

3. FOREST DAMAGE AND PROTECTION

3-1 Forest Fire

GRIG CHANDLER, PHILIP CHENEY et al.

Fire in forestry: Volume II forest fire management and organization
A Wiley-Interscience Publication, John Wiley & Sons, New York,
127-286, English

This publication provides general information on various aspects of forest fire. It covers all aspects of forest fire suppression, organizing for fire suppression, fire at the urban-forest interface, managing fire use, safety of fire fighting practices and terminology of forest fire.

Key words: Forest fire, Fire suppression, Fire fighting practices

SHARON L. CODAMON

Forest destruction by fire in Mount Arayat: A case of social forestry
Sylvatrop, Philippine Forest Research Journal, Philippines, 8(1), 1-7,
1983, English

Mass and individual interview techniques were used to study the socio-economic and psycho-social orientations of a rural forestry populace situated within and surrounding Mount Arayat in Pampanga conducive to or inhibitive of forest burning behavior threat. Four types of forest fire-setters, namely, kaingineros, cogon cutters, charcoal makers, and passers-by, seemingly reveal that forest fires are deliberately man-made and induced by the socio-cultural or political climate obtaining in the area. Burning may be due to peoples' shared belief of its comparative advantages; it could also reflect their reaction towards government policies, programs, and attitudes. As principal respondents, the kaingineros, who were all males and mostly married, with at least a primary education and an annual income of ₱2,786, showed a deep "tree-welfare consciousness" despite their utility-oriented perceptions. The majority perceived the control of burning as basically resting on the government specifically through the willingness of its local implementing arm to fairly perform its role of patrolling, disseminating forest conservation information, and regulating the number of people moving to and from the mountain.

Key words: Forest fire, Social and economic analysis, Fire prevention

SAMUEL R. PENAFIEL & G.B. DOCTORO

Comparison of three different methods of firebreak construction
Sylvatrop, Philippine Forest Research Journal, Philippines, 3(2), 123-130,
1978, English

The most common method of firebreak construction in the pine region of Northern Luzon is the cut and grub method. It involves monthly cutting of vegetation and grasses close to the ground and partial removal of plant underground parts with scythes, bolos and spades. Much of government funds for forest protection during the fire season is spent for the purpose.

This study was conducted within the experimental area of Conifer Research Center at Loakan, Baguio City with an average slope of 25%.

Three methods of firebreak construction were compared in a *Themada triandra* dominated pine-grassland. The methods compared were the cut and grub method, chemical burning method using the herbicide paraquat, and the mechanical method using a motor brush cutter. In terms of cost, the mechanized method was found to be the cheapest method for firebreak construction. However, all of the methods have their advantages and disadvantages. A tabular comparison based on several factors is given as guide in the use on any of the methods.

Key words: Forest fire, Fire break/line, Herbicide, Cost analysis

SAMUEL R. PENAFIEL

Determination of plant species for fuelbreaks

**Sylvatrop, Philippine Forest Research Journal, Philippines, 9(1 & 2), 21-31, .
1984, English**

Five (5) plant species, namely: *Alnus japonica*, *Eucalyptus camaldulensis*, *Lantana camara*, *Tithonia diversifolia* and *Agaya cantala* were planted in combinations in a spur ridge to determine which species are suitable for planting in fuelbreaks. Six months after a fire burned the strips of greenbreaks/fuelbreaks, all of the species except *Alnus* resprouted and developed a much thicker vegetal cover. Apparently, *Eucalyptus camaldulensis*, *Agaya cantala*, *Tithonia diversifolia*, and *Lantana camara* withstood the scorching effects of the wild fires manifesting adaptations and resistance to fire.

Key words: Fire break tree belt, Fire resistance, Tree species, Fire break, Forest fire

3-2 Pests and Diseases

TAKAO KOBAYASHI

**Manual for forest tree diseases and their control measure in the
Philippines**

**RP-Japan Forestry Development Project of the Pantabangan Area, Philippines,
54, 1986, English**

This is manual for forest tree diseases in the tropics. It provides the information for diagnosis and control measures of tropical tree diseases.

In this book, the description on forest tree diseases is mentioned dividing into two sections viz. diseases common to various tree species and diseases for each tree species. Regarding diseases by tree species, it provides information on symptom, damage and control measure of 25 tree species including indigenous species. It describes also application methods of fungicides for control measures of tropical trees.

Key words: Forest protection, Tree disease, Control measure, Fungicide

CHAWEEWAN HUTACHAREN, et al.

Pests and diseases of forest plantations

**FAO Regional Office for Asia and the Pacific (RAPA), Bangkok, Thailand,
283, 1990, English**

Forest plantations have received much attention in recent years as a means to increase wood production and at the same time provide a wide range of services. Yet the protection of forest plantations has received very little notice in most plantation programs. Insect and disease pest are a very real threat to the success of plantation forestry in the tropics.

There is much to learn about this threat and how to deal with it as witnessed by the fact that the IUFRO Working Group meeting on Pests and Diseases of Forest Plantations held in Bangkok in June, 1988 attracted some 74 scientists from 13 countries. These proceedings provide a written record of the papers and presentations made during the meeting.

Key words: Tree disease, Insect damage, Plantation

RICARDO D. BRAZA

Varicose borer, *Agrilus sexsignatus* (Fisher) infestation on native Bagras,

***Eucalyptus deglupta* Blume in PICOP plantation**

Philippine Lumberman, Philippines, 34(4), 19-21, 1988, English

This study was carried out within the PICOP industrial tree plantations in Surigao del Sur in August 1987 to assess the extent of infestation by the varicose borer *Agrilus sexsignatus* (Fisher). A total of 1,413 trees were examined on 190 plots (.05-12 ha in size) in six stands of native bagras (*Eucalyptus deglupta*).

The percentage of infested trees ranged from 1 to 21 per cent, with an average of 6 per cent.

Of 89 total infested trees, 80 per cent were at most only lightly damaged and 20 per cent were moderately to severely infested.

Infested suppressed trees were more preponderant (64%) than infested intermediate (29%), co-dominant

(5%), or dominant (2%) trees.

Dead trees with borer damage were only 1.2% of total trees examined and 4.1% of total trees observed. The results indicate that varicose borer is not causing serious damage on PICOP bagras plantations.

Key words: Plantation, Insect damage, Eucalypt, Bore

RICARDO D. BRAZA

Falcata seeds infested by unknown moth species

**Canopy International, Ecosystems Research and Development Bureau, DENR,
Philippines, 13(6), 3, 1987, English**

Insects appeared to have not been a problem in falcata (*Albizia falcataria* (L.) Fosb.) seed production in the PICOP (Paper Industries Corporation of the Philippines) plantation. However, in August 1986, larvae of an undermined species of moth were observed causing damage on falcata seeds that were still inside the pods. The pest was first detected on seed samples from the falcata seed orchard.

The larvae are dirty white with brown heads, slender, cylindrical, and sparsely hairy. Mature larvae measure about 10 mm long.

Key words: Seed, Insect damage

RICARDO D. BRAZA

Asiatic palm weevil destroys rattan, too

**Canopy International, Ecosystems Research and Development Bureau, DENR,
Philippines, 13(4), 6, 1988, English**

The asiatic palm weevil, scientifically named *Rhynchophorus ferrugineus* Olivier (Coleoptera: Curculionidae) is one of the most destructive pests of coconut in the country (Abad and Gallego 1977). The larvae tunnel into and feed on the tissues of the trunk and leaf bud, thus resulting in the death of coconut trees.

For some time, the weevil has never been reported as a pest of other crops in the country. However, in 1984 the insect had turned out to be destructive also to rattan. This was discovered after the damage caused by the weevil larvae on one- to two-year old palasan (*Calamus merillii*) in plantation at the logging concession of the Paper Industries Corporation of the Philippines (PICOP) in Surigao del Sur. The plantation was started in 1982 and is now established in thousands of hectares of the concession's second-growth forest.

Key words: Rattan, Pest damage, Plantation

MARCOS J. QUIMIO JR & MARIO A. EUSEBIO

How to prevent and control damping-off of nursery seedlings

**Canopy International, Ecosystems Research and Development Bureau, DENR,
Philippines, 16(4), 10-12, 1990, English**

In the Philippines, there are a number of important fungus diseases of both hardwood and coniferous seedlings particularly in nurseries. The most serious of these is damping-off. It is a term applied to any disease that results in the rapid decay of young succulent seedlings. It is caused by a number of soil-inhabiting fungi that are facultative parasites and not specific as to the host. A wide range of hosts suffer from damping-off. Damping-off is a major problem of nursery men in growing seedlings in the newly-sown beds before and after emergence.

It is impossible to give exact measures for the control that is applicable to all conditions since damping-off is caused by a wide range of different fungi and, therefore, there is no constant relationship between environmental factors and the disease or between various chemical fungicides and their effects in terms of lethal dose (LD) on these fungi. However, results of specific studies on certain hosts and fungi yielded very important information which may be adopted in controlling damping-off in nurseries.

Key words: Nursery, Seedling, Tree disease, Fungi damage, Control measure

ASIAN DEVELOPMENT BANK

Handbook on the use of pesticides in the Asia-Pacific region

Asian Development Bank, Manila, Philippines, 294, 1987, English

Pests are a serious problem to many of the major food and industrial crops grown in the Asia-Pacific

region, causing annual yield losses estimated at 30 to 60 percent. Consequently, many developing countries in the region have depended heavily on the use of pesticides. Increased use of pesticides, however, has caused considerable concern about their effects on health and the natural environment and the quality of agricultural products.

In view of these concerns as well as those expressed within the Asian Development Bank, in early 1986 the Bank engaged staff consultants to review the overall use and regulation of pesticides in selected member countries and to offer recommendations on how the Bank should proceed to ensure environmentally sound practices in its agricultural projects. In light of the consultants' findings, the Bank has produced this handbook. It is designed to guide Bank staff and member country government officials in the selection, procurement, and safe and cost-effective use of pesticides.

Key words: Insecticide, Environment conservation

SEBASTIAN S. QUINIONES

New disease of ipil-ipil (*Leucaena leucocephala* (Lam.) de Witt) in Minoz, Nueva Ecija
Sylvatrop, Philippine Forest Research Journal, Philippines, 3(2), 131-133, 1978, English

A new disease of ipil-ipil was observed in Muñoz, Nueva Ecija. The first external symptom observed was yellowing of the lower leaves. The basal cortical of the plant at soil line were water soaked in appearance. When favorable conditions prevailed, (e.g. soil temperature ranges from 28 to 32° C) the causal fungus produces visible white mycelia which later turned pinkish on the surface of infected parts of the plant.

