end of the 10-yr cutting rotation. Lowland farmers gather rattan during the rainy season, when they are free from farm activities. In areas where the rattan industry is booming, canes are harvested continuously and gatherers may include other villagers and labor hired by traders. In Vietnam, harvesting is during the months of June to October (Bich and Lapis 2004).

Harvesting Method

Table 5 shows that in most of the 9 ASEAN member-countries included in the study, the cane is cut with a native tool (big knife or axe), then pulled down. More details are discussed below.

Tools used. A large-bladed knife, bolo, or an axe is used to cut the cane. Since there are no large-scale cutting operations, no mechanized cutters are used except in Malaysia where some use the cutter fabricated at FRIM.

Cutting cane below. Usually, before cutting a large-diameter cane, the gatherer makes an estimate: If more than half of the cane's length can be utilized, he decides to cut. Traditionally, the rattan stem is cut at the base at a convenient height. After cutting at the base, the gatherer has two options. For small-diameter canes, he pulls down the stem until it cannot be pulled down anymore. The mere act of pulling down cleans the stem of thorns and fronds.

For large-diameter canes, the gatherer pulls down the cane as much as possible without sweeping off the fronds or thorns; then he leaves the cane in

the forest for days or weeks until the fronds, leaves and thorns have dried up and are easy to clean off.

Cutting cane above. In either case described above, to cut the topmost portion of the cane, the gatherer again has two options. One, to climb the tree that the rattan has climbed and cut at the topmost reachable mature portion. Then he continues to pull down the cane and clean it. Two, to attach his cutting tool at the end of a long pole, usually of bamboo, with which to cut the cane at the topmost desired portion.

Participants in Harvesting

Harvesting of rattan can be done by at least 2 to 3 or a group of 10 to 20 individuals and in Indonesia by a number of villagers who are on full or short-term basis (Table 6). Traditionally, the aborigines or indigenous peoples harvest the canes making it a source of livelihood. There has been little change in the harvesting of rattan over the centuries. Harvesters of rattan always go as a team of two or more. Either family members go or a group hired by the middleman, trader or rattan company go. A team of 2 to 3 individuals may be able to harvest

Table 5. Rattan harvesting in ASEAN member-countries, 2004.

COUNTRY	HARVESTING
Brunei Darussalam	<i>Cut base of stem with a bolo at convenient height.</i>
Cambodia	<i>Cut stem and haul down. Cut and leave 1 to 2 days in the forest.</i>
Indonesia	<i>Cut stem 1 m from the ground with knife, axe, or dagger. Leaves and thorns cut off, SD leaves not cut.</i>
Lao PDR	<i>Cut with bolo at reachable height.</i>
Malaysia	<i>Conventional method: Cut at base. Mechanical method: Use equipment fabricated at FRIM.</i>
Philippines	<i>Cut close to base or 30-60 cm above ground by bolo. Pull down.</i>
Thailand	<i>Cut at the base, then pull down.</i>

Table 6. Rattan harvesting in ASEAN member-countries, 2004.

COUNTRY	HARVESTING	PARTICIPANTS IN HARVESTING
Brunei Darussalam	<i>Cut base of stem with a bolo at convenient height.</i>	<i>Family members of 2 to 3</i>
Cambodia	<i>Cut stem and haul down. Cut and leave 1 to 2 days in the forest.</i>	<i>Villagers on full- or short-term basis</i>
Indonesia	<i>Cut stem 1 m from the ground with knife, axe, or dagger. Leaves and thorns cut off, SD leaves not cut.</i>	NR
Lao PDR	<i>Cut with bolo at reachable height.</i>	<i>Family with 3 to 4 members</i>
Malaysia	<i>Conventional method: Cut at base. Mechanical method: Use equipment fabricated at FRIM.</i>	<i>Villagers as full- or part-time harvesters</i>
Philippines	<i>Cut close to base or 30 cm to 60 cm above ground by bolo. Pull down.</i>	<i>At least 2 gatherers</i>
Thailand	<i>Cut at the base, then pull down.</i>	<i>In groups of 10 to 20</i>
Vietnam	NR	<i>3 to 5 persons</i>

NR-No Report

3 to 5 canes a day while a team of 10 to 20 can gather 30 to 40 large-diameter canes or 200 to 300 small-diameter canes in a day in Myanmar.

A team of two or more is necessary for two reasons. One, for safety, that is, two people looking out for each other for any signs of danger. Two, because of the difficulty of extracting the cane from the clump and the forest canopy. So, in a team of two, one climbs the tree to loosen the grip of the cane on the tree and cut off the topmost reachable part; the other stays on the ground to cut at the base and pull while the climber cuts off parts of the vegetation that gets in the way.

If the aborigines are the rattan harvesters, the gathering is any season and all seasons. If the lowland farmers are the harvesters, the gathering is usually during the rainy season, when they are free from farm activities. In areas where the rattan industry is booming, canes are harvested continuously and gatherers may include other villagers and labor hired by traders.

Maturity of cane. Small-diameter canes are harvested at 6 yr to 10 yr while big-diameter canes are harvested at 10 yr to 15 yr of age. Just by looking at certain signs, the harvesters know whether a cane is mature or not. Harvestable canes are distinguished by the presence of dry sheaths

or absence of sheaths in the lower part of the stem. The other sign is that the stem turns from yellowish to dark green in color. Other indicators that a stem is mature are the thorn and leaf that have broken, thorn with black color, and stem wrapped with green powder.

For small-diameter rattan, the same procedure is done and the cane is pulled down the stem until it cannot be pulled down anymore. The mere act of pulling down cleans the stem of thorns and fronds.

It is reported that losses have been incurred in terms of raw materials due to the fact that portions of the cane are left behind and only around 50% of the cane can be hauled down (Lao 2004, Malaysia 2004). Difficulty is encountered in pulling down the whole cane from the tree.

8. Problems and Constraints in Rattan Production

Lack of planting materials. *One of the difficulties in establishing more or wider rattan plantations is the lack of planting materials, especially seedlings. Suckers and wildlings are alternative materials, but they are difficult to obtain. The probable main reason is that rattan seeds are difficult to handle, something to do with the hard seedcoat and sensitivity to moisture.*

Lack of taxonomic support. *The "bestimate" of the number of rattan species found in all of ASEAN member-countries is more than 650. This is an expert estimate, but this is largely unsupported by taxonomic study, where specimens are identified to the nearest variety or cultivar, and where botanical (scientific) names are validated by painstaking examinations of minute details (if name exists) or slowly and patiently described (if newly species).*

Seeds difficult to handle. *Because of the nature of the seedcoat, there is difficulty in inhibition, so that rattan seeds can take as long as 12 mo to germinate*

without human intervention. The outer pericarp of the rattan fruit and the sarcotesta have to be removed before the seed is sown; otherwise, the result will be poor germination. Thus, to obtain the seed from the fruit, it is necessary to soak the fruit in water 3 to 5 days, to soften the hard materials, then to macerate or rub off the pericarp (seedcoat) and sarcotesta (flesh). To enhance germination, there are alternatives: soak the seeds in hot water (50°C to 60°C for a day); soak in running water for 3 days; soak in cold water for 7 to 10 days, changing water daily to prevent the attack of molds; wash with sulphuric acid for 3 min to 5 min; scarify, nick, or slice through the embryo cover while being careful in such a way that the embryo is not damaged. Soaking the seeds for a maximum of 24 hr may result in maximum germination percentage.

Susceptible to staining fungi. *Once the canes are harvested, they must immediately be dried or treated in such a manner that they meet the moisture content level that is low enough to prevent the invasion of staining fungi. Being moist, canes are susceptible to the attack of fungi. Once established, the fungal stain is difficult to remove.*

9. Identified Priority S and T and R and D Projects on Rattan Production

Based on the Regional conference held in Manila, Philippines on 22-23 Jan. the different member countries identified priority needs and concerns on rattan production (Table 7).

Table 7. Identified Priority S and T and R and D Projects on Rattan Production, 2004.

RESEARCH STUDY	COUNTRY INVOLVED BASED ON PRIORITIZATION
a. The use of chemical induction to break the phase of grass stage to hasten rattan growth.	Brunei Darussalam Malaysia Philippines Vietnam
b. Isozyme and DNA analysis for rattan	Indonesia Malaysia Thailand
c. Regeneration system	Brunei Darussalam Cambodia Indonesia Myanmar Philippines Thailand Vietnam
d. Proven germination techniques for lesser-known species	Cambodia Indonesia
e. Potential/lesser used species	Cambodia Indonesia Malaysia Myanmar Philippines Thailand Vietnam
f. Eco-physiological site characterization	Brunei Darussalam Cambodia Lao PDR Myanmar Philippines Thailand Vietnam
g. Comparative analysis of intercropping rattan with other tree species	Brunei Darussalam Indonesia Myanmar Thailand

Table 7. Identified Priority S and T and R and D Projects on Rattan Production, 2004 (continuation).

RESEARCH STUDY	COUNTRY INVOLVED BASED ON PRIORITIZATION
h. Silvicultural requirements of commercially potential underutilized rattan species	Brunei Darussalam Cambodia Malaysia Myanmar Thailand Vietnam
i. Ex-situ conservation (establishment of germplasm and seedbanks)	Brunei Darussalam Indonesia Malaysia Thailand Vietnam
j. Harvesting cycle/economic rotation	Brunei Darussalam Cambodia Indonesia Lao PDR Malaysia Myanmar Philippines Thailand Vietnam
k. Analysis of demand versus annual allowable cut to determine sustainable levels of resource supply and demand	Brunei Darussalam Indonesia Malaysia Philippines Thailand Vietnam
l. Develop planting technology for edible shoot/cane	Brunei Darussalam Cambodia Indonesia Thailand
m. Develop technology for waste reduction	Brunei Darussalam Cambodia Indonesia Malaysia Myanmar Philippines Thailand Vietnam

Table 7. Identified Priority S and T and R and D Projects on Rattan Production, 2004 (continuation).