Microscopic examination of diseased tissues showed that the fungus associated with this ipil-ipil disease is *Fusarium solani* (L. H. and G. Mart.) L.R. Jones and Grant. The same organism has been recently reported on seedlings of *Pinus kesiya* Royle ex Gordon.

Key words: Tree disease, Fast growing tree species, Fungus, Plantation

ERANEO B. LAPIS

Geographical and altitudinal distribution of the six-spined Engraver Beetle, *Ips calligraphus* (Germar), (Coleoptera: Scolytidae) in the Philippines
Sylvatrop, Philippine Forest Research Journal, Philippines, 10(3), 211-218, 1985, English

Ips calligraphus (Germar) was found only in the major island of Luzon especially in the central and northern part, where natural pine forest and old pine plantations exist. The insect was not present in several species of pines planted in some areas in the southern parts of the Philippines. The beetles thrive well in areas with elevations of 350 to 2,300 m above sea level (asl) although there was an instance when they were found breeding on logs at 150 m a.s.l. It is suggested that strict quarantine procedures be observed to prevent artificial spread of *Ips* outside its present areas of infestation.

Key words: Pine, Insect damage, Control measure, Elevation

MARIO A. EUSEBIO & MARCOS J. QUIMIO JR

New disease of benguet pine (*Pinus kesiya*) seedlings
Sylvatrop, Philippine Forest Research Journal, Philippines, 28(2), 159-161, 1977, English

A disease caused by *Fusarium solani* (Mart.) Appel. and Wr., attacking Benguet Pine seedlings is reported for the first time from the Philippines. The first symptom is yellowing of the needles. Shortly thereafter, pinkish discoloration of the stem becomes the most distinct symptom, hence the name "pink disease." This is followed by toppling and wilting of the seedlings. The disease has been observed in 3-month old pine and is estimated to affect 20 to 35% of the total seedlings.

Samples of diseased seedlings were gathered and brought to the laboratory for cultural and microscopic examinations. Small sections were then cut from the roots and stems. These were rinsed with 0.1% mercuric chloride (HgCl₂) for 1 to 2 min and subsequently washed 3 times with sterile distilled water for 2 to 3 min. They were then dried in sterile filter paper before they were planted in malt agar with 2 to 3 drops of lactic acid added. After 2 or 3 days, pure isolates were taken from along the periphery of the root and stem sections and

transferred to test tube slants. Representative isolates have been identified and verified to be *Fusarium solani*.
Key words: Pine, Seedling, Nursery, Tree disease

MARIO A. EUSEBIO

Occurrence of heart rot in virgin forests and decay in logged-over areas
Sylvatrop, Philippine Forest Research Journal, Philippines, 2(3), 195-208,
1977, English

An average of 5 trees per hectare (with diameter breast height of at least 29 cm.) were affected by heart rot in Eastern Quezon; 2 per ha in Oriental Mindoro and 5 per ha in Zambales.

The subject trees were felled and dissected and the extent of their decay was measured and evaluated. Dissection was done by bucking and/or making deep wedge-shaped cuts along the bole. To determine the cull-volume deduction, the following were measured.

- a. Average diameters and length of heart rot inducing associated brashy portions due to incipient decay;
- b. Maximum width, length and depth of rotten sapwood affected by fungus entry;
- c. Extent of decay along the bole, above and below the decay indicators.

Cull indicators on affected trees varied from rotten branches to numerous fruiting bodies on the trunk.

The injuries to remaining trees as a result of logging also varied from mere scraped barks to deep and large wounds exposing the heartwood.

Mature and over-mature trees tended to be more susceptible to heart rot. In trees affected by heart rot, toughness and specific gravity abruptly decreased as one moved from the sapwood to the pith. Generally, the reduction in specific gravity has a corresponding reduction in toughness.

About 30% of the fiber of wood attacked by white-rot fungi was sound. No sound fiber was found in wood attacked by brown-rot fungi.

Key words: Heart rot, Fungi damage, Overmature forest

SEBASTIAN S. QUINONES & MARIA P. DAYAN

Fungi associated with ipil-ipil (*Leucaena leucocephala* (Lam.) de Wit) seeds
Sylvatrop, Philippine Forest Research Journal, Philippines, 10(3), 143-162,
1985, English

Thirteen fungi were isolated from *Leucaena* seeds collected from different provinces in the Philippines. These were: *Fusarium moniliforme*, *F. solani*, *F. semitectus*; *Colletotrichum gloeosporioides*, *C. graminicola*, *C. truncatum*; *Botryodiplodia theobromae*; *Cephalosporium sp.*; *Phoma sp.*; *Cladosporium cladosporioides*; *Chaetomium sp.*; *Penicillium sp.* and *Aspergillus flavus*. Three were seed-borne (*F. moniliforme*, *F. solani* and *C. graminicola*). *C. graminicola* completely inhibited the germination of ipil-ipil seeds once it has colonized the seeds. Eight were field contaminants (*F. semitectus*, *C. gloeosporioides*, *C. truncatum*, *B. theobromae*, *Cephalosporium sp.*, *Phoma sp.*, *Cladosporium cladosporioides*, and *chaetomium sp.*) and two were storage fungi (*Penicillium sp.* and *Aspergillus flavus*).

Key words: Fungus, Seed, Fungi damage, Germination

ERANEO B. LAPIS & ZOSIMO N. GEMIL

Biology of *Ozola minor* Moore (Lepidoptera: (Geometridae) a defoliator of yemane (*Gmerina arborea*)
Sylvatrop, Philippine Forest Research Journal, Philippines, 4(1), 31-27,
1979, English

Ozola minor was found seriously defoliating Yemane seedlings. At high pest population density, seedlings can be completely defoliated. Before any control program could be implemented successfully, knowledge on the pests life history and habits is imperative. Unfortunately, information about the pest is wanting. Hence this study was conducted.

Immature stages of the pest were collected in the field and reared in the laboratory under average room temperature of 25° C. Virgin adults were sexed and paired in screen cages for oviposition. Newly laid eggs were in turn incubated inside petri dishes. Immediately after hatching, first larvae were reared individually in petri dishes. Fresh leaves were provided as necessary. observations on their development were conducted daily for 1 generation. Habits of the pests were also observed in the field.

The results of the study discuss life history, habits and description, host range, seasonal occurrence, list of plants presented to the larvae of *Ozola minor* as food, feeding habits and nature of damage.

Key words: Insect damage, Defoliator, Life history, Fast growing tree species

SEBASTIAN S. QUINONES

Yellowing of caribbean pine (*Pinus caribaea*) seedlings

Sylvatrop, Philippine Forest Research Journal, Philippines, 10(1), 49-55, 1985, English

A disease that causes general yellowing of *pinus caribaea* seedlings and at the same time stunting and killing them was studied at the ASEAN-New Zealand Afforestation Project (ANZAP). The pathogenic fungus associated with the disease was identified as *Fusarium solani* (Mart.) Sacc. About 80% of the seedlings raised for 1983 plantings were severely infected. In early 1984, the disease occurred again in epiphytotic proportion because the same compost was used. This time there was almost nothing left of the pine seedlings for planting. This is a new record of pine disease in the Philippines. The study discusses the pathogen and how it developed in the nursery, and suggests control measures.

Key words: Pine, Tree disease, Fungi damage, Seedling, Nursery

ERANEO B. LAPIS

Evaluation of insecticides for the control of the pine shoot moth

***Dioryctria rubella* Hamps. in the Philippines**

Sylvatrop, Philippine Forest Research Journal, Philippines, 10(2), 77-85, 1985, English

Replicated plot tests on young *Pinus kesiya* Royle ex. Gordon showed that fenitrothion (Sumipine 30 EC) and fenvalerate (Sumicidin 3 EC) effectively reduced shoot damage and infestation by the pine shoot moth, *Dioryctria rubella* Hamps. Both insecticides at 0.1% and 0.2% a.i., respectively, gave excellent control. Insecticide application at two weeks interval was superior to 2 and/or 1 application during the flushing period of 2 months.

Key words: Pine, Insect damage, Control measure, Insecticide

ERANEO B. LAPIS & H.O. VALENTIN

Field responses of ips *Ips calligraphus* (Germer) to synthetic aggregation pheromones and other attractants

Sylvatrop, Philippine Forest Research Journal, Philippines, 4(4), 223-229, 1979, English

This study reports the aggregation behavior of Ips beetles in the field as affected by the synthetic pheromones ipsdienol and cis-verbenol and other chemicals.

Beetles were trapped using a cylindrical pipe, perforated with holes big enough for the beetles to pass through. A plastic funnel and a collection jar were attached to the end. The other end of pipe was closed with a flat wood on which the attractants were hung.

Attractants used were synthetic preparations of ipsdienol and cis-verbenol, ipsenol (2-methyl-6-methylene 7-octen 4-ol), ethanol (90%) and pine bolt 5 cm. in diameter and 15 cm. long.

Cis-verbenol + ipsdienol was more than other test materials attractive to the flying beetles. Addition of host volatiles (pine bolts) did not significantly increase the number of beetles caught in traps with cis-verbenol + ipsdienol. Ipsenol obtained a negative response from the beetles and masked the attractiveness of cis-verbenol + ipsdienol. These results open new possibilities in the control of ips with the use of synthetic aggregation pheromones.

Key words: Insect damage, Beetles, Control measure

ERANEO B. LAPIS

Observation on the seasonal distribution of *Ips calligraphus* Germar, Baguio city, Philippines

Sylvatrop, Philippine Forest Research Journal, Philippines, 11(1 & 2), 61-68, 1986, English

In the Philippines, *Ips calligraphus* breeds continuously throughout the year. However, there were two conspicuous peaks of abundance of flying adults observed in Baguio, i.e., during March to June and September to December. The method used was found useful in monitoring the activity of adult *I. calligraphus*.

Key words: Insect damage, Beetles

S.C. HALOS, S.S. QUINONES et al.

Towards an integrated control measure against shoot moth and needle blight affecting pines

PCARRD Monitor, Philippines, 13(8), 6-8, 1985, English

All pine plantations in Luzon were found to be damaged by shoot moths (*Dicrytria rubella*, *petrova cristata*) and needle blight (*Cercospora pini-densiflora*/*Mycosphaerella gibsonii*) early in their rotation.

A series of studies on pesticides, including microorganisms, biological control using hymenopterous parasitoids, pheromone trapping, and resistance was undertaken. Results indicated that Sumipine 80 EC at 0.1 or 0.2% a.i. reduced *D. rubella* damage by 100% in a plantation established in 1980. *Bacillus thuringiensis* reduced shoot moth infestation by 95% but was expensive and could only be applied for a relatively short period. The parasitoid *Eriborus* was found to increase *D. rubella* larval mortality by as much as 50% in the field. Assessment showed that *Pinus caribea* var. *bahamensis* was the most resistant of 11 species screened. Of 6 commercial fungicides tested, Brassicol (quintozene) and Benlate (benonyl) gave the highest control (80%) of needle blight. Preliminary studies show that N and Mn are limiting nutrients for the growth of pines. An integrated control system for shoot moth is recommended including: immediate reduction in the pest populations using chemical pesticides, followed by a mass release of *Eriborus* about 1 month later; planting resistant varieties; and applying fertilizers.

Key words: Pine, Fungicide, Insecticide, Control measure, Forest protection

REYNALDO E. DE LA CRUZ, SEVERINA L. LIANTO & LORNA M. TEODORO

Relationships between nutrient content in soils and tissues and

the incidence of needle blight and shoot moth in Benguet pine

Sylvatrop, Philippine Forest Research Journal, Philippines, 9(1 & 2),

1-20, 1984, English

Relationships were studied between soil pH, organic matter, N, P, K, Ca, Mg, Fe, Mn or Zn contents in soils and tissues and the incidence of needle blight (*Cercospora pinidensiflorae*) and shoot moth (*Dicrytria rubella* and *Petrova cristata*) on Benguet pine (*Pinus kesiya* Royle ex Gordon). Four (4) types of responses were observed. Type I response is a positive correlation between the incidence of needle blight or shoot moth and soil or tissue parameters. This response was observed for needle blight or shoot moth in relation to K, Mg, pH and organic matter content in the soil, for needle blight in relation to Ca, Fe, Mn and Zn in the tissue, and for shoot moth in relation to Fe and Mn in the tissue.

Type II response is a negative correlation between the incidence of needle blight or shoot moth with soil or tissue parameters. Such negative correlation was observed on needle blight in relation to Mn content in the soil and N or P content in the soil and N or P content in the tissue, or in shoot moth in relation to N and Mn in soil and N, P and Mg content in tissues.

Type III response is characterized by a "concave upwards" nature of relationship implying that low and high concentrations for soil and tissue parameters increased the incidence of needle blight or shoot moth. This response was observed for needle blight in relation to N, P, Ca, Fe and Zn content in soil and K content in tissue, and for shoot moth in response to P, Ca, Fe and Zn content in soil, and K, Ca, and Zn content in tissues. For type III responses, critical ranges are presented for each element within which needle blight and shoot moth may be reduced.

Type IV response wherein low and high concentrations of an element decreased the activity of an organism was detected only in needle blight in response to Mg content in tissues.

Implications of these responses on the control of needle blight and shoot moth in Benguet pine are discussed.

Key words: Pine, Insect damage, Control measure, Soil fertility, Soil texture

MARCOS J. QUIMIO JR & MARIO A. EUSEBIO

How to prevent and control damping-off disease of nursery seedlings

**Ecosystems Research and Development Bureau (ERDB), Philippines,
18, English**

This publication is one of How-to manuals issued by Ecosystems Research and Development Bureau (ERDB) to assist the nurseryman, foresters, extension workers and other in preventing/controlling damping-off diseases in forest nurseries.

In the Philippines, there are a number of important fungus diseases of both hardwood and coniferous seedlings particularly in nurseries. The most serious of these is damping-off. A wide range of hosts suffer from damping-off. The most common fungi of both coniferous and hardwood seedlings in the Philippines are *Pythium* spp., *Fusarium* spp. and *Rhizoctonia* spp.

This book mentions several procedures to be adopted to prevent and control damping-off diseases caused by the said fungi.

Key words: Fungi damage, Tree disease, Fungicide, Nursery, Seedling

**RP-JAPAN FORESTRY
DEVELOPMENT PROJECT OF THE PANTABANGAN AREA
Manual for forest tree diseases and their control measure in
the Philippines
RP-Japan Forestry Development Project of the Pantabangan Area,
Philippines, 55, 1987, English**

The manual includes common forest tree diseases observed in the provinces of Nueva Ecija, Laguna, Quezon, Rizal, Bulacan, Tarlac, Cebu, Bukidnon, Misamis Oriental and Davao del Sur. It also includes disease observed in several woody crops often used in agroforestry.

There are seven common forest tree diseases and eight fungicides described in the manual. Terminology in forest pathology, agricultural pesticides is appended.

Key words: Tree disease, Control measure, Fungicide

**SURACHAI CHOLDUMRONGKUL, CHAWEEWAN HUTACHARERN
Possibility of using light trap to estimate the population of the
teak defoliators
Thai Journal of Forestry, Thailand, 7(1), 28-36, 1988, Thai**

Estimation of the population density of the teak defoliators by using light traps at Khaobin Teak Forest in Ratchaburi province in 1986 found the number of *Hyblaea puera* Cramer was much less than *Eutectona machaeralis* Walker. The average number of *E. machaeralis* caught daily from the light traps in June, July, August, and September was 14.3, 2.6, 1.2 and 0.2, respectively.

In 1986, there was no outbreak of either *H. puera* or *E. machaeralis* caught from light traps showed some relation to the incidence of insect feeding in the study area. The result indicated the light trap was possible to use as one of the tools to estimate the population of *E. machaeralis* but not applicable to *H. puera* in the year of 1986.

Key words: Defoliator, Insect damage

**ANIWAT CHALERMPONGSE
Common forest tree diseases in Thailand
Thai Journal of Forestry, Thailand, 8(3), 216-226, 1989, English**

Forest pathology research in Thailand was initiated by the Forest Pest Control Branch, Division of Silviculture, Royal Forest Department in 1977. At present, very few researchers are working in this specialized field. Their objectives are to carry out research in Forest Pathology and Microbiology in different forest ecosystems of Thailand. This paper summarizes current potentially dangerous forest tree diseases identified and reported in Thailand. Some control measures are also recommended on the basis of laboratory and field practices. Future research should focus on the biology and ecology of serious diseases to provide data for control management in the field.

Key words: Tree disease, Control measure

SUPACHOTE EUNGWITARNPANYA et al.
Bionomics of the Teak Beehole Borer, *Xyleutes ceramicus*, in
northern Thailand: mating behavior
Thai Journal of Forestry, Thailand, 9(3), 196-202, 1990, English

Female displayed calling behavior from 20:00 to 23:00 and males responded to the calling of females with wing-fluttering. Males approached females with fluttering wings and copulated them. Females copulated only once but males copulated twice.

Males walked up wind and approached females when virgin females were placed windward on an olfactometer. In the field, four males were captured on the traps baited with virgin female in both 1989 and 1990, although no male was captured on the traps baited with crude extract of sex pheromone. Some of the chromatographically separated fractions, however, elicited wing-fluttering of male moths when exposed to air-puffing.

Key words: Insect damage

4. FOREST MEASUREMENT AND MANAGEMENT

4-1 Growth, Increment of Trees and Stands

KOICHI KAMO, BOPIT KIATVUTHINON, et al.
Research report No. 2
Research and Training in Re-forestation Project RFD-JICA, Thailand,
No. 2, 38, 1991, English

1. "Seasonal growth of some broad-leaved tree species in central Thailand"

Seasonal diameter increment of *Eucalyptus camaldulensis*, *Acacia auriculiformis* and *Azadirachta indica* var. *siamensis* in western part of central Thailand was examined in relation with the seasonal rainfall pattern.

2. "Estimation of stem and stand volume of *Eucalyptus camaldulensis*."

Stem volume table of *Eucalyptus camaldulensis* was constructed covering the main plantation areas in Thailand. The data obtained were 458 sample trees coming from central, western, northern, and northeastern parts of Thailand. Multiplicative model was applied to estimate the stem volume from the diameter at breast height (D) and height (H) of the tree.

Key words: Fast growing tree species, Stem volume, Standing tree volume

MONINA G. TORRES-URIARTE et al.
A comprehensive review of growth and yield studies in the Philippines
Canopy International Ecosystems Research and Development Bureau, DENR,
Philippines, 13(4), 3-5 & 12, 1988, English

This report is a comprehensive review of growth and yield studies in the Philippines. It mentions 6 species viz. *Gmelina arborea*, *Leucaena leucocephala*, *Pinus kesiya*, *Pinus merkussii*, *Swietenia macrophylla* and *Tectona grandis*.

The trend of the predicted values conforms to the generally accepted principle of growth and yield. It is shown that with respect to age and site, there is a continuous increase in yield when the site becomes better and the stand becomes older. It is evidently safe to conclude that the developed yield models provide good estimates of the biological potential of the species concerned and can be used with confidence to estimate site productivity.

Key words: Tree species, Growth, Yield volume, Yield table

A.B. LAPIS & V.C. DEJA CRUZ
Ten year growth of natural benguet pine (*pinus kesiya*) stands
Sylvatrop, Philippine Forest Research Journal, Philippines, 2(4), 269-276,
1977, English

Benguet Pine forests have an aggregate area of 0.2 million ha with a volume of 18.6 million m³. These forests are a source of mine timbers, construction materials and of high-quality exudate such as crude turpentine or oleoresin used for the manufacture of paints, plastics, sizing materials and varnishes.

The data were collected from 12 permanent circular growth plots each having a radius of 17.85 m. or an area of approximately 0.1 ha.

Pressler's formula was used to determine the growth rate (in percent) based on observations and measurement of the sample trees within the 12 sample plots.

Analyzed were density of stock, growing stock, rate of growth, mortality, crown class and tree size distribution of 10-yr old second growth Benguet Pine stands. Out of an average of 456 trees/ha left after logging in 1961, an average of 342 trees survived 10 yr later. Mortality was attributed to illegal cutting, forest fires and natural death. The average annual diameter growth was 0.92 cm and the annual basal area growth was 4% based on Pressler's formula. Tree diameter ranged from 5 to 70 cm at initial measurements and 10 to 80 cm 10 yr after.

Key words: Pine, Natural forest, growth rate, Growing stock, Secondary forest

SARAYUDH BUNYAVEJCHEWIN, SOOMBOON KIRATIPRAYOON et al.

Primary production of plots of five young close-spaced fast-growing tree species, II. above-ground biomass nutrient and energy content

**Technical Paper, Division of Silviculture, Royal Forest Department, Thailand
No. 30, 57-63, 1990, English**

The aims of the study were to present data for dry matter, nutrient and energy content of the above-ground portions of 5 fast-growing species. This work was carried out to provide a basis for estimating production of species suitable for growing firewood for rural needs.