RESEARCH STUDY	COUNTRY INVOLVED BASED ON PRIORITIZATION
n. Develop appropriate tool for harvesting	Brunei Darussalam Cambodia Indonesia Malaysia Myanmar Thailand
o. Training on seed production, seed germination and plantation establishment at the community/ village level	Brunei Darussalam Cambodia Indonesia Malaysia Myanmar Philippines Thailand Vietnam
p. Training on Rattan Taxonomy	Brunei Darussalam Cambodia Indonesia Malaysia Myanmar Philippines Thailand Vietnam
q. Training on Rattan Harvesting	Brunei Darussalam Cambodia Indonesia Malaysia Myanmar Philippines Thailand Vietnam
r. Training on Rattan Inventory	Brunei Darussalam Cambodia Indonesia Malaysia Myanmar Philippines Thailand Vietnam



Rattan Furniture-making in Cebu City, Philippines

1. Processing

1.1 Primary Processing

Fresh rattan is cut into 5 to 6 pieces and sorted according to species, size, straightness or smoothness by gatherers (Ahmad 2004; Myint 2004; Ramos and Diaz 2004 and Sutthisrisilapa and Puriyakorn 2004). Each ASEAN member-country follows a set of rules in sorting freshly cut rattan that is applicable only to their respective use. A national standards (PNS 229-1999) for rattan poles and by-products was approved for implementation in the Philippines but not mandatory and grading was mainly dictated by stakeholders (Tesoro 2000). Apparently, there is no standard grading system on a regional basis that could be due to the variation in the species of rattan found in each country.

Generally, canes are sorted into large-, medium-, and small-diameter rattan or may be classified as good or heavily defective (Ketphanh and Dalmacio 2004; Raja 2004; Lic 2004). Malaysia specifically sort rattan in 5-diameter classes and 2-quality classes which may be good or heavily defective.

Primary processing may include trimming, scraping, treating, drying, straightening, grading, and sorting (Walker 1993) and at the village level, this may include splitting (Tesoro 2000). Gnanaharan and Mosteiro (1997) have included the removal of silified epidermis, fumigation, bleaching, oil-curing and -drying. In this paper, classification was based on the 3 systems except that fumigation and bleaching were placed under secondary processing. It is only in Indonesia where these are done at the processing plant as explained below.

In Indonesia where the primary processing plant is located close to the harvesting site, freshly cut rattan undergo pretreatment, grading, washing, drying, whitening, fumigation, scraping, sorting into large- or small-diameter canes and packing

(Wiyono and Santos 2004). Freshly cut rattan measuring 5 m to 6 m are soaked in flowing water for 7 days, rubbed with coconut husk, deglazed, sun-dried and straightened.

Pretreatment at Harvest Site or Campsite

It is necessary to pretreat green rattans as soon as they are cut; without it, they are vulnerable to staining fungi that can discolor them (Liese 2002). Lao PDR and Myanmar are the only ASEAN countries reported to practice cane treatment at the harvest-site. Due to inadequate tools and implements in the forest, the following pretreatments are usually applied to the green rattans on-site (Myint 2004).

Draining off water. Gatherers lean the canes against a tree or branch to allow water to drain off. A waterproof cover is provided at night to protect the cane from dew or rain.

Skin-off and sun-dry method. Rattan is scraped along the grain of the cane. The method is cheap in terms of cost, however treated canes are brittle and results in wastage in furniture-making.

Smoking method. Alternate layers of canes are piled leaving small air spaces for aeration. Straw is used as fuel during the process, the straw burn slowly thus drying up the canes gradually. The canes however, turn from greenish to reddish. This method is suitable for small-diameter canes.

Diesel-cooking method. This is the best and widely practiced method. Halves of empty drums are used as containers of the diesel fuel. The green canes are soaked in the boiling diesel for 15 min to 30 min depending on maturity. The cured canes are then rubbed with sawdust to clean off the remaining diesel on the skin. Diesel consumption is 50 gal for 1,000 canes. The diesel increases the cane's flexibility and protects them from mildew.

⁴FPRDI, College, Laguna 4031 PHILIPPINES

Cane Bundling & Transport

All canes harvested are bundled with or without pretreatment in the harvest site. The bundles range from 50 kg to 60 kg each or a bundle may contain 20 canes. The bundles are mostly carried on the shoulders of or dragged by the gatherers themselves. Rattan canes may also be transported to the roadside by kerbau (water buffalo) or elephants or oxcart (Mabong 2004; Sutthisrisilapa and Puriyakorn 2004; Bich 2004; Ketphanh and Dalmacio 2004; Raja 2004 and Myint 2004) (Table 8). Transporting canes may likewise be done with the use of bicycles, rattan raft navigated by boat, motorboat, and trucks. (Lic *et al* 2004).

The bundled canes may be transported using boat, as in Central Kalimantan, or carried on a man's shoulder as in West Sumatra (Wiyono and Santos 2004). Transport by the river is still practiced but only in Sarawak. Bundles of 50 kg to 60 kg are tied together to form a raft. The rattan raft is navigated by boat or motorboat to the collecting site. The canes are dried immediately. Where there are logging roads, 4-wheel drive vehicles, trucks or

lorries are used for cane transport. Bundles of rattan, 50 kg/bundle to 60 kg/bundle, are loaded into trucks or lorry and delivered to the processing sites. At the gathering place, the collectors buy the canes from the collectors. After preprocessing, the canes are transported to town using either truck or boat to the processing plants.

1.2 Secondary Processing

It was noted that scraping, sanding, bending, preservation or treatment, straightening, weaving, and drilling are common in the countries under study. Out of the 9 countries, Indonesia, Malaysia, and the Philippines appeared to have developed and used advanced technologies in processing and using rattan. It appears that the use of existing technologies is still wanting in Brunei, Cambodia, Lao PDR, Myanmar, and Vietnam.

Aside from steaming, bending, splitting, dyeing, sanding, and finishing that were reported by Liese (2002), treatment, grading, drilling, grooving, and binding were included in secondary processing (Table 9). These processes apparently improve the quality of the finished products.

Table 8. Transport system for rattans gathered in the wild in ASEAN member-countries, 2004.

COUNTRY	TRANSPORT SYSTEM FOR CANES
Brunei Darussalam	<i>Canes manually carried to roadside or by carabao. Buyers use land vehicles.</i>
Cambodia	<i>oxcart, elephants, bicycles</i>
Indonesia	<i>boat, man</i>
Lao PDR	<i>Gatherers drag bundles of cane, others use animals.</i>
Malaysia	<i>buffalo, river</i>
Myanmar	<i>boat, raft in river, animals like elephants</i>
Philippines	<i>man, also floated down the river</i>
Thailand	<i>elephants</i>

Table 9. Secondary processing of rattans in ASEAN member-countries, 2004.

COUNTRY	SECONDARY PROCESSING TREATMENTS
Brunei Darussalam	<i>Sanding. Bending by torching. Painting for finishing.</i>
Cambodia	<i>No processing mills, small handicraft only. Sundrying, debarking, splitting, bending, weaving. Sulphur fumigation. Straightening, crosscutting, bending and moulding, drilling and grooving, assembly, binding and weaving, scraping and sanding, finishing.</i>
Indonesia	<i>Scraping. Bleaching potassium hypochlorite & H₂O₂. Bending by soaking in DMSO for 8 hr at 82 °C. Grading of canes.</i>
Lao PDR	<i>Scraping by knife. Straightening and bending manually or by machine. Sorting into large, medium, small. Storing with sufficient ventilation.</i>
Malaysia	<i>Scraping epidermis of canes, bundling. Straightening by man or machine. Drilling, grooving, end-capping, measurement, bending, weaving, finishing, grading.</i>
Myanmar	<i>Scraping.</i>
Philippines	<i>Bleaching using peroxide and hypochlorite. Bending or straightening by steam-conditioning and drying chamber. Bending using jig.</i>
Thailand	<i>Sorting, coring, or wickering machine. Sanding and bleaching with chlorine and sodium hypochlorite. Bending, air- or oven-drying. Sulfur application.</i>
Vietnam	<i>Scraping. Painting, smoking, varnish, paint, lacquer</i>

Steaming. Canes are steamed prior to bending and an important process in the preparation of rattan components such as backs and seats. Bending can also be done with the use of a blow torch, however, it leaves a dark colored burnt portion thus its use has become limited.

Peeling and splitting. Processing is done by hand with simple tools or simple machines (Liese 2000). The outer layers or peel are removed leaving the inner core. Round or split canes are further sanded to give fine and smooth surfaces.

Sorting. Rattan is sorted into large, medium and small diameter and allowed to stand on its end to dry. The large diameter rattans undergo washing, frying (cooking), drying and quality control while small diameter rattans are washed, deglazed, whitened, fumigated, drained, scraped, quality control and packaged.

Scraping. This is normally done manually with a sharp scraper and is a slow process which produces scraped materials which are not uniform (Tesoro 2000). Most of the ASEAN member-countries do not have a mechanized system for scraping rattan canes.

Treatment or preservation of freshly cut rattan

Nonchemical Method

Treatment procedures are basically used in the prevention of fungal stain in the secondary processing stage.

The most common nonchemical treatment is air-drying of canes under shade before processing (Lic 2004; Mabong 2004; Ketphanh 2004 and Diaz and Ramos 2004). After sun-drying, the canes are stacked horizontally in a criss-cross manner to facilitate the circulation of air and prevent fungal attack or discoloration due to dampness.

Smoking. Smoking basically is oxidizing process using sulphure (gas of SO₂) to prevent fungal attack (Wiyono and Santos 2004). However, the rattan skin or rind becomes yellow. Rattan that has undergone sulphur treatment and washing is termed as W&S.

Kiln-drying. A kiln drying schedule was developed by FPRDI for large-diameter rattan which could dry rattan for a period of 4 days to 5 days which normally takes 2 mo to 3 mo to air dry the canes.

Boiling in Oil. Canes are boiled with a mixture of diesel fuel and palm oil at a ratio of 9:1. It is aimed to: (1) remove the wax and silica on the cane surface easily, (2) facilitate faster drying, (3) prevent fungal attack, and; (4) make the cane more resilient and lustrous. Factories may boil the canes in diesel solution before cleaning. The canes are later sun-dried and stored in a well-ventilated warehouse provided with shelves.