Five-year-old *Eucalyptus camaldulensis*, *Leucaena leucocephala*, *Cassia siamea*, *Azadirachta indica* var. *siamensis* and *Acacia auriculiformis* plots contained 109, 103, 48, 52 and 45 tonnes of above-ground biomass per ha, respectively. Energy content ranged from 443 x 10⁶ kcal/ha for *E. camaldulensis* to 192 x 10⁶ kcal/ha for *A. auriculiformis*. In the 5 species, the nutrient content per unit of energy varied from the same order of magnitude for phosphorus to 2 times different for nitrogen, potassium and magnesium.

Key words: Fast-growing species, Firewood, Fuelwood, Fuelwood tree species

SARAYUDH BUNYAVEJCHEWIN & SOOMBOON KIRATIPRAYOON

Primary production of plots of five young close-spaced fast-growing tree species, I. biomass equations

**Technical Paper, Division of Silviculture, Royal Forest Department, Thailand
No. 29, 47-56, 1990, English**

Biomass equations for the above-ground component of individual *Eucalyptus camaldulensis* Dehnh., *Leucaena leucocephala* de Wit, *Cassia siamea* Britt., *Azadirachta indica* Juss. var. *siamensis* Valetton and *Acacia auriculiformis* Cunn. aged 1 1/2, 3 and 5 years were developed for species trial plots in Ratchaburi Province. The mass of stems of branches and of foliage are given as functions of *d* and *d*²*h*. Pooled regression equations for the components of each species were then developed.

Key words: Biomass, Species trials, Fast growing tree species, Growth

KOICHI KAMO et al.

Biomass production and seasonal growth of some broad-leaved tree species in Central Thailand

**Research and Training in Re-Afforestation Project, RFD-JICA,
Thailand, 19, 1990, English**

Seasonal diameter increment and annual growth of *Eucalyptus camaldulensis*, *Acacia auriculiformis*, and *Azadirachta indica* var. *siamensis* in Ratchaburi in western part of central Thailand was examined in relation with the seasonal and annual rainfall pattern. The monthly diameter increment tended to coincide not only among the sample trees of each species but among the three species studies. This may explain the severe conditions in terms of rainfall and soil conditions in Ratchaburi.

Key words: Fast-growing tree, Increment, Mean annual increment

4-2 Harvesting

MONINA T. URIARTE & FELIZARDO D. VIRTUCIO

Growth and yield of residual forests in the Philippines

Occasional Paper, Ecosystem Research and Development Bureau - DENR,

Philippines, No. 1, 75, 1988, English

Periodic annual increment (PAI) in diameter is still used in determining allowable cut because it is more readily available and is believed to be more reliable than the growth per cent method.

The diameter PAI is used to determine the length of time residual trees in unit areas attain size and volume profitable for cutting. Regulation at this stage is a practical safeguard for continuity of operation of the concessionaire.

A total of 881 permanent plots were used in determining the vegetative structural changes that took place in selectively-logged dipterocarp forests. Periodic annual increment equations were developed and the corresponding diameter growth projection tables were generated based on fifth year re-measurements of Continuous Forest Inventory (CFI) plots.

It is generally observed that small diameters of the same species group and locality have higher growth rates than trees with bigger diameters. Since bigger trees are older than smaller trees, their growth rate is slower. Thus the periodic annual increment was affected by tree sizes. The maximum diameter growth of different species groups was attained at different diameter classes.

Finally, a five year comparison of diameter growth rates was carried out by region and climatic types.

Key words: Mean annual increment, Cut volume, Growth rate, Yield volume

DANILO C. CACANINDIN

Tree volume, yield and economic rotation of kaatoan bangkal (*Anthocephalus chinensis* (Lam.) Rich ex Walph) plantations in Nasipit Lumber Company, Tungao, Butuan City.

Part II. Yield prediction models

Sylvatrop, Philippine Forest Research Journal, Philippines, 11(1 & 2), 23-34,

1986, English

Yield prediction models were developed for kaatoan bangkal (*Anthocephalus chinensis* (Lam.) Rich ex Walph) plantations in Nasipit Lumber Company (NALCO), Tungao, Butuan City. Data from 110 randomly selected sample plots were gathered for the development of yield prediction models for total volume and sawtimber. The models consisted of a site index guide equation on stand age and site quality. Variable sampling or point sampling was resorted to using an improved sampling stick with a basal area factor of 2 m²/ha. The yield prediction functions were validated against an independent set of 20 yield plots. The results of the paired t-test and chi-square test showed no significant differences between the predicted and the actual yield data.

Key words: Fast growing tree species, Indigenous species, Plantation, Yield volume, Yield table

DANILO C. CACANINDIN

Tree volume, yield and economic rotation of kaatoan bangkal (*Anthocephalus chinensis* (Lam.) Rich ex Walph) plantations in Nasipit Lumber Company, Tungao, Butuan City.

Part I. Tree volume equations and tables

Sylvatrop, Philippine Forest Research Journal, Philippines, 8(2, 3 & 4), 119-131,

1983, English

Acceptable tree volume equations and tables were developed for plantations of kaatoan bangkal (*Anthocephalus chinensis* (Lam.) Rich ex Walph) in Agusan del Norte. Total volume equation was developed from 310 sample trees and tree volume equation was developed from 190 sample trees. Another volume equation was developed to determine the sawtimber volume for a given diameter and merchantable height up to 10 top dib.

Key words: Fast growing species, Indigenous species, Yield volume, Increment, Plantation

LEUVINA M. TANDUG

Modelling diameter distribution of benguet pines using the Weibull probability function

Sylvatrop, The Technical Journal for Philippine Ecosystems and Natural Resources, DENR, Philippines, 1(1), 103-111, 1991, English

The two-parameter Weibull probability density function was used to fit the diameter distribution of Benguet pines. Data used were taken from the continuous forest inventory plots established after logging in Northern Luzon and remeasured up to the 15th year. Chi-square test proved the soundness of fit.

Based on the Weibull parameter estimators, growth and yield models appropriate for *Pinus* stands in the country were developed.

Key words: Pine, Growth, Yield volume, Diameter grade

JAMES W. GOUDIE & JAMES A. MOORE

Growth and yield of *Leucaena* in the Philippines

Forest Ecology and Management, Philippines, 21(3 & 4), 285-298, 1987, English

Empirical yield tables are presented for *Leucaena leucocephala* plantations in the Philippines. Site index and height growth equations were developed as components of growth and yield. The relationship between volume and biomass per hectare and top height were quantified. The yield tables and site index equation can be applied in the Philippines and perhaps other geographic areas where *Leucaena* grows under similar edaphic and management conditions. The methodology described should be applicable to a variety of tree species grown in even-aged stands.

Key words: Fast-growing tree species, Plantation, Growth, Yield volume

AMNUAY CORVANICH

Thai domestic elephant

Forest Industry Organization, Thailand, 13, 1988, English

Thai domestic elephant is subjected to asiatic family, it is scientifically named *Elephas maximus*, found indigenously in India, Burma, Sri Lanka, Thailand, Malaysia, Indonesia, Laos, Kampuchea and Vietnam, etc. The creature was literated and becoming domestic animal since the famous stone inscription made during the reign of King Ramkhamhaeng the Great 700 years ago.

At present, there are very few people who can afford to raise elephant only to be used for ceremonial purposes because of its high feed consumption. The concept of rearing elephants for ceremonial purposes was changed when logging was introduced to Thailand a century ago.

Key words: Logging, Pre-yarding

AMNUAY CORVANICH

Thai elephant

Forest Industry Organization, Thailand, 24, 1976, English

Timber working by elephant in Thailand was recommended by the foreign firms taking up concessions in teak in Thailand's northern province a century ago. Employment of elephant in forest work was derived from nearby Burma and India whence certain evidence could be traced to the words of vocabulary and command in their native languages still in use nowadays by the people.

This booklet describes the brief story of Thai elephant, filiation of elephants, nature of elephant and so on.

Key words: Logging, Pre-yarding

KOICHI KAMO, BOPIT KIATVUTTINON, CHINGCHAI VIRIYABUNCHIA, PIN KUERKOOI.

Estimation of stem and stand volume of *Eucalyptus camaldulensis* Thai Journal of Forestry, Thailand, 9(2), 129-138, 1990, English

Stem volume table of *Eucalyptus camaldulensis* was constructed covering the main plantation areas of this species in Thailand. The data obtained were 458 sample trees coming from central, western, northern, and northeastern parts of Thailand. Multiplicative model was applied for to estimate the stem volume from the diameter at breast height (D) and height (H) of the tree. Application of one equation for all data showed some deviation in the bigger trees. Therefore, the data were separated into two parts according to the size of tree. The equation of each part was applied, by using these equation, the stem volume table of *E. camaldulensis* was constructed.

Key words: Stem volume, Breast height diameter, Tree height, Eucalypt, Plantation

4-3 Forest Management

JOSE G. SANVICTORES JR.

**Sustainable management of the Philippine dipterocarp forests:
the experience of the Aras-Asan Timber Co., Inc.
Philippine Lumberman, Philippines, 8-10, 1991, English**

ARTIMCO is a small forest-based company as compared to many other forest concessions in the country. It started logging in small community in Surigao del Sur, some 37 years ago.

Since the start of the operation of the forest concession in the early 50s, the company has been following the concept of sustained yield. In the early 60s, a five-year timber management plan, among the first from timber license agreement holders, was prepared and from that time on succeeding management plans were further prepared, for the sole purpose of managing and developing properly and protecting effectively its forest. The company is the first forest-based company in the industry to engage in the study of timber stand improvement (TSI) in 1959.

This publication presents information concerning the sustainable forest management adopted by ARTIMCO.

Key words: Dipterocarps, Sustainable management of forest, Forest management

DANILO C. CACANINDIN

**Tree volume, yield and economic rotation of kaatoan bangkal (*Anthocephalus chinensis* (Lam.) Rich ex Walph) plantations in Nasipit Lumber Company, Tungao, Butuan City. Part III. Economic rotation
Sylvatrop, Philippine Forest Research Journal, Philippines, 11(1 & 2), 35-42, 1986, English**

The economic rotations of kaatoan bangkal (*Anthocephalus chinensis* (Lam.) Rich ex Walph) for pulptimber and sawtimber plantations of the Nasipit Lumber Company plantations were determined by the Net Present Value approach at 18% rate interest. The economic rotations derived were 5 years for pulptimber, and 7 years for sawlogs in site indices 12 to 21. The effects of accessibility, site quality and rate of interest in economic rotation are discussed.

Key words: Cutting age, Rotation, Fast growing tree species

PETER BURGESS

**ITTO Pre-project report, natural forest management for sustainable
timber production, Volume III (Asia)
International Institute for Environment and Development, London,
U.K., 96, 1988, English**

In November 1987 the International Tropical Timber Organisation initiated a pre-project study designed to promote research and development with a view to improving forest management and wood utilization, encouraging the development of national policies aimed at sustainable utilization and conservation of tropical forests and their genetic resources, and maintaining the ecological balance in the regions concerned. The International Institute for Environment and Development was appointed the implementing agency for the pre-project study, which was to be confined to tropical moist forests.

This report combines the findings of the survey and of the seminar; details of the survey by countries and a record of the proceedings of the seminar are in appendices.

Key words: Forest management, Sustainable management of forest, Natural forest

TIMOTHY SYNNOTT

ITTO pre-project report, natural forest management for sustainable timber production, volume IV (South America and the Caribbean)
International Institute for Environment and Development, London, U.K., 1988, English

This report describes the present state of management of the tropical rainforests of the ITTO member countries in Central and South America and the Caribbean, namely Brazil, Bolivia, Ecuador, Honduras, Peru and Trinidad & Tobago.

The scope of the study is limited to professional forest management. It includes attempts to initiate or maintain longterm yields and repeated harvesting of timber from natural or semi-natural tropical moist forest (TMF) and seasonal tropical broad-leaved forests, and also includes silvicultural treatments, research, biological studies, inventories, and projects and plans which relate to these attempts.

Separate chapters are devoted to each member country. Each chapter is arranged in the following sections:

1. Introduction;
 2. Forest land and its control: areas, ownership, reservation;
 3. Forest law and policy: the main laws and their features;
 4. Forest management and silviculture: inventory, management plans, field practices;
 5. Research related to TMF management: research plots, sample plots, demonstrations, trials;
 6. Logging: concessions, licenses, methods, volumes, fees, species;
 7. Industries: numbers, types, import-export;
 8. Training: university, technical schools;
- Publications: relevant or consulted;
People met.

Key words: Natural forest, Silvicultural technique, Logging, Forest management

INTERNATIONAL INSTITUTE FOR ENVIRONMENT AND DEVELOPMENT

ITTO pre-project report, natural forest management for sustainable timber production, volume V (bibliography)
International Institute for Environment and Development, London, U.K., 1988, English

This publication is a bibliography for ITTO pre-project of natural forest management for sustainable production.

Key words: Natural forest, Sustainable management of forest

SIMON RIETBERGEN

ITTO pre-project report, natural forest management for sustainable timber production, volume II (Africa)
International Institute for Environment and Development, London, U.K., 1988, English

This document reports the findings of a three-month study tour of all six Africa International Tropical Timber Agreement (ITTA) signatory countries (Congo, Gabon, Cameroon, Côte d' Ivore, Ghana and Liberia) completed in July 1988. The tour was part of a pre-project study designed to develop terms of reference for natural tropical moist forest management projects commissioned by the International Tropical Timber Organization and carried out by the International Institute for Environment and Development.

This study concentrates on forest management for the production of industrial timber, which actually forms only a very limited part of produce and benefits provided by TMF in Africa.

Key words: Natural forest, Forest management, Sustainable management of forest

5. FOREST CONSERVATION

5-1 Watershed Management

CHARLES CASTRO

Upland conservation in Asia and the Pacific

**FAO Regional Office for Asia and the Pacific (RAPA), Thailand,
114, 1991, English**

This report consists of the papers discussed at the FAO/Finland Workshop on People's Participation in Upland Conservation, held in Bangkok, Thailand, 22-30 November 1988. These papers help to illustrate and clarify new perspectives on the roles of Government, Non-Governmental Organizations, International Agencies, etc., in Watershed management. The thoughts of well-known leaders like Mr. Dioscoro Umali, Mr. Sunderlal Bahuguna and Mr. Victor Ramos on people's power, and on the new roles of government, together with the documents presented by watershed management specialists and social scientists both underline the urgency of change and show how future programmes should be geared towards supporting upland people, rather than executing project on their behalf.

Key words: Forest land conservation, Watershed management

S. R. BACONGIS & C.S. RONDILLA

**Infiltration studies on giant-ipil-ipil (*Leucaena leucocephala*)
plantation sites at the Buhisan watershed**

**Sylvatrop, Philippine Forest Research Journal, Philippines, 4(1), 23-29,
1979, English**

Relative rates of water entry into the soil were studied under two Giant Ipil-ipil plantation sites at the Buhisan Watershed, Cebu City.

The areas studied were a) Giant Ipil-ipil plantation without interplanted agricultural crops and, b) Giant Ipil-ipil plantation interplanted with agricultural crops such as, Gabi (*Colocasia esculenta*), squash, tomato, and other vegetables. About 29 mm of rainfall had fallen during the week before the conduct of the study. Infiltration was measured in terms of depth and volume of water using a double-ring infiltrometer.

Results showed significant differences in infiltration rates between the two areas at 5% level. The mean infiltration rate for the plantation without interplanting of agricultural crops was 4.25 liters/min and 1.98 liter/min with interplanting. Cumulative infiltration with respect to time followed a linear pattern for both sites.

Key words: Forest floor, Intercropping, Infiltration capacity, Soil texture

V.P. VERACION & A.C.B. LOPES

**Rainfall interception in a thinned benguet pine (*Pinus kesiya*)
forest stand**

**Sylvatrop, Philippine Forest Research Journal, Philippines, 1(2), 128-134,
1976, English**

Rainfall interception is significant in watershed management because it represents a loss of rainfall to the soil. The study was undertaken to determine interception losses (water losses) and net rainfall (through fall and stemflow) under different thinning intensities.

The pine forest stand was thinned about 1 yr. before the measuring instruments were installed. Total rainfall was measured by 2 standard raingauges installed in the open within the vicinity of the study area. net rainfall was determined from the measurement of throughfall and stemflow. Throughfall was measured in each plot with the use of 3 improvised throughfall gauges (each 10.3 x 40.5 cm). The gauges were set at random within the plot. They were randomly moved to new locations after every measurement, which was done after every rainy day. stemflow was measured in each plot using 3 improvised stemflow gauges. Only 3 trees (biggest, medium-sized, and smallest) in each plot were instrumented.

Heavily thinned plots produced significantly higher net rainfall (throughfall and stemflow) than either

moderately thinned, lightly thinned or control plots. Control plots produced the highest water loss value followed by moderately and lightly thinned plots. Heavily thinned plots accounted for the lowest water loss value. From the results, it appears advisable to conduct either moderate or light thinning on 30-yr-old stands.

Key words: Watershed management, Forest hydrology, Rainfall interception

PRADERMCHAI SANGKUWONG, SOMYOS RUNGROJWANICH et al.

Interception losses by bamboos

Research Paper, Watershed Management Division, Royal Forest Department, Thailand, 22, 1985, English

The study on rainfall interception loss by the bamboos of age 3 years was carried out at the Mae Klong Watershed Research Station, Karnchanaburi Province. The total of 5 clumps of the bamboo stands were selected as the samples for this study. The data were collected for 101 storms for estimating of interception losses, stemflow and throughfall.

The study was carried out on 2 species they were *Gigantochloa migrociliata* and *Dendrocalamus membranaceus*, and the result indicated that interception losses (I) were 69.77% and 75.75%, throughfall (Tb) were 24.10% and 23.46%, stemflow (St) were 6.13% and 0.79% respectively. The result showed that both species of bamboos were not suitable in planting for water conservation as interception were high. On soil conservation basis, bamboo can protect soil at some degree and the study on this case should be carried out in the future.

Key words: Bamboo, Forest hydrology, Stemflow, Throughfall, Rainfall interception

FAO REGIONAL OFFICE FOR ASIA AND PACIFIC (RAPA)

Land use, watershed, and planning in the Asia-Pacific Region

RAPA Report: 1986/3, Bangkok, Thailand, 230, 1986, English

The seminar-workshop on Watershed, Land-use, and Planning was held in Queensland, Australia, May 1985, by FAO Regional Office for Asia and Pacific.

This publication is the proceedings of the seminar-workshop.

Key words: Land-use, Watershed, Watershed management, Forest management

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT

The Philippines recommends for watershed management, PCARRD

Technical Bulletin Series No. 72

Philippine Council for Agriculture, Forestry and Natural Resources

Research and Development (PCARRD), Philippines, 88, 1991, English

The uplands comprise about 18 million hectares of the Philippines' total land area (30 million hectares). In these areas are located watersheds of various sizes which play vital role in the agricultural, industrial, and ecological programs and thrusts of the government.

Watershed management refers to the application of business methods and technical principles on the handling of all renewable resources of a water shed. Basically, watershed management aims at developing and maintaining the multiple uses of the watershed, while conserving it as a balanced ecosystem. Such uses include irrigation, hydroelectric power generation, grazing, fishing, timber harvesting, agroforestry or upland farming.

The various watershed protection, rehabilitation and utilization practices in the Philippines were developed through the years through repeated trials and experimentation. Some are of indigenous origin while others were adapted from other countries.

This publication presents the latest information and technologies on watershed management in the Philippines.

Key words: Watershed, Watershed management, Multiple purpose forestry, Ecosystem

HONORATO G. PALIS

Canopy hydrology of a mahogany (*Swietenia macrophylla* King) plantation

Sylvatrop, The Technical Journal for Philippine Ecosystems and

Natural Resources, DENR, Philippines, 1(1), 1-7, 1991, English

The accounting of water via precipitation, stemflow and throughfall pathways in a mahogany (*Swietenia macrophylla* King) plantation was studied over an 11-month period in the slopes of Mt. Makiling Forest, Los Banos, Laguna.

Eighty percent and 3% of the total open precipitations comprised throughfall and stemflow, respectively, and the rest (17%) was lost either by interception of the plant parts or evaporation.

Strong positive linear relationships were observed between rainfall and throughfall and stemflow with relatively high R^2 values of 0.98 and 0.70, respectively.

Key words: Forest hydrology, Mahogany, Stemflow, Through fall, Precipitation

PRADERMCHAI SANGCOOWONG, SAMARN ROUYSUNGNERN

Sediment yields and surface runoff from sample plots on various types of land use at Mae Klong Watershed Research Station Karachanaburi Province, Thailand

Watershed Management Div. Royal Forest Department, MAC, Thailand, No. 4, 14, 1985, English

The study on sediment yield and surface runoff derived from selected sample plots having different vegetations which were:

1. Dry Dipterocarp Forest,
2. Bamboo forest,
3. *Dipterocarpus alatus* in conjunction with corn, and
4. *Dipterocarpus alatus* in conjunction with rice.