Chemical Method

To improve the quality of rattan products, it is essential that the raw canes undergo proper preservative procedures using the right preservative materials

Raw canes are sprayed with or dipped in chemical solution (undetermined) for the prevention, control,

and remedial measures against blue-staining fungi (Mabong 2004 and Lic 2004). Water-borne preservatives like 2-thiocyanomethylthio-benzothiazole (TCMTB), and deltamethrin are used to control staining fungi and insect attack, respectively (Diaz and Ramos 2004). The current practice in Malaysia is to treat the canes within 24 hr after cutting. To obtain better-treated poles, the canes are allowed to stand on their ends to drain excess water. Rattan are sorted according to size and separately placed in the preservative solution. Ovens may be used for drying and fumigated to prevent fungal attack.

Bleaching. Only a few of the ASEAN member-countries apply bleaching process to improve the quality of rattan. Bleaching of slightly stained rattan can be done with the use of potassium hypochlorite and hydrogen peroxide (Wiyono and Santos 2004 and Diaz and Ramos 2004) or in sodium hypochlorite and chlorine (Sutthisrisilapa and Puriyakorn 2004). Bleaching of *C. symphysiphus*, *C. subinermis* and *C. marginatus* have been done to obtain better finishing quality.

Bending and moulding. Rattan poles are heated with the use of a steaming chests for 20 min to 30 min and blow torches are sometime used to preheat rattan parts. For 2-D furniture components are produced using jigs made from wooden blocks and plywood board. Poles are manually bent by pressing them against the wooden block stoppers arranged on the plywood surface of the jig. Clamps of pneumatic types are added to secure the poles. For 3-D components, wooden block stoppers are arranged on several plywood boards not parallel to each other.

Drilling, grooving, and end-coping. Holes are drilled on rattan seat or backrest for inserting slates (small rattan poles or cores) or grooved for inserting rattan webbing. These are drilled or grooved prior to or during the assembly depending on the shape of the furniture component. For straight components, bench drill units are used while a hand drill can be used when the frame is assembled. Some components are cut into half moon shape and termed as 'coping' to ease jointing of the

components during the assembly process. A special drill is used for the purpose.

Binding/Assembly. Assembly involves putting parts or components together which can be by dowels or combined nails and tying.

Finishing. Finished furniture pieces are painted, shellacked, or varnished, for beauty and durability.

1.3 Manufacturing Process

The advanced processing technologies in Malaysia represent a typical production process to produce high quality rattan products. The Philippines likewise follow the same process and reports showed that the Filipino craftsmanship cannot be equaled and rattan furniture and crafts from the country is still in demand in the international market (Raja 2004).

The method used in processing rattans is mostly dictated by species, initial physical condition, and diameter. Rattan processing involves cooking, drying, and processing into secondary products such as peels, cores, splits, and skins; and these are done either manually or by machines. Products are classified whether they are from small- or large-diameter canes. Cores, splits, skins, and sticks are derived from small-diameter canes while products from large-diameter canes may be cores or skins and are used as natural or debarked frames. The general processing steps for big diameter rattan in Peninsular Malaysia is shown in Figure 2.

For small-diameter rattan, processing is similar to that of the large-diameter group, however, after several days of air-drying, natural canes are selected; and also for core and skin products. These are further graded and processed and later stored or sold in the market.

Rattan furniture-making involves processes described in Figure 3. Rattan canes are selected and undergo straightening that can either be done manually or through the use of pneumatic straightening machines. These are used for

producing high quality rattan furniture. Straightened canes are measured as a requirement and cross-cut with the use of radial arm saw with adjustable stoppers.

2. Packaging

Packaging of rattan products in ASEAN countries has not gone beyond wrapping with transparent or nontransparent plastic sheets and boxes. There are no special packaging materials or crating techniques (Mabong 2004) since all finished products are for local consumption. Raw canes or finished products for export are bundled or wrapped for shipment (Wiyono and Santos 2004).

In Lao *PDR*, raw materials are grouped according to grades after piling and polishing and those that will be processed in the factory are stacked in shelves. Those that will be sold or exported are wrapped in plastic sheet (100 poles/wrapper). Finished products are grouped in categories and displayed in the showroom and shelves. There is no complex packaging of finished rattan products. Wickers and cores are bundled into 50 kg and packed in jute sacks while shoots are bundled in 5 pieces and brought to the market in Thailand.

3. Products

3.1 Rattan Products

Table 10 shows the primary, secondary, finished products and other uses of rattan in the nine ASEAN member-countries in this study.

Primary products. The primary rattan products in the ASEAN member-countries can be generalized as raw or whole canes which may be treated, coarse or polished rattan. In Myanmar, the primary product is the rattan stick that is used for tying the teak logs together to make a log-raft and float the timber down the river. In a year, about 3 million sticks are consumed for log-rafts alone. *Calamus platyspathus* makes first-class cane that meet the required quality for seat and back of chairs.

Figure 2. Processing steps for big diameter canes in Peninsular Malaysia
 (Source: Razak *et al* 2001)

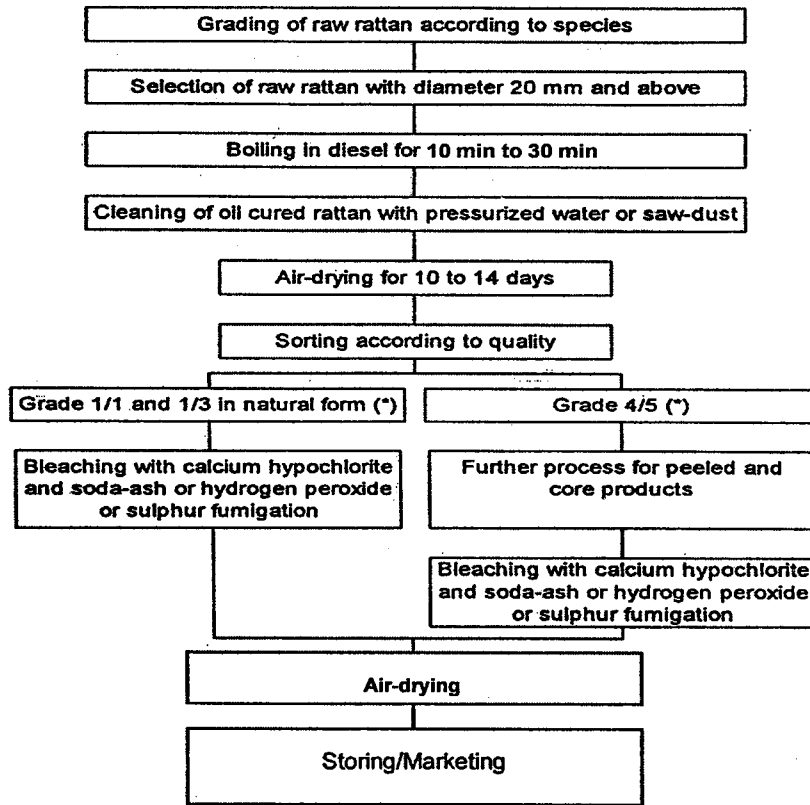


Figure 3. Rattan Manufacturing Processes

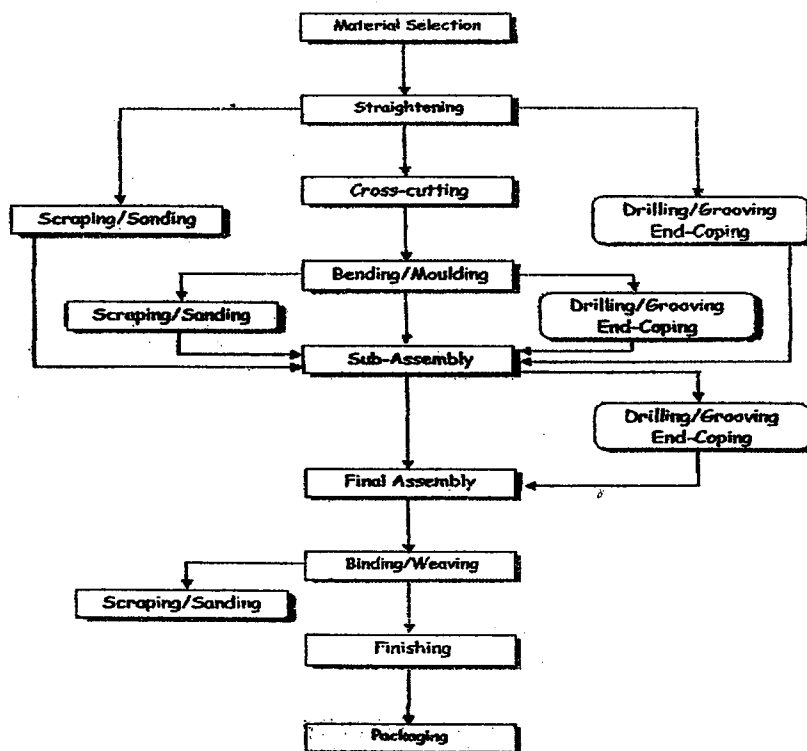


Table 10. Products from rattan in ASEAN member-countries, 2004.

COUNTRY	PRODUCTS FROM RATTAN			
	Primary	Secondary	Finished	Other Uses
Brunei Darussalam	<i>canes</i>	<i>splits, wickers, cores</i>	<i>furniture, handicraft, baskets</i>	<i>Dye, food (umbut), medicine</i>
Cambodia	<i>canes</i>	<i>NR</i>	<i>furniture</i>	<i>Fishing tools, light construction, handicraft</i>
Indonesia	<i>canes</i>	<i>splits, wickers, cores</i>	<i>furniture, baskets</i>	<i>Dye, food, medicine</i>
Lao PDR	<i>canes</i>	<i>NR</i>	<i>furniture, souvenir items</i>	<i>Food, medicine</i>
Malaysia	<i>canes</i>	<i>peels, cores, splits, skins</i>	<i>furniture, handicraft</i>	<i>Dye, medicine, food (seed), roofing materials (leaves and stalk)</i>
Myanmar	<i>NR</i>	<i>NR</i>	<i>furniture, handicraft</i>	<i>Farm, fishing tools</i>
Philippines	<i>canes</i>	<i>splits, wickers, cores</i>	<i>furniture, handicraft, baskets</i>	<i>Cordage, construction, thatching & matting, broom handles, carpet beaters, hammocks, walking sticks, animal traps/cages, footballs, hats, bags, twines, food (ubod), fruits, dyes from fruits</i>
Thailand	<i>(imported)</i>	<i>wickers, cores</i>	<i>furniture, handicraft, baskets</i>	<i>Dyes, food, medicine, utensil</i>
Vietnam	<i>canes</i>	<i>splits</i>	<i>Furniture, baskets</i>	<i>Cordage, bridge cables, cables for ferry boats, hauling logs, picture frames</i>

*NR-No Report

Secondary products. In general, the secondary rattan-based products are mostly splits, wickers, and cores. The small canes are the ones usually split, the length depends on the market requirements.

In Indonesia, the semifinished products are fine-polished rattan, skin, separate furniture components, and core. Fine-polished rattan results from peeling the skin of rattan with W&S marked with the cylindrical bar and refinement impression

along the bar length. In Lao PDR, the secondary products depend on the purpose of the manufacturers. At this level, the canes are either split, wickered, or spiraled using suitable bamboo culms as the main core. In Thailand, canes are passed on to the coring or wickering machine. Wickers or cores are graded according to color, depending on the whiteness of the material. Those that do not pass the standard are bleached for the second time.

Finished products. The list of products include furniture items such as chairs, tables, cabinets, and dividers, backpacks, hand fans, mats, canes, picture frames, jewel boxes, vanity cases, handbags, cloth hangers, flower bases, and lampshades. The finished products in Indonesia are rattan carpet, Sabrina, basket, rattan hat, rattan-matting, handicraft, furniture component, and furniture.

3.2 Other Uses

Rattan fruits and roots are used as traditional medicine. The fruit is a source of colorant for the ceramic and pharmaceutical industries (Mabong 2004; Wiyono and Santos 2004; Raja 2004). Small amounts of skin waste are used as filler for car jock or chair. In the Philippines, other uses of rattan include cordage, construction, thatching, broom handles, and walking sticks.

4. Problems and Constraints in Rattan Processing

Decline in the supply of raw materials. All ASEAN countries need to focus into rattan cane production in the face of its growing scarcity. Difficulty is now being encountered by gatherers because rattan is only available deep in the forest. The scarcity of rattan has led furniture and handicraft manufacturers to use mixed media in their products.

High wastage in harvesting. Rattan canes are cut at the base at 30 cm to 60 cm from the base up to a convenient length or the reachable height with which 50% of the canes is wasted. The topmost portion which cannot be pulled down is wasted. Climbing the closest tree or cutting the support tree to maximize cutting the topmost portion cannot be attained at all times. Cutting the support tree is against the law and impermissible.

The Forest Research Institute of Malaysia has designed and fabricated four kinds of cane cutters to improve harvesting efficiency. These however are yet to be tested before they will be marketed.

Low quality raw materials. This could be due to the occurrence of fungal stain or insect attack on rattan

canes that degrades or reduces the quality and market value of the product. Difficulty in obtaining high quality raw materials has been cited as one of the problems in Malaysia and Indonesia although these countries have acquired technologies in the preservation and treatment of raw materials. It is possible that gatherers have not really gone into actual application of the technology on treatment in their freshly cut rattan canes. Low quality raw materials may also be due to the kind of species available in the country which is not suitable for the manufacture of high-end rattan products.

Poor product quality. Technologies in processing and using rattan for the furniture and handicraft products are available. However, it is possible that dissemination of these technologies is ineffective. Apparently, Malaysian rattan products are not competitive with those manufactured in the Philippines. Application of postharvest technologies will help improve the quality of the products.

No advanced processing technology. Ineffective information dissemination on advance processing technologies is one of the reasons for inefficient use of rattan. Cambodia, Brunei, Lao PDR, and Vietnam appear to lack the proper technologies in contrast with other ASEAN countries that generate competitive rattan-based products. Although Vietnam have produced products for export (Evans 2000), current study reveals that its products still need improvement to compete in the world market (Bich and Lapis 2004). Compounding the lack of technology, is the absence of processing tools to craft competitive and quality furniture and handicraft products (Bich and Lapis 2004).

Based on the results of the study, there is a need to extend technical assistance to the following ASEAN member-countries as far as application of rattan utilization technologies is concerned: Cambodia, Lao PDR, Myanmar, and Vietnam. The rest of the ASEAN member-countries will give their share in attaining the objective of the study for sustainable development of rattan.

6. Identified Priority S and T and R and D on Rattan Utilization

Table 11. Identified Priority S and T and R and D Projects on Rattan Utilization, 2004.

RESEARCH STUDIES	COUNTRIES INVOLVED BASED ON PRIORITIZATION
a. Develop and adopt ASEAN grading standard	Brunei Darussalam, Lao PDR Malaysia, Philippines Thailand, Vietnam
b. Right season/timing of harvest to reduce susceptibility to insect destruction or staining	Brunei Darussalam, Indonesia Malaysia, Myanmar Thailand, Vietnam
c. Comparative study on preservation practices used in ASEAN region	Brunei Darussalam, Cambodia Indonesia, Malaysia Myanmar, Philippines Thailand, Vietnam
d. Application of existing technology on Kiln drying for rattan	Brunei Darussalam, Cambodia Thailand, Vietnam
e. Develop improved product design based on market demands	Brunei Darussalam, Cambodia Malaysia, Myanmar Philippines, Thailand Vietnam
f. Technology on mechanized weaving	Brunei Darussalam, Cambodia Lao PDR, Myanmar Philippines, Thailand Vietnam
g. Develop improved bleaching technologies that are environment friendly	Brunei Darussalam, Cambodia Indonesia, Malaysia Philippines, Thailand Vietnam
h. Develop new preservation technologies at depot	Brunei Darussalam, Indonesia Malaysia, Myanmar Thailand, Vietnam
i. Training on the application of post-harvest technology	Brunei Darussalam, Cambodia Indonesia, Lao PDR Malaysia, Myanmar Thailand, Vietnam
j. Training on processing technologies	Brunei Darussalam, Cambodia Indonesia, Lao PDR Malaysia, Myanmar Thailand, Vietnam



Chapter IV. SOCIOECONOMICS, MARKETING, POLICIES, AND LINKAGES

By Merlyn Carmelita N. Rivera⁵ and Carolyn Marie C. Garcia⁶

1. Economic Importance of Rattan

1.1 Contribution to the Village Economy

Throughout the ASEAN Region, it is perhaps the village communities that benefit most from rattan. Rattan-gathering and -weaving provide employment particularly to the indigenous and local people. Indonesia has by far, the most number of home-based rattan enterprises. Approximately 4,200 households, spread across South Kalimantan, Cirebon, and Central Sulawesi produce rattan handicrafts and the traditional *lampit* or rattan mats (Wiyono and Santos, 2004). In the Philippines, although literature cites about 2,100 workers engaged in the production of rattan handicraft this is suspected to be even more (Diaz and Ramos, 2004).

The economic importance of rattan in the village economy is best exemplified in Myanmar, where an agrarian village of about 2,700 households has evolved into a major center for rattan production (Win Myint, 2004). One exporting company pours in as much as USD 2,300 to households in this village as piecework payment for rattan baskets, trays, and other handicrafts. With five firms farming out job-orders in the village, total monetary resources flowing into this village translates to no less than USD 11,000/mo.

Similarly in Vietnam, an estimated 5,000 villagers supply rattan and bamboo handicrafts to exporters. Here, income received from weaving rattan is 75% higher than income received from farming (Do Thi Ngoc Bich, 2004).

Because production of rattan craft throughout the ASEAN is still largely done by rural labor, the degree of involvement of village communities correlates with the demand volume. Thus, in ASEAN countries with growing rattan craft exports, there corresponds an active rattan-based rural economy such as those

in Vietnam, Indonesia, the Philippines, and Myanmar. To sustain these income-generating activities, interventions should thus focus on improving the global competitiveness of rattan products produced in the ASEAN.

1.2 Skills Development

Changes or upgrading of traditional skills in a community often accompany a shift in the nature of a village's industry. Thus, shifts from an agriculture-based to a low-manufacturing based industry have been noted in some villages in Myanmar and Vietnam, where there is a growing rattan industry.

This development has spurred changes in skills. Traditional designs and weaving skills have been upgraded to conform to export standards. Entrepreneurial abilities, notably among women have been developed and in some ASEAN countries where few women hold managerial positions, this is quite significant.

1.3 Exports

The contribution of rattan to the national economies of ASEAN countries can be gauged from the value of their rattan exports. Countries that export raw rattan and finished products are Indonesia, Myanmar, Thailand, Lao PDR, Malaysia, and the Philippines.⁷ Of these, Indonesia and the Philippines have reported significant export earnings (Table 12). In 2002, Indonesia had the largest exports of rattan raw materials and finished rattan products in the ASEAN, amounting to USD 291 million. Of this, USD 112 million (38%) are finished furniture, handicraft, and the traditional *lampit* (rattan carpet). In the same year, the Philippines exported only about USD 96.9 million worth of finished products, down from USD 118 million in 2000. Rattan exports of the other ASEAN countries were minimal.

⁵ ERDB, College, Laguna 4031 PHILIPPINES

⁶ FPRDI, College, Laguna 4031 PHILIPPINE

⁷ No export figures for Vietnam and Cambodia

Table 12. Export values of rattan raw material and finished products of five.

Country	Exports (million USD)	%
Indonesia	291.04	68.82
Philippines	96.94	22.92
Malaysia	24.00	5.67
Myanmar	10.00	2.36
Thailand	0.89	0.02
Total	422.87	100.00

ASEAN countries.^a

^a As reported in the country papers; figures are for 2002, except for Malaysia which is an estimated annual figure.

Based on available data, however, the contribution of rattan relative to the national total for forestry or the wood-based sector is very small. In Myanmar, foreign exchange earnings from rattan was only 5% of the total timber exports in 2003. This was only slightly higher than Malaysia, which reported a rattan's contribution to be 3% of the total wood-based exports.

Thailand and Lao PDR report even lower figures. In Thailand, rattan constitutes only about 0.1% of the total forestry sector contribution. Lao PDR, on the other hand, estimates the contribution of rattan to total GDP at 1%.