The different sediment yield and surface runoff from the sample plots may be influenced by 1) the height, crown form, and ability to intercept of vegetations, 2) soil disturbance, 3) spacing and root area of plants, 4) forest fires, and 5) human beings and animals.

Key words: Dipterocarps, Surface runoff, Sediment yield, Rainfall interception

PONGSAK WITTAWATCHUTIKUL, G.S. HENDERSON, SAMARN RUAYSUNGNERN

Bed load transport at Huay Ma Feung Rayong Province, Thailand Watershed Management Div. Royal Forest Department, MAC, Thailand, No. 34, 14, 1984, English

A new road to the top of Yaida Mountain resulted in increasing of bed load transport in the channels in Huay Ma Feung watershed. The relationships between bed load transport and discharge was found, by comparison of bed load sediment in the weir pond to the discharge recorded, significant. The movement of bed load sediment started once the discharge exceeded 0.0083 cubic meters/second. In estimation of bed load transport during the recession period, the following equation was suggested:

$$Y = 128.3265 \times -1.0631$$

where, Y = rate of bed load transport (cu.m/day), and x = discharge (cms).

Key words: Sediment yield, Rate of discharge

WARIN JERASUKTAWEEKUL, SUPOJ CHAREONSUK, SAMARN ROUYSUNGNERN

A preliminary study on throughfall, stemflow and interception of *Eucalyptus camaldulensis*

Watershed Management Div. Royal Forest Department, MAC, Thailand, 18, 1983, English

A study on throughfall, stemflow and interception of *Eucalyptus camaldulensis* was initiated in 1982-1983 in a 3 year old forest plantation at the Nan Watershed Research Station, Nan Province. Ten trees were randomly selected as the samples and total rainfall, throughfall, stemflow and interception were measured for 44 rainfall events.

The study indicated that interception, throughfall and stemflow of *Eucalyptus camaldulensis* were 4.82%, 91.82% and 3.36% of total rainfall respectively.

From the result of the study, it can be concluded that *Eucalyptus camaldulensis* is suitable for reforestation to protect soil and water losses.

Key words: Throughfall, Stemflow, Eucalypt, Plantation

WEERA PUTJAROON, SAMARN ROUYSUNGNERN

Sediment yields and surface runoff from sample plots in farming areas after using various types of soil conservation measures at Sakonakorn Province, Thailand

Watershed Management Div. Royal Forest Department, MAC, Thailand, 18, 1983, English

The study on soil and water losses in agricultural areas as effected by the application of various conservation practices was carried out at the Maung District, Sakonakorn Province. Twelve soil erosion plots of size 2x10 meters were established to study the effects of 4 methods of conservation practices on soil and water losses. Those plots were divided into 3 groups, and each group of 4 plots were put on three different slopes of 0-5, 5-10, and 10-15%. Within 4 plots of each group, 4 methods of conservation practices, namely: contour farming, bedding, contour furrowing and contour ridging were used as the treatments. Every plot was planted with *Andropogon nardus* Linn.

Key words: Sediment yield, Surface runoff, Soil type, Erosion

PRADERMCHAI SANGCOOWONG, SAMARN ROUYSUNGNERN

Sediment yield and surface runoff from 6 types of agro-forestry systems at Mae Klong Watershed Research Station Karnchanaburi Province, Thailand

Watershed Management Div. Royal Forest Department, MAC, Thailand, No. 8, 14, 1985, English

The study on sediment and surface runoff losses from selected sample plots of 6 agro-forestry systems which were:

1. *Azadirachta indica* in conjunction with cotton-plant,
2. *Parkia javanica* in conjunction with corn,
3. *Eucalyptus camaldulensis* in conjunction with cotton-plant,
4. *Eucalyptus camaldulensis* in conjunction with corn,
5. *Leucaena leucocephala* in conjunction with corn and millet,

and

6. *Parkia javanica* in conjunction with rice and cotton-plant, at Mae Klong Watershed Research Station, Karnchanaburi province.

Key words: Sediment yield, Surface runoff, Agro-forestry

WEERA PUTJAROON, SAMARN ROUYSUNGNERN

Sediment yields and surface runoff from dry evergreen forest, bare land and mixed deciduous forest at Sakonakorn Province, Thailand

Watershed Management Div. Royal Forest Department, MAC, Thailand, 13, 1986, English

The study on the sediment yields and surface runoff from the Dry Evergreen Forest, Dry Dipterocarp Forest and bare land was conducted at Sakonakorn Province during July-September 1985 employing 2m x 10m - sediment plots. It was determined that the sediment yields from the Dry Evergreen Forest, Dry Dipterocarp Forest, and bare land were 32.88, 95.65 and 247.56 kilograms/rai, and the surface runoff from the three areas were 73.92, 219.49, and 450.47 cubic meters/rai respectively.

Key words: Sediment yield, Surface runoff, Evergreen forest, Barren, Deciduous tree

WARIN JIRASUKFAVEEKUL, PONGSAK WITHAWATCHUTHIKUL & SUPHOT CHAROENSUK

Rainfall interception in mixed deciduous and dry Dipterocarp forest at Nan Watershed Research Station Nan Province, Thailand

Watershed Management Div. Royal Forest Department, MAC, Thailand, 23, 1986, English

The study on rainfall interception of Mixed Deciduous and Dry Dipterocarp Forests at Nan Watershed Research Station was conducted from June to October 1983. General characteristic of the trees growing on the study area was scrubby caused by infertile soil and low amount of annual rainfall. The results of the study indicated that the interception of the scrubby trees in the Mixed Deciduous Forest type was about 12.72% while the interception estimated from the Dry Dipterocarp Forest was about 3.75% of the total rainfall through the study period.

Key words: Rainfall interception, Deciduous tree, Dipterocarps

H.M. SCHIECHTL

FAO watershed management field manual, vegetative and soil treatment measures

FAO, Rome, Italy, 59, 1985, English

The purpose of this paper is to provide practical guidance for vegetative measures for slope stabilization. This may be particularly useful in environments with a wide choice of readily available vegetative material. Measures include revegetation of slope by living material, slope stabilization measures using living material, slope stabilization by the combined use of dead and living materials, and biotechnical drainage systems.

Key words: Watershed management, Hillside work, Soil conservation

SAMAKKEE BOONYAWAT

Watershed class prediction equations for three main rock type watershed in humid tropical, Thailand

Thai Journal of Forestry, Thailand, 6(2), 109-133, 1987, English

An analysis of the different equations tested for a watershed class prediction in Thailand showed that the equation using logarithmic transformation at the right side of the equation was the most appropriate form. Therefore, this form of the equation was used to develop the equations to predict watershed classes for the three rock type watershed.

Watershed class prediction equations for all rock types taken together and each rock type considered individually, namely: granite, sandstone and limestone were developed from 300 randomly selected grids of each rock type of northern Thailand.

Key words: Watershed, Flow rate, Forest hydrology

P.J. O'SHAUGHNESSY, R.J. MORAN, D.W. FLINN

The effects of strip thinning *Eucalyptus regnans* on water yield

Forest commission, Victoria, Australia, 78, 1981, English

This report describes in detail the establishment of a co-operative study between the Forest Commission Victoria (FCV) and the Melbourne and Metropolitan Board of Works (MMBW) being undertaken near Narbethong in Central Victoria to determine the initial and long-term effects on wood and water yields of thinning *Eucalyptus regnans* regrowth. The study represents an important extension of an existing investigation by the MMBW into the relationship between the density of *E. regnans* regrowth and water yield. Analyses of pretreatment stream flow data from several small catchments in the nearby North Maroondah Experimental Area have indicated the potential for increasing water yield by reducing stand density, and some of these catchments have recently been subjected to various thinning treatments. The present study aims to obtain data on the magnitude and duration of water yield responses following the progressive thinning of a relatively large catchment under operational conditions.

Key words: Thinning, Catchment, Water balance, Eucalypt

WICHA NIYOM

Determination of direct runoff from rainstorm on natural hill-evergreen forest in northern Thailand

Thai Journal of Forestry, Thailand, 8(3), 237-248, 1989, English

Stepwise regression analysis was applied to develop selected hydrologic prediction equations of 175 observation from small watershed at Kog-Ma Watershed, Doi Pui, Chiangmai, northern Thailand from 1966 to

1985.

Total flow (QT) and direct flow (QR) were directly correlated with baseflow (QB) as well as rainfall amount (EP). Peak of direct flow (HP) was also directly correlated with rainfall amount (EP) but inversely correlated with rainfall duration (ED). Time to peak (TP) was directly correlated with rainfall duration and 9-hour cumulative antecedent rainfall intensity (CA19) but inversely correlated with rainfall amount. Recession time (TR) was directly correlated with amount of rainfall (EP) and baseflow (QB) but was inversely correlated with 6-hr cumulative rainfall intensity. Lagtime (TL) was inversely correlated with maximum rainfall intensity (Elmax) and amount of rainfall and directly correlated with rainfall duration.

Key words: Water balance, Watershed, Flow rate, Forest hydrology

NIPON TANGTHAM

The hydrological role of Khao Yai National Park

Thai Journal of Forestry, Thailand, 9(3), 172-195, 1990, English

The hydrological role of Khao Yai National Park as a function of watershed ecosystems was investigated using historical data of runoff and sediment discharges recorded during 1964-1986 by the Royal Irrigation Department, National Energy Authority and Electricity Generating Authority of Thailand. The specific yield, seasonal distribution, water budget, flow timing (flow dates and flow intervals) including sediment yield and some physical water qualities contributed from eight catchments having their headwater source in Khao Yai National Park were analyzed. Probable impacts of deforestation in those watersheds on flow magnitude, erosion and sedimentation were also attempted to determine.

Key words: Watershed, Flow rate, Run-off of soil, Erosion

NIWAT RUANGPANIT, ANUNTASAK SONGPRAI

Impact of land use on water quality at Doi Pui and Tung Jaw

Chiangmai

Thai Journal of Forestry, Faculty of Forestry, Kasetsart University,

Thailand, 6, 1981, English

The impact of various land use types on water quality at Kog Ma and Tung Jaw watershed in Chiangmai has been investigated. The changing of land use from the natural forest to agriculture and for human settlement on highland areas can affect the water quality especially the colour and turbidity of stream water. It was found that the average values of stream water quality from the hill evergreen forest, reforestation, agriculture and human settlement sites were as follows: temperature 19.8, 20.1, 20.0 and 20.3°C; pH 6.38, 6.84, 6.87 and 6.80; turbidity 1.2, 3.2, 425.1 and 75.0 J.T.U.; colour 15, 16, 1,385 and 287 units; electrical conductivity 21, 51, 39 and 60 micro-mhos/cm; and hardness 5, 13, 12, and 16 ppm CaCO₃; respectively. Although the water quality in each of investigation tributaries is still within the acceptable range of water quality criteria for public water supply and usages but without any preventive measures and/or good management practices the stream water quality might be seriously in the future.

Key words: Watershed, Turbidity, Land-use

5-2 Soil Conservation

SANTIAGO R. BACONGUIS & ANTONIO M. DAÑO

**Some geomorphological characteristics and infiltration capacities
of the different land-uses at the Buhisan Watershed**

Sylvatrop, Philippine Forest Research Journal, Philippines, 9(1 & 2),

65-88, 1984, English

This study looked into geomorphological characteristics (average elevation, local relief, mean slope, watershed shape factor, stream order, frequency and bifurcation ratio, drainage density, longitudinal profile and main stream concavity) and infiltration capacities at the Buhisan watershed in Cebu.

The highest infiltration capacity was found in a 12-year-old Yemane (*Gmelina arborea* Roxb.) plantation (315.11 mm/min) while the lowest infiltration capacity was observed in a heavily-grazed grassland

(2.20 mm/min.).

Key words: Infiltration capacity, Watershed, Plantation, Soil texture, Physical characteristic

MARIO A. EUSEBIO, NGUYEN HOANG HOANH & ELVERO EUSEBIO
Soil conservation in the Philippines: The case of Passi, Iloilo
Canopy International, Ecosystems Research and Development Bureau, DENR,
Philippines, 15(6), 2-5, 1989, English

Based on estimates, 58 percent of the total land area is susceptible to erosion. The control measures for soil loss so far applied include appropriate farming system in highly erodible or susceptible soils; biomass buildup and soil improvement to sustain their fertility in potentially-productive areas; and re-afforestation in eroded areas. Various government agencies are mandated to undertake soil conservation/soil erosion control. Pilot projects, therefore, have been established to demonstrate appropriate soil conservation technologies in various sites nationwide.

This report is a case study of the research and development areas related to soil conservation.

The combination of farming practices, e.g., furrow contour farming, hedgecrows, etc., with appropriate farming systems in agroforestry schemes could help check soil erosion and improve the productivity of the land. The condition of the planting sites; the available manpower in individual farms; and the supply and demand of the farm products are some of the factors that should be considered with regard to the size of the area to be developed; the kind of crops that should be involved; and the schedule of farm activities. Gradual conversion of the sloping areas to productive agro-forestry farms and planting of short-term crops in gentle slopes or in flat areas are also recommended. With these strategies, the reduction of soil loss and attainment of a sustainable yield could be realized.

Key words: Hillside erosion control, Erosion, Agro-forestry, Run-off of soil

LEVI V. FLORIDO & SEVERO R. SAPLACO
Surface runoff and sediment yield in a thinned natural benguet
pine (*Pinus kesiya* Royle ex Gordon) stand
Sylvatrop, Philippine Forest Research Journal, Philippines, 6(2), 55-60,
1981, English

Surface runoff and sediment yield did not significantly vary among the various thinning intensities, namely: control, light thinning, moderate thinning, and heavy thinning. During the months with less rainfall, the control plots gave the lowest surface runoff (6.8 mm). With a continuous and prolonged rainfall, surface runoff in the moderately-thinned plots was higher (33.7 mm) than in the other experimental plots. The moderately-thinned plots gave the highest sediment yield (72.51 mm) due to the high surface runoff.

Key words: Sediment yield, Surface runoff, Thinning, Erosion, Forest floor

LEVI V. FLORIDO
Check dams for the control of gully erosion in the pine forest watershed
Sylvatrop, Philippine Forest Research Journal, Philippines, 10(1), 9-16,
1985, English

Rock, log, brush and hogwire check dams can control gully formation in the pine forest watersheds. These structures can stabilize the 2.5 m wide gullies within 5 years. The rock check dams last longer than the other structures.

Comparative cost of construction for a 5 series check dam (based on 1975 prices and labor cost) are as follows: hogwire check dam ₱712.00; rock check dam, ₱700.00; brush check dam, ₱390.00; log check dam, ₱436.00; and average cost of a combination of any of the structures is estimated at ₱446.00.

Key words: Erosion, Stream work, Watershed management, Gully

EGIDIO F. COSTALES JR & ADELAIDA B. COSTALES
Effects of plant combinations on the protection/stabilization of
mined waste areas
Sylvatrop, Philippine Forest Research Journal, Philippines, 10(3), 187-202,
1985, English

Stabilization plantings on mined waste areas were studied using combinations of trees (*Pinus kesiya* Royle ex Gordon, *Alnus maritima*, and *Psidium guajava* (Linn.); shrubs (*Tithonia diversifolia* Gray and *Datura metal* Linn.); grasses (*Pennisetum clandestinum*) Hoch ex. *Thysanolaena maxima* Kuntze, and *Paspalum longifolium* Roxb.); and vines (*Centrosema pubescens* Benth., *Secchium edule* P. Browne, *Passiflora grandilla* Linn. and *Fragaria* sp.). Five years after planting, *Alnus maritima* Nutt., and *Pinus kesiya* Royle ex Gordon and *Secchium edule* P. Browne combination produced the lowest mean annual soil loss (6.11 tons/ha). However, the amount was not significantly different from the other plant combinations. The untreated or control plots exhibited the highest mean annual soil loss (54.46 tons/ha) due to the absence of vegetative cover.

The cheapest and comparatively most effective plant combination was *Alnus maritima* Nutt., *Pinus kesiya* Royle ex Gordon, *Centrosema pubescens* Benth., *Secchium edule* P. Browne, *Passiflora grandilla* Linn. and *Fragaria* sp. Using this combination, there was an expenditure of P21,678.03 to revegetate a one hectare mine waste area.

Key words: Erosion, Infertile forest land, Degraded land, Planting, Hillside erosion control

EGIDIO F. COSTALES JR & ADELAIDA B. COSTALES

Determination and evaluation of some emergency measures for the quick rehabilitation of newly burned watershed areas in the pine forest
Sylvatrop, Philippine Forest Research Journal, Philippines, 9(1 & 2), 33-53, 1984, English

This investigation focuses on the evaluation of selected biological measures in reducing soil erosion namely: broadcast sowing of annual and perennial grasses, broadcast sowing plus fertilizer application, contour planting with tiger grass and contour trenching including planting of slow growing and creeping vegetation. Three years after the treatment application, surface runoff and sediment yield were significantly higher in the control plots than in the treated plots.

Due to the comparable vegetative cover, surface runoff and erosion yield did not vary significantly among the treated plots. The cheapest treatment to revegetate/rehabilitate newly burned pine watershed was contour planting with tiger grass.

Key words: Pine, Erosion, Hillside erosion control, Vegetation, Surface runoff

SANTIAGO R. BACONGUIS

Evaluation of *Leucaena leucocephala* de Wit, *Tectona grandis* Linn., *Pterocarpus indicus* Wild. and *Eucalyptus deglupta* Blume for streambank stabilization in the Agusan River Basin
Sylvatrop, The Technical Journal for Philippine Ecosystems and Natural Resources, DENR, Philippines, 1(1), 79-101, 1991, English

Leucaena leucocephala de Wit. (Ipil-ipil), *Tectona grandis* Linn. (Teak), *Pterocarpus indicus* Wild. (Narra) and *Eucalyptus deglupta* Blume (Bagras) were evaluated as to their adaptability and erosion control potential in the streambanks of Agusan river basin. Plant survival 30 months after planting were 98.5%, 97.6%, 89.3% and 78.6% for *T. grandis*, *L. leucocephala*, *P. indicus*, respectively. Soil erosion rate under the different plant species were 46.0, 49.0, 203.0 and 208.0 m³/ha/yr for *T. grandis*, *L. leucocephala*, *E. deglupta* and *P. indicus*, respectively. The soil erosion rate for the control treatment is 271.0 m³/ha/yr. The lower erosion rate in plots covered by *T. grandis* and *L. leucocephala* was attributable to the species' more developed canopy, thus providing more ground cover than the other two species in protecting the soil from the erosive impact of raindrops.

Key words: Erosion, Runoff of soil, Bank protection, Hillside erosion control

CHALATORN SRITULANON, SAMARN ROUYSUNGNIERN, MONTRI POOTAWONG

Soil erodibility and water holding capacity of dry-mixed Deciduous forest and shifting cultivation at Lam Ta Kong Watershed Research Station Nakoratchasima Province, Thailand
Watershed Management Div. Royal Forest Department, MAC, Thailand, 19, 1985, English

The study on erodibility and water holding capacity of soils in Dry-Mixed Deciduous Forest and shifting cultivation area was conducted at Lam Ta Kong Watershed Research Station, Pakehong district,

Nakornratchasima province. The results of the study indicated that the Dry-Mixed Deciduous Forest soil was nonerosive while the soil sampled from the shifting cultivation area was erosive. And the water holding capacity of sample soil from Dry-Mixed Deciduous Forest was more efficient than the soil sampled from the shifting cultivation land.

Key words: Deciduous tree, Shifting cultivation, Erosion, Soil conservation

JAPAN INTERNATIONAL COOPERATION AGENCY

Erosion control in mountainous areas

**Japan International Cooperation Agency, Japan, FDD, JR 81-19,
149, 1981, English**

This Manual on Erosion Control in Mountainous Areas has been compiled by JICA project "Afforestation in the Pantabangan Area" in the Republic of the Philippines as teaching material for the training activities of the project.

The manual consists of five chapters, (1) erosions in mountainous areas, (2) forest function on disaster prevention, (3) designing and construction of hillside work, (4) torrent work and (5) landslide prevention.

Key words: Hillside work, Stream work, Land slide

RP-JAPAN FORESTRY DEVELOPMENT PROJECT-WATERSHED MANAGEMENT

Manual for erosion control works

**RP-Japan Forestry Development Project-Watershed Management,
Philippines, 67, 1988, English**

This manual is an outcome of the ten years efforts of erosion control for watershed management of the project area and the training of erosion control at RP-Japan Training Center for Forest Conservation.