2. Marketing

2.1 Products and Prices

Rattan products traded in the ASEAN markets can be broadly classified into: 1) raw poles and secondary raw materials such as splits, cores and wicker and 2) rattan finished products such as furniture, handicraft and other rattanware.

Variations in design, weave, and raw material mix result in product differentiation. In the Philippines, rattan craft incorporate stone, metal or leather. This mixed media trend was a direct result of the difficulties in sourcing canes felt by the industry. In contrast, most of the products from rattan-rich countries such as Indonesia, Lao, Vietnam, and

Myanmar are still 99% made from rattan. Indonesia, for instance is famous for its traditional *lampit* or rattan carpet.

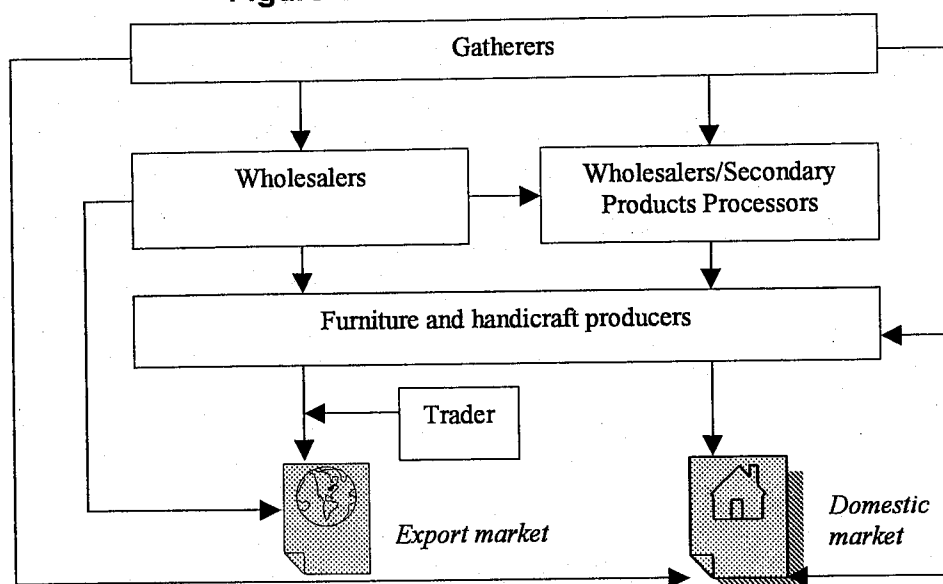
Prices of rattan, whether as raw material or finished product reflect the costs associated with harvesting, transporting, and processing plus profit margin. In Indonesia, profits are greatest for traders of W&S rattan who net around USD 28/t to USD 33/t of raw cane rattan, while profits are least for weavers of rattan carpets who net only USD 0.70/carpet (Bambang and Santos, 2004).

2.2 Product Flow

The marketing of rattan in all the ASEAN countries follows a general pattern. Rattan gatherers, usually villagers near the harvest sites, are the first link in the rattan marketing chain. Traders provide them with cash or goods as advance payment for the canes that they harvest.

The harvested canes are transported either by the gatherers or by animal to a temporary stockyard in or near the forest. Here, pretreatment activities such as sorting, bundling, and air-drying are done. These are collected by the traders and transported by trucks, raft or boat, to their depots where they are further treated and processed into splits, cores and wicker. Some large exporting firms contract their own rattan gatherers to assure steady supply of raw materials.

Figure 4. Product Flow of Rattan



The harvested poles enter either the local or foreign market. Countries that export rattan raw materials to countries both within and outside the region are Indonesia, the Philippines, Lao PDR, and Myanmar. Indonesia is the major supplier of raw rattan. In 2002, 68% of Indonesia's rattan exports were semiprocessed rattan raw materials. Myanmar supplies canes to Thailand and China. Of its total rattan exports in 2002, 35% were canes. Lao PDR, on the other hand, exports 70% of its rattan raw materials across the Mekong to Thailand.

Poles and secondary products reach furniture and handicraft producers and suppliers through wholesalers. Large export firms or individual weavers convert these into furniture or handicraft. These products find their way either into the export or domestic market.

3. Investment and Profitability Indicators for Plantation Establishment and Processing

The investment required in setting up a rattan furniture/handicraft firm varies with the intended scale of operation. In Indonesia, setting up a furniture plant with an annual output of 1,250 assorted items would need about USD 6,530. In Lao PDR, where the industry is still relatively small compared to Indonesia, setting up small scale rattan

firms would need from USD 30 to USD 200; return on investment averages from 15% to 20%.

Since the rattan industry in the ASEAN is still largely dependent on labor, cost of labor in the rattan sector would factor significantly in the cost of processing rattan. Thus, the prevailing labor rates in the rattan industry of each ASEAN country would affect the price competitiveness of rattan (Table 13). In Indonesia, rates for specific jobs range from USD 0.22, USD 0.39, and USD 0.78 for binding, hole boring, and framing, in that order. Comparatively, piecework rate in the Philippines averaged USD 4.00/product in 1994.

Except for Cambodia and Myanmar the investment required in establishing rattan plantations in the other ASEAN countries have already been estimated and results of feasibility studies gave favorable indicators. These findings may independently be interpreted as true and acceptable and activities supporting the establishment of rattan plantation should be pursued.

4. Policies

Although all the ASEAN countries have policies pertaining to regulation of resources and trade of rattan, these differ in scope or degree of rigidity.

Table 13. Socioeconomic indicators for the rattan industry in the ASEAN.

COUNTRY	MARKETS (USD)	PEOPLE INVOLVED	PRICES (USD)	LABOR (USD)	INVESTMENT (USD only as indicated)	FINANCIAL FEASIBILITY INDICATORS (USD only as indicated)
Brunei	Export none; limited to local markets	No data	No data	No data	No data	Plantation: NPV, 6%: B\$49.4 million; IRR: 13%; BCR: 1.9 Furniture/handicraft production: none
Cambodia	No data on exports; limited to local market	No data	Canes: 0.3/pole to 1.2/pole	No data	No data	No data
Indonesia	Exports: 291 million in 2002 Domestic: Tourist and local Markets	4,200 households in So. Kalimantan, Cirebon and Central Sulawesi	Canes: 39/t to 44/t from gatherers 4.70/pack , splits	0.78 framing; 0.39 holing; 0.22 binding	Plantation: No data Furniture/handicraft production: 6530 (for 1,250 items/mo)	Plantation: NPV: Rp5.5 billion; IRR:17.08%; BCR: 2.18 Furniture/handicraft production: none
Lao PDR	Exports: 70% across the Mekong to Thailand	No data	0.65/pole to 0.8/pole; 0.7/pc to 1/pc from factory	40/mo to 60/mo	Plantation: 352 for 1 ha to 4 ha Furniture/handicraft production: 200, large; 80, medium; 30, small	Plantation: none Furniture/handicraft production: ROI: 15-20%
Malaysia	Exports: 24million/yr	No data	Canes: 0.17/pole to 1/pole; 1.43/bundle, splits	14/day (1990)	Plantation: 450/ha. in natural forest; 840/ha. in rubber plantation	NPV, 10% Palasan, NPV of 1 m growth rate/yr. = USD 990.07 2 m growth rate/yr = USD 1834.89 3 m growth rate/yr. = USD 4659.84
Myanmar	Exports: 10 million in 2002 Local and tourist market	2,700 workers in Yekyi Township supplying 5 exporters	0.7-1/pole; 0.75/kg to 3.4/kg	4 /mo to 7/mo, unskilled; 12 to 23, skilled	No data	No data
Philippines	Exports: 96.9 million in 2002 Local and tourist markets	2169 workers in handicraft production	0.17/pole to 0.46/pole	4 /day (1994)	Plantation: PhP 7102, 1 st yr; PhP1678, 2 nd yr; PhP1418, 3 rd yr.	Plantation: NPV,12%: PhP4070 IRR: 17% Furniture/handicraft production: none
Thailand	Exports: 898.9 million in 2002 Local & tourist markets	No data	No data	No data	No data	Plantation: NPV,12%: 2024 baht Furniture/handicraft production: none
Vietnam	No data on exports. Local & tourist markets	5,000 villagers produce rattancraft	4000-8000 VND per pole	No data	Plantation: 1.1 million VND Furniture/handicraft production: 1 billion VND	Plantation: No data Furniture/handicraft production: 350T/mo to 450T VND/mo.

All of them, however, have no known policies on biological protection and genetic conservation (Table 14).

Of all the countries in the region, probably only Indonesia, Malaysia and the Philippines have extensive policies regulating harvesting and trade of rattan and promoting the establishment of rattan plantations. This is not surprising since the rattan industry in Indonesia and the Philippines is relatively larger and has more advanced processing technologies than their ASEAN neighbors. Malaysia and the Philippines, on the other hand, have mature and advanced studies on rattan propagation and plantation establishment.

5. Institutional Capabilities and Linkages

5.1 Academe and Government

The academe in ASEAN countries is relatively active in research and instruction related to the forests, while the forestry departments essentially are in charge of forest protection (Table 15). However, activities are not integrated properly as each institution carries out its activities in its own way.

Worth special mention is the Forest Research Institute of Malaysia which has a core of experts who are able to train entrepreneurs in the uses of rattan and bamboo. In Myanmar, the Institute of Forestry was established only in 1992. Beyond enumeration, the other country reports do not mention, define or clarify the institutional capabilities that the academe and Government play in the rattan industry.

5.2 NGOs and the Private Sector

Table 15 presents some data on NGOs and sectoral organizations that can operate at the grassroots level to support rattan-based projects and activities. In Lao PDR, NGOs have discovered that nontimber forest products are viable sources of income for rural people. In Indonesia, NGOs focus both on rattan exports and rattan cultivation.

In Malaysia, financial and technical assistance is extended to small-scale rattan entrepreneurs. Technical assistance takes the form of providing machinery and sometimes the building itself. In Indonesia, some NGOs focus on products and others focus on production.

5.3 International Linkages

International linkages of the rattan industry in the region are quite limited. These are presented in Table 16. These do not seem to be an ASEAN network for forestry at all.

It appears that attendance in international conferences is the only linkage as far as Brunei Darussalam is concerned. In other countries, the linkage takes the form of a common project i.e., in Indonesia supported by the IDRC, European Union, INBAR, and CIFOR. Lao PDR has some linkages with RECOFTC in Bangkok, INBAR in Beijing, CIFOR in Indonesia, DI in England, and with the FAO and IUCN. In 1992-1994, INBAR worked together with FORDA to construct a rattan database, and the abstracts can be seen in the website. Thailand has links also with ITTO, Danish International Development Assistance (DANIDA) in Copenhagen and the International Plant Genetic Resources Institute (IPGRI).

6. Problems and Constraints on Socioeconomics, Marketing, Policies and Linkages

Substitute products from plastics. Substitute products or services are threats to one's products or services. Conceivably, every single product that you can make out of rattan, you can make and shape out of plastic. There are now beautiful chairs that look like they are made of rattan but are in reality beauties of plastic. If the competition is strong, for instance, if plastic is cheaper, many people will forego rattan and shift to plastic.

Inadequate marketing support, lack of marketing information and illegal trade. Promotion of rattan as raw cane or finished products as furniture or handicraft appeared to be wanting.

Table 14. Policy initiatives on production, utilization, regulation, trade of rattan and conservation and protection in the ASEAN, 2004.

Country	Policy			
	Production	Utilization	Marketing	Conservation and Protection
Brunei Darussalam	NR	Permit or license to gather rattan required	No limits set on imported rattan products but are subject to import taxes	No interventions made toward the biological protection and genetic conservation of existing rattan resources. The National Forestry Policy stresses the responsibility of all citizens to sustainably manage and develop the natural resources of the country
Cambodia	NR	NR	NR	<ul style="list-style-type: none"> Royal Decree of 1993 placed 3.4 million ha under protection
Indonesia	NR	Permits issued allowing harvesting rights for rattan but did not set limits on allowable cut; as a result, 90% of rattan comes from natural forest, only 10% from plantations	<p>1979-export of raw rattan (deglazed but not yet cleaned, smoked or sulphurized) was banned</p> <p>1986-prefious ban was extended to rattan products that have undergone slight processing</p> <p>1988-total export ban of half-finished products</p> <p>1992-gov't softened position on earlier decrees; imposed export taxes on raw rattan and half-finished products, respectively</p> <p>1998-gov't gave more freedom to the rattan industry through tax incentives</p>	No policy yet on rattan protection and genetic conservation.

Table 14. Policy initiatives on production, utilization, regulation, trade of rattan and conservation and protection in the ASEAN, 2004 (continuation).

Country	Policy			
	Production	Utilization	Marketing	Conservation and Protection
Lao PDR	• No policy on development of rattan plantations	Permit to gather rattan is required with specific allowable cut	Rattan canes for export should be in semi-finished or finished products.	No policy yet on biological and genetic conservation
Malaysia	NR	Encouraged more value-added processing	Export ban on raw rattan canes coming from Peninsular Malaysia and Sabah; does not apply to rattan coming from plantations.	NR
Myanmar	NR	Forest Policy (1995)-Sec. 17. Harvesting of any forest product is restricted by permit.	Shift from centrally planned to market economy triggered boom in exports of rattan finished products.	Encouraged more value-added processing
Philippines	<p>DENR Administrative Order No. 4 (1989). Revised regulations governing rattan resources including cutting, gathering, transporting, and disposal, including amendments related to plantation development.</p> <p>DENR Administrative Order No. 4-1 (1989). Special provision for the processing of rattan application within area reserved or occupied by cultural communities.</p> <p>DENR Administrative Order No. 61 (1990). Guidelines in the Determination of Floor Price for Rattan.</p> <p>DENR Administrative Order 315 (1991). Encourages establishment of bamboo/rattan plantations.</p>	NR	<p>Board of Investments (BOI) credit programmes for starting and developing enterprises.</p> <p>Amended Rules and Regulations implementing PD 930.</p> <p>BOI Credit Programs for Beginning and Developing Enterprises Magna Carta for Exporters (Export Development Act), 1994. Exemption from advanced payments of duties and taxes of exports prior to the opening of the letter of credit, percent duty on importation of machines and equipment and others.</p>	<p>RA 7586 (1992) Act providing for the establishment and management of the National Integrated Protected Areas System (NIPAS).</p> <p>DAO 25 (1992) The National Integrated Protected Areas System implementing rules and regulations focusing on the twin objectives of biodiversity conservation and sustainable development.</p> <p>PD 1586 (1978) Establishment of Environment Impact Statement System (EIS)</p> <p>DAO 21 (1992) Revision of Rules and Regulation on EIS System</p> <p>DAO 96-37 (1996) Revising DAO 21 (1992) to further strengthen the implementation of the EIS.</p>

Table 14. Policy initiatives on production, utilization, regulation, trade of rattan and conservation and protection in the ASEAN, 2004 (continuation).

Country	Policy			
	Production	Utilization	Marketing	Conservation and Protection
Philippines	<p>DENR Administrative Order No. 39 (1993). Rates and Forest Charges Pursuant to Republic Act 7161. An important provision is that charges are levied on the basis of a certificate of minor forest product origin.</p> <p>DENR Administrative Order No. 2 (1993). Rules and Regulations for the Identification, Delineation and Recognition of Ancestral Land and Domain Claims.</p> <p>DENR Administrative Order No. 25 (1993). Ancestral Domain Claims guidelines for the recognition and protection of Indigenous Cultural Communities' rights to enter ancestral lands.</p> <p>DENR Administrative Order No. 42 (1991). Revised Regulations and Guidelines Governing the Establishment and Development of IFPs.</p> <p>DAO 63 (2000). New Rates of Forest Charges pursuant to Republic Act No. 7161 and based on the 1999 FOB Market price of forest product.</p>			<p>E.O 247 (1995) Prescribing guidelines and establishing a regulatory framework for the prospecting of biological and genetic resources, their by-products and derivations for scientific and commercial purposes, and for other purposes.</p> <p>DAO 96-20 (1996) Implementing rules and regulation on the prospecting of biological and genetic resources.</p>
Vietnam	NR	NR	Policies in general cover NTFPs; export ban on bamboo, rattan and leaves of forest trees.	No specific policies on rattan conservation

*NR-No Report

Table 15. Institutional capabilities and linkages in ASEAN countries, 2004.

Country	INSTITUTIONAL CAPABILITY & LINKAGE		
	Academe	Government	NGO and Private Sector
Brunei Darussalam	University of Brunei Darussalam	MCYS, RBPA, FD, DA, Ministry of Development on land tenure and land-use.	NSB
Indonesia	BAU, GMU, HU, MU, LMU	Directorate General of Land Rehabilitation and Social Forestry, Forestry Research and Development Agency, and Directorate General of Forest Utilization.	SSSI, IHA, SHK Kaltim, Latin, Yayasan Dian Tama et. ASMINDO
Lao PDR		NAFRI, DoF, FRC	
Malaysia	UPM	FRIM, MTIB, and SIRIM	MYS, Agricultural Bank, Development Bank of Malaysia Limited, the Trustee Council for Indigenous People, and the Malaysian Industry Development Bank, MNRD
Myanmar	The Institute of Forestry	The Forest Research Institute (FRI)	
Philippines	UPLB, BSU, MMSU, NVSIT, TCA, PNAC, PSPC, VSCA, and MSU.	ERDB, FPRDI, TAPI, PCARRD, DTI, NSCB and CITC.	CFIP, PCHI, PCCI, CFEF, CCIP, CDEAP, and ECCP.
Thailand	Kasetsart University (KU), Forestry Research Center of KU.	RFD, DA, DAE, CPD, LDD, ALRO, OAE, FIO, TPC Ltd., ORRAF, and MOF.	
Vietnam	FSI in Hanoi, FU in Hatay.	HSFPRC, FIPI in Hanoi, Sub-Institute of Economy, RE, IEBR, NGEDC, RTCCD, and MPRC	CNRES of the University of Hanoi, and IEE.

Table 16. International linkages involving rattan among ASEAN countries, 2004.

Country	INTERNATIONAL LINKAGE
Brunei Darussalam	Attendance in conferences/seminars such as this sponsored by ITTO
Indonesia	IDRC, European Union, INBAR, and CIFOR.
Lao PDR	RECOFTC in Bangkok, INBAR, CIFOR and DI, FAO, IUCN. FRC exchanges information about NTFPs with NTFPs Research Center of Vietnam.
Malaysia	INBAR, UNDP, FAO, and ITTO
Myanmar	ITTO, ASEAN Research and Development Expert Group on Forest Products, the Smithsonian Institution (USA), IPGRI, and FAO.
Philippines	INBAR, IDRC, FAO, ADB, IUCN, CIFOR and ITTO
Thailand	FTEP, FTEP, RECOFTC, ITTO, DANIDA, and IPGRI
Vietnam	IADA.

Policies on illegal trade of rattan have to be looked into to determine the actual rattan resources of each of the ASEAN member countries.

Competition for budget (government). In terms of government allotment of funds for research and development, and government support to the rattan industry, competition comes from timber production and products. Since rattan is classified as a minor forest product, it receives minor attention in budget circles; since timber is classified as a major forest product, it receives major attention in terms of budget.

Lower versatility than competitor. Plastic also rivals rattan in terms of versatility as a raw material. It goes without saying that plastic is more versatile than rattan when it comes to working with it. If economies of scale are favorable, the plastic manufacturer can fashion all kinds of furniture and handicraft and novelty items out of plastic, dislodging rattan products where they may.

Other countries' rattan products. It cannot be denied that rattan products from one country compete with the rattan products of another country inside the importing country or in a third country. This is significantly so with the advent of globalization, and especially when the imported product is cheaper. Globalization is here and cannot be fought against; the intelligent response to it is to make one's products or services world-class to be competitive.

Lack of access to credit. Especially stakeholders who poor, access to credit is difficult due to credentials and documentation requirement. This impedes the establishment rattan plantation among poor household.

Lack of guidelines and standards. In all the ASEAN member-countries, since there is no single, national all-inclusive policy or law on rattan, there are no standards for grading rattan products, finished or unfinished, and guidelines

for imports and exports that are favorable to the industry.

Government support of more rewarding sectors. It cannot be over-emphasized that Government's major support of timber as a major forest product is, by SWOT analysis definition, a continuing threat to rattan as a forest product. This neglect will persist until Government is made to recognize the importance of rattan in the economic, ecological, and social equity aspects of national development.

Out-migration from rural areas. It is not obvious, but when those of the remote rural areas are "bitten by the bug" of "looking for greener pastures," including rattan gatherers, they migrate to the city or abroad. That results in a loss of expertise and experience.

Lack of support from LGUs. With devolution of power, reported by Indonesia and the Philippines, local government units (LGUs) have more authority and more funds; they also now allocate logging and land clearing permits. But in the absence of knowledge or awareness, they do not care about rattan or have no program concerning rattan even if they have forested areas under their jurisdiction.

Lack of Government policies. In general, ASEAN member-countries do not have a national policy or law specifically for rattan as a forest product as they do with timber. Where guidelines exist, they are not comprehensive, not systematized, not synchronized, not consistent. Government failure arises from the fact that it does not consider rattan a major forest product.

Lack of NGO support. Along with or as a consequence of the lack of Government support, or as a result of the lack of initiative of NGOs, it is to be bemoaned that NGOs in ASEAN member-countries do not advocate and do not support rattan-based initiatives.

7. Identified Priority on Rattan Socioeconomics, Marketing and Linkages

Table 17. Identified Priority on Socioeconomics, Marketing, and Linkages, 2004.

RESEARCH STUDY	COUNTRY INVOLVED BASED ON PRIORITIZATION
a. Study on socioeconomic aspects of rattan (financial analysis, indigenous knowledge system, gender roles)	Brunei Darussalam, Cambodia Indonesia, Lao PDR Malaysia, Myanmar Philippines, Thailand Vietnam
b. Study on consumption patterns and market preferences	Brunei Darussalam, Cambodia Malaysia, Myanmar Thailand, Vietnam
c. Review market chain to determine what is economically viable to the farmer	Brunei Darussalam, Cambodia Indonesia, Lao PDR Malaysia, Myanmar Thailand, Vietnam
d. Establish a national herbarium with a rattan section by each country. An ASEAN database on rattan can be set up to facilitate access to information.	Cambodia, Malaysia Myanmar, Thailand Vietnam
e. Establish a common database/taxonomy data.	Cambodia, Malaysia Myanmar, Thailand Vietnam
f. Establish a seedbank and germplasm.	Indonesia, Malaysia Thailand, Vietnam
g. Establish an ASEAN certification and fair trade practices.	Brunei Darussalam, Malaysia Myanmar, Thailand Vietnam
h. Establish an ASEAN rattan network that would discuss and share policies to complement or support implementation of rattan project. e.g. transboundary issue. (Rattan Project Website)	Brunei Darussalam, Cambodia Indonesia, Malaysia Myanmar, Philippines Thailand, Vietnam
i. Coordinate, compile documents for sharing e.g. dissemination of information through RIC electronic bulletin using the FRIM website.	Brunei Darussalam, Cambodia Malaysia, Myanmar Philippines, Thailand Vietnam



A mature rattan (*Calamus* sp.) bearing fruits

Chapter V. Situational Analysis

By Celso P. Diaz⁸, Aida B. Lapis⁹ & Magdalena Y. Giron¹⁰

1. SWOT Analysis

ASEAN country representatives identified the Strengths, Weaknesses, Opportunities and Threats concerning the rattan industry (Table 18).

Table 18. SWOT analysis of rattan industry in the ASEAN Region, 2004.

Aspect/Country	Strength	Weakness	Opportunity	Threat
1. Production of Raw Materials				
Brunei	Abundant Natural Rattan Resources	Only few species of rattan are identified of commercial value; Lack of resource inventory data.	The natural forests are still vast and intact	Unfavorable markets.
Cambodia	NR	NR	NR	NR
Indonesia	Stability in supplying rattan raw material Many rattan species to be used in rattan industry Possessing large number of species and good quality of raw material Natural rattan plants can be cultivated Distribution of rattan plants throughout Indonesia	Scarcity of raw material of commercial rattan Only few rattan species have been utilized Weakness in handling harvesting and postharvest activities which lead to decreasing in quality Most raw materials are coming from natural forest Lack of gatherer's knowledge on raw materials quality of required market Not enough capital for farmers to gather natural rattan or to cultivate rattan plant.	Improving number and rattan species to be utilized. Development of forest plantation Developing wise harvesting technique High bargaining position for farmer Improving welfare of forest dwellers Providing credit for the rattan farmers Improving local earning	Low in rattan price Smugglings Using unwise harvesting technique
Malaysia	NR	NR	NR	NR
Myanmar	NR	NR	NR	NR
Lao PDR	Local people still cooperate in harvesting; give information on the existing areas	Vest of raw material from the sources; no plantation yet for cane production	Demonstration for rattan canes plantation; existing of natural forests	Lack of fund and techniques; security in harvest method; custom of eating young shoots.
Philippines	NR	NR	NR	NR
Thailand	NR	NR	NR	NR
Vietnam	Labor available and cheap	Lack of capital for rattan cultivated	Create job for local people	Lack of knowledge for planting, treating diseases

⁸ ERDB, College, Laguna 4031 PHILIPPINES

⁹ ERDB, College, Laguna 4031 PHILIPPINES

¹⁰ FPRDI, College, Laguna 4031 PHILIPPINES

Table 18. SWOT analysis of rattan industry in the ASEAN Region, 2004 (continuation).

Aspect/Country	Strength	Weakness	Opportunity	Threat
2. Marketing a. Raw Materials b. Finished Products				
Brunei	Potential domestic market. Good farm to market roads Available locally.	Low to nil demand in locally produced rattan products . Presence of imported goods. Only few species identified with commercial value. Poor product quality.	Potential Demand for rattan products is present. More than 80 species are found in the country. Modern design and better craftsmanship. Assessable from neighboring countries.	Presence of imported goods. Available resources in neighboring countries. Most quality products offered by ASEAN Countries.
Cambodia	NR	NR	NR	NR
Indonesia	High availability of industrial number and capacity High availability of craftsmen High number of cheap labor Simply operated equipments	Low Utility Less friendly technology process Conventional equipments and process Postharvest processors' low motivation Low in modification processing	High opportunity to increase in production volume Opening on diversify of species utilization of non commercial rattan Development of rattan product diversification High opportunity to innovate new product Opening development on processing technology. Waste utilization	Existence of synthetic rattan products Existence of cheap rattan product from competitor country Pollution.
Malaysia	NR	NR	NR	NR
Myanmar	NR	NR	NR	NR
Lao PDR	Varieties of rattan canes species	Not enough knowledge on rattan morphology; weak quality study	Raw materials preservation improved, new design of products	Time consumed in hauling canes from forests; real price of raw material.
Philippines	NR	NR	NR	NR
Thailand	NR	NR	NR	NR
Vietnam	Large demand The competition on price at the different areas- high quality products, cheap and various kinds of products Traditional products	Lots of middle-men Lack of market information Market survey Market information Old-fashioned designs	Farmers readily to participate Internal and external trade has been expanded	Distribution sparsely High transportation costs Harvest time Unstable markets Competition with foreign countries' products.

Table 18. SWOT analysis of rattan industry in the ASEAN Region, 2004 (continuation).

Aspect/Country	Strength	Weakness	Opportunity	Threat
3. Utilization/ Manufacturing				
Brunei	Available technology and existence of several manufacturing / processing plants.	Local product processing has diminished due to low demand.	Potential local market demand for rattan products is good and can be expanded to foreign market.	Domestic rattan products manufacture will be totally neglected.
Cambodia	NR	NR	NR	NR
Indonesia	Highly supplying potency of raw material to rattan enterprises Possessing natural durability and easy to be formed High demand 90% of finished products for exporting Very potential for International market Various production types and usable product every where High esthetical value and comfortable.	Inequitable rattan price due to long marketing chain A little of raw material information at local farmer Highly fluctuation of rattan price at farmer and craftsmen level Weakness of international rattan price information Weakness of bargaining position at international market Less innovative of product design.	Equitable rattan price Shortening market chain Determining basic price of rattan at farmer level Increasing in earning of local government Extending in market segmentation Improving main role in international market Increasing in foreign exchange Highly probability in innovation of new products	Scarcity of raw material for industry Illegal trade Lack of supply in raw materials due to low price Limited in market international supply Increasing in rattan industry competitors in other country
Malaysia	NR	NR	NR	NR
Myanmar	NR	NR	NR	NR
Lao PDR	Preference of all users; local people have some skills in handicrafts.	Few design, only some species used	Raw material preservation, reduce vest, improve handle tools	Price incentive
Philippines	NR	NR	NR	NR
Thailand	NR	NR	NR	NR
Vietnam	Labor available, skillful, and heavy in experience.	Manual production Protection of raw materials and finished products	Technology transfer Imported modern machines Application of science knowledge in rattan processing	Lack of processing knowledge Lack of raw materials

Table 18. SWOT analysis of rattan industry in the ASEAN Region, 2004 (continuation).

Aspect/Country	Strength	Weakness	Opportunity	Threat
4. Policy				
Brunei	Existence of broad government policy.	Not specific to rattan resource.	Possible review of existing policy.	Out-dated policy.
Cambodia	NR	NR	NR	NR
Indonesia	Prevention of raw rattan export by high export taxes No taxes on finished products export Only the industry that can export rattan finished products	Less conducive of existing policy to rattan farmer. Less socialization on released rattan policy to rattan farmers Weakness to control in rattan policy implementation Less harmonized and unsynchronized of rattan policy between central government and local government, and among local governments	Improving to control rattan policy implementation Improving market chain and administrative policy Harmonizing and synchronizing rattan policy between central government and local government, and among local governments	In autonomy era, local governments tend not obey the rattan policy from central government Rattan traders tend not to obey an existing policy Local government policy flange to monopolies Convention policy
Malaysia	NR	NR	NR	NR
Myanmar	NR	NR	NR	NR
Lao PDR	Allow harvest of rattan; export ban of raw material; check points for NTFPs transportation	Not implemented well	Could be improved	Strong policy implementation
Philippines	NR	NR	NR	NR
Thailand	NR	NR	NR	NR
Vietnam	Support to the state's policies on the development of the professional villages	Specific policies related to rattan	The necessary policy for the development of rattan industry	The farmer's knowledge Policy implementation
5. Information System				
Brunei	Existence of mass-media; linkages with the academe and private organization.	Lack of impetus and less aggressive approach.	Receptive public. Local product promotion.	Diminished public understanding and cooperation.
Cambodia	NR	NR	NR	NR
Indonesia	High development on information network	Rattan resource areas have not yet been reached by information network. Relatively costly in information network usage	Opening request of information network development in rattan producing center	High investment on networking development No transparency of market actor in providing rattan price information

Table 18. SWOT analysis of rattan industry in the ASEAN Region, 2004 (continuation).

Aspect/Country	Strength	Weakness	Opportunity	Threat
5. Information System				
Malaysia	NR	NR	NR	NR
Myanmar	NR	NR	NR	NR
Lao PDR	Existing of information office.	Still weak capacity	Could be improved	Need sometime
Philippines	NR	NR	NR	NR
Thailand	NR	NR	NR	NR
Vietnam	Showrooms for rattan products	Lack of interdisciplinary linkages	Biodiversity information center and network on rattan	Information analysis and processing.
5. Institutions				
Brunei	Existence of both government and private institutions involved in the industry.	Lack of coordination. Individual/Respective mandates and objectives may post as constraints.	The institutions are willing participants to proper cooperation and coordination.	Enthusiasm to cooperate and condensate may wane.
Cambodia	NR	NR	NR	NR
Indonesia	Rattan post-harvest and farmer association in some region Existing of Indonesian handicraft Associations (ASMINDO) Promotion on finished products by ASMINDO to other country Availability of many research scientist in rattan activities	Lack of farmer association at any local government ASMINDO more accommodating the importance of downstream industry No institution to conduct rattan activities	Opening to establish farmer association at all rattan producing center Possibility in forming special institution to conduct rattan activities	No motivation of all stake holder to establish rattan association
Malaysia	NR	NR	NR	NR
Myanmar	NR	NR	NR	NR
Lao PDR	Government organizations in all levels	No clear roles	Could be improve	Need sometime
Philippines	NR	NR	NR	NR
Thailand	NR	NR	NR	NR
Vietnam	NR	NR	NR	NR

*NR-No Report



a. Rattan is a very important source of livelihood for the rural folks.

This is especially true to those who are at the bottom of the economic level which is particularly constitutes the large segments of the population in many ASEAN countries.

b. Diminishing supply and low quality rattan materials

Despite their importance in the socioeconomic and cultural contribution to the marginalized people, little effort has been given to manage these resources on a sustainable basis which resulted to decline in the supply of raw materials. Difficulty is now being encountered by gatherers because rattans are only available deep in the forest.

c. High wastage in harvesting

Rattan canes are cut at the base or 30 cm to 60 cm from the base up to a convenient length or to a reachable height. Around 30% to 50% of the canes are wasted.

d. Inadequate knowledge on advanced production and utilization technologies

This has partly resulted in the desultory development of the rattan industry. Although technologies on seed production, nursery, and plantation establishments are available, results of the situational analysis showed that transfer of technologies to the direct beneficiaries have not been conducted.

Limited access to advanced processing technologies is one of the reasons that lead to poor product quality which are not competitive in the world market. Cambodia, Brunei, Lao PDR, and Vietnam appeared to be wanting of these technologies which are being utilized by other ASEAN countries. Apparently, acquisition of knowledge on postharvest technologies will bring about an improvement of product quality.

e. Need for new or improved production and utilization technologies

Specifically, information on silvicultural requirements of lesser-used rattan, intercropping of rattan with other crops, new preservation techniques and socioeconomic aspects of rattan production and utilization.

It is apparent from the results of the study that there is a need for improved techniques in rattan plantation establishment and management in degraded forest. Likewise, there is also a need for improved techniques on harvesting to reduce wastage during the process.

f. Limited information on rattan marketing practices, product promotion and pricing

Although rattan products are manufactured in almost all of the ASEAN member-countries, results indicate that promotion and marketing of rattan products input requirements and costs prevailing in the rattan industry.



Daemonorops
sp. sp. sp. sp.
(A. sp.)
K. sp. sp. sp.

Daemonorops sp., Indonesia

Chapter VII. RECOMMENDATIONS

For sustainable development of the rattan industry in the ASEAN member-countries, the following recommendations have to be considered:

- a. *Strengthening of the program on seed production, nursery and plantation establishment to minimize if not completely solve the problem on raw material supply.*

Plantation establishment and management in all the ASEAN countries appear to be most effective method of solving the continuing decline in raw material resources in the region. These can be complemented with seed production and nursery establishment to augment the need of prospective entrepreneurs who will go on plantation establishment. It is also recommended that other species have to be looked into as alternative resource.

- b. *Intensify training and demonstration on the application of production and utilization technologies.*

To address the problem on declining supply of raw materials, low quality raw materials, and poor product quality, demonstration and training on the application the following: a) seed germination; b) nursery establishment; c) plantation management; and, d) processing technologies like preservation, bending, assembly, finishing, and product design have to be conducted at the village or community level.

Technical assistance has to be extended to the following member-countries: Cambodia, Lao PDR, Myanmar and Thailand. The rest of the ASEAN member countries will give their share in attaining the objective of the study for sustainable development of rattan.

- c. *Development of technology on harvesting to address high wastage in harvesting and utilization of waste*

The technology that was developed and designed by FRIM has to be looked into and fast track its

testing and evaluation so that these can be immediately used by rattan gatherers in commercial scale. Further testing and evaluation of techniques in harvesting have to be conducted. research and development on the use of waste products generated from harvesting and processing have to be conducted.

- d. *Generation of new technologies through R&D*

Information on improved silvicultural practices, intercropping, treatment, drying, bleaching and finishing techniques through research and development projects have to be generated. Likewise, information on the natural rattan resources has to be verified since this was found to be wanting in most of the ASEAN member countries.

- e. *Increase or intensify awareness on marketing practices, product promotion and pricing*

It appears that most of the ASEAN member-countries use rattan at the local market level only in spite of the lucrative prospects in the export market. There are available markets for high quality rattan products.

- f. *Information dissemination*

There should be an extensive information campaign on the various production and utilization technologies for sustainable development of rattan in the ASEAN region. These should complement the thrusts and objectives of the International Network for Bamboo and Rattan (INBAR) and Rattan Information Center (RIC) and other institutions involved in rattan programs.

- g. *Government support, in terms of human, financial, and technical resources for rattan sustainable development should be provided*

There is a need to provide incentives to the various sectors or stakeholders involved in the rattan

industry. Credit programs and other financing programs that will provide lower interest rates for the small and medium scale industries will alleviate the problem on lack of capital.

h. Need for policies to ensure sustainable productivity

A review on the implementation of policies relating to allocation of forest land, plantation establishment, forest charges, allowable cut, access to raw rattan and export and import regulations and have to be conducted.

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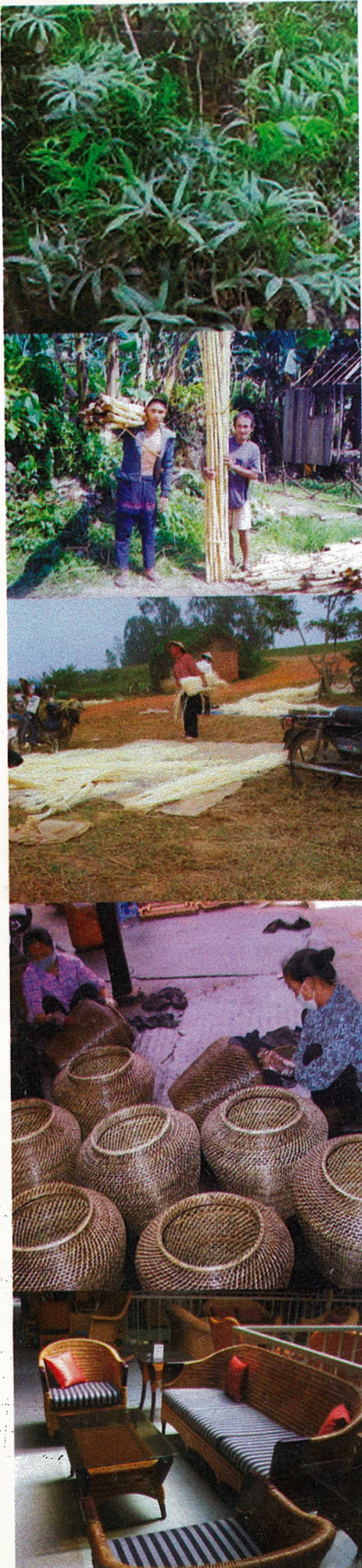
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Chapter VI: Conclusions (Dr. Aida B. Lapis)

Chapter VII: Recommendations (For. Gregorio E. Santos)



Application of Production and Utilization Technologies for Rattan Sustainable Development in the ASEAN Member-Countries

The Southeast Asian region is endowed with diverse species of non-wood forest products (NWFPs) owing to its vast tropical forests. Of the 13 known genera of rattans, ten genera with about 574 species are found in the Southeast Asian and neighboring regions. Owing to this great number of rattan species, Southeast Asia is considered to be the centre of biodiversity of rattan. Commercial species of rattan are only approximately 10 percent of the total known species worldwide.

The global threat on ecosystems and environment brought about by forest destruction and deforestation has influence in the major shift from timber-oriented program to nonwood forest products or NWFPs such as rattan. The problem in rattan production and utilization technologies requires improvement of techniques in planting and management of rattan in degraded forest.

As a first step towards sustainable development of rattan in the region, the Ecosystems Research and Development Bureau-Department of Environment and Natural Resources (ERDB-DENR) and the Forest Products Research and Development Institute-Department of Science and Technology (FPRDI-DOST) implement a pre-project entitled "Application of Production and Utilization Technologies for Rattan Sustainable Development in the ASEAN Member Countries. This pre-project aims to assess the socio-economic acceptability, financial and market feasibility of rattan production and utilization technologies in the ASEAN member countries.

The study reported in this book highlights the situation of rattan commodity, the socioeconomic, production, harvesting, processing, utilization and market dimensions of rattan in local communities and plantation in the ASEAN member countries and to determine the future action needed to enhance ASEAN regional cooperation through collaborative research in rattan sustainable development.