This manual includes subject matter on low-cost and indigenous material introduced erosion control works, mainly simple theory and its application to hillside works and torrent works.

Key words: Erosion, Hillside work, Torrent work

RP-JAPAN FORESTRY DEVELOPMENT PROJECT-WATERSHED MANAGEMENT

Handbook for erosion control works

**RP-Japan Forestry Development Project-Watershed Management,
Philippines, 15, English**

This handbook includes hillside works and stream works. Hillside works are site preparation, grading and terracing works, wattling, cogon mat covering, retaining work and water channel work. Stream works are checkdam and revetment measure.

Key words: Hillside work, Stream work, Erosion, Dam

SANTIAGO R. BACONGUIS, ANTONIO M. DAÑO, AND TERESITA P. DUMLAO

Surface runoff and soil loss under a secondary dipterocarp forest

watershed in Norzagary, Bulacan, Philippines

The Philippine Lumberman, 25-32, 1987, English

The quantity of runoff and sediment yield under a secondary dipterocarp forest watershed for a period of eight years (1975-1982) from various storm sizes was analyzed. The surface runoff per storm range from 6.006 to 180.523 m³/ha. About 86 per cent of the variation in surface runoff was due to the combined effects of rainfall amount, rainfall intensity and soil moisture deficiency. Rainfall amount was found to be the most important factor in the variation of surface runoff. For sediment production, surface runoff, rainfall amount, rainfall duration and soil moisture deficiency accounted for 91 per cent of the variation.

The average annual soil loss from the watershed is 6.62 tons/ha/year.

Key words: Watershed, Surface runoff, Run-off of soil, Soil conservation

6. FOREST PRODUCTS

6-1 Timber

P. SONO

Merchantable timbers of Thailand

Forest Products Research Div., RFD, Thailand, 144, 1974, English

This paper is prepared primarily to fulfil the requirement of the 1st Asean Technical Meeting on Forestry held on July, 1974 at Kuala Lumpur, Peninsular Malaysia.

All interested timber-producing tree species are listed together with density (specific gravity), local names, colour and sources.

In Appendix I, notes on the species or species groups are made to clarify the present situation of the timber, giving the reasons why the species is so named, or so grouped and other information concerned.

In Appendix II, all available data for various properties of the species are presented.

In Appendix III, the classification of the timbers for end-uses is tried to be made and presented. This classification is done on the bases of experience and judgement from the available technical data.

Key words: Commercial tree species, Tree species, Physical quality of wood

PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH

The Philippines recommends for dipterocarps 1977 I. Lumber

**Philippine Council for Agriculture and Resources Research (PCARRD),
Philippines, 125, 1977, English**

In the Philippines, the dipterocarps or the species belonging to the lauan family (*Dipterocarpaceae*) presently comprise 6 genera and 50 species which are usually large trees with tall cylindrical stems and strong buttresses. They produce the largest trees in the forest and supply the greatest volume of logs and lumber for local consumption and for export.

The Dipterocarpaceae family is the source of the wood commercially and more popularly known in the foreign market as "Philippine mahogany". The Philippine mahogany group is composed of seven closely-related species belonging to *Shorea* and *Parashorea* and are marketed locally as white lauan and red lauan. In the modern home, Philippine mahogany has gained popularity for paneling, moulding, siding, door and shelving.

This publication provides the expertise of the country to develop the utilization of dipterocarp species for lumber which includes among others the world famous "Philippine Mahogany" group. The information contained herein were extracted mostly from research conducted locally. For this reason, this series is envisioned to cater to the wood-based industries and the consuming public in a language easily understood.

Key words: Dipterocarps, Commercial tree species, Industry of forest products

**PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES
RESEARCH AND DEVELOPMENT**

**State of the art and abstract bibliography, utilization of lesser-used
timber species in the Philippines, Forestry research series No. 5**

**Philippine Council for Agriculture, Forestry and Natural Resources
Research and Development (PCARRD), Philippines, 134, 1987, English**

This publication is the fourth of the State of the Art series for forestry research. Generally, Philippine timber species are classified as either commercial or non-commercial species. The commercial timber species are those which are well known locally and abroad and are industrially utilized in large quantities. The noncommercial species are those not traditionally used or not exploited in commercial quantities. Other terms or epithets used to denote these noncommercial species are: miscellaneous species, weed species, secondary species, lesser-used species (LUS) and lesser-known species (LKS). To date, there is no specific demarcation line between commercial species and LUS. Lesser-used or lesser-known timber species are arbitrarily defined as timber species with annual production below 1000 cu meters, but identified as having potential use in the form of sawnwood, veneer and plywood.

The information contained in this publication were gathered from completed researches by the Forest Products Research and Development Institute (FPRDI), College of Forestry, University of the Philippines at Los Baños and the private sector within the twenty year period, from 1961 to 1981. Specifically, the progress of research works exploring the potentials and utility of various lesser-used timber species in the Philippines were reviewed. Research situation for the industry, what has been done and what remain as gaps needing further investigation was also reviewed.

Key words: Lesser-used species, Lesser-known species

PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH AND DEVELOPMENT

State of the art: wood furniture industry of the Philippines

Philippine Council for Agriculture and Resources Research and Development (PCARRD), Philippines, 59, 1983, English

This publication is expected to cater to policy makers, planners, research administrators, researchers as well as the cottage and private wood furniture industries. The information and data included in this publication were gathered from completed researches by government agencies concerned including those by the private sector within the period 1955 to 1980. Specifically, the national status of the wood furniture industry was reviewed covering both its profile and its current problems. The research situation for the industry was also reviewed focussing on what has been done and what still remain as gaps needing further research.

Key words: Wood work, Wooden ware, Industry of forest products

F.O. TESORO & J.U. ADAY

Properties and uses of some Philippine woods

FPRDI, Department of Science and Technology and Philippine Wood Product Association, Philippines, 34, 1990, English

The expansion of the raw material base has been a continuing thrust of the Forest Products Research and Development Institute. Through research important information on the basic and working properties of 82 commercial and potentially commercial species and 116 commercially less acceptable species are now available and are compiled in this manual. The current application and the potential uses of the species based on the recommendations of FPRDI wood research specialists/technologists as well as those of the UN-FAO "Guidelines for the Improved Utilization and Marketing of Tropical Wood Species" have been included to serve as a guide in the increased utilization of non-traditional species. Hopefully, the wider array of alternative raw materials for specific uses will lessen the indiscriminate utilization of premium species and help in the preservation of these species in our forests.

Key words: Wood physics, Wood quality, Tree species

J.A. MENIADO, F.N. TAMOLANG, F.R. LOPEZ et al.

Wood identification handbook Volume I

Government Printing Office, Philippines, 370, 1975, English

Volume I of this "Wood Identification Handbook" which covers 201 species, including two forms of *Pterocarpus indicus* Willd. and one variety of *Albizia leonensis* (Blanco) F. Vill., fulfills the needs of the wood-users, wood industrialists and students in identifying wood species. It presents only the gross or macroscopic identification of Philippine woods and of a few exotic timbers well-adapted to Philippine soil and climatic conditions. These gross characteristics visible to the naked eye or seen with the handlens or detected by other means are emphasized, as such identification can be made without extensive training.

As the gross characteristics of the woods, this book provides distinct features (sapwood, heartwood, texture, growth rings, pores, parenchyma and rays), similar woods, differentiation, uses etc.

Key words: Wood quality, Heart-wood, Sap-wood, Texture, Wood physics

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT

The Philippines recommends for fuelwood and charcoal utilization, PCARRD Technical Bulletin Series No. 56

**Philippine Council for Agriculture, Forestry and Natural Resources
Research and Development (PCARRD), Philippines, 95, 1985, English**

Wood's thermal qualities for fuel can be upgraded by such methods as drying, densifying into briquettes or pelleted (as in the case of sawdust) or converting into charcoal and liquid fuels such as methanol and ethanol. Wood can also be converted into gaseous fuel that can be conveyed through pipelines.

Charcoal burns better than wood and provides heat energy equivalent to 7.1 Kcal/g. This is twice as much heat as that generated by the same weight of wood.

To promote the efficient use of wood and agroforestry wastes as energy sources, PCARRD prepared this publication in cooperation with major government agencies involved in fuelwood and charcoal research. This publication includes charcoaling methods, fuelwood and charcoal utilization, etc.

Key words: Fuelwood, Charcoal, Sawdust, Fuelwood tree species

**PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH
The Philippines recommends for dipterocarps 1979 II. Veneer and
plywood
Philippine Council for Agriculture and Resources Research (PCARRD),
Philippines, 80, 1979, English**

This is the second volume of the Philippine Recommends for Dipterocarps. It concentrates on veneer and plywood. While the recommendations are based on research findings and experience of the industry in the Philippines, some of them may be based on information more relevant to foreign experience.

In this book, the manufacturing process of veneer and plywood is mentioned in detail and many recommendations based research findings and experience are given technically to enhance productivity quantitatively and qualitatively. Grading of log and plywood is also mentioned.

Key words: Plywood, Veneer, Industry of forest products

PCARRD

**The Philippines Recommends for Coconut Timber Utilization
Philippine Council for Agriculture Resources Research and
Development (PCARRD), Philippines, No.60, 93, 1985, English**

To make full use of coconut timber, the Philippine Coconut Authority (PCA), in cooperation with the Food and Agriculture Organization and the United Nations Development Program's (FAO/UNDP) Coconut Research and Development Institute (FPRDI) investigated the physical and mechanical properties, primary and secondary processing of coconut wood. Findings indicate that the coconut trunk offers a host of potential economic uses: as poles and building construction materials, parquet flooring, panelling, ceiling, roof shingles, and partitions; and an important material for the manufacture of furniture and novelty products.

The contents are as follows. Basic Properties of Coconut Wood, Harvesting and Logging of Coconut Trunk, Sawing, Drying, Secondary Processing, Important Agents of Biodeterioration, Preservation, Uses of Coconut Timber, Economics and Marketing, and Cost Study in the Finishing of Coconut Lumber.

Key words: Physical quality of wood, Wood utilization, Sawn timber, Harvesting

**SUREE BHUMBHAMON, VIKHUN ANAPANURAKSA
Forest research bulletin, Variation in basic density of 15 years old
Pinus merkusii
Faculty of Forestry, Kasetsart University, Thailand, 39, 1981,
English**

The present investigation was aimed to find out the variation in wood basic density *Pinus merkusii* at the end of the rotation. Based on the selected seed source in Thailand, ten random trees were studied. Wood basic density decrease from bottom toward tree tops. If compass direction was taken into account, more wood basic density was found in the south side than on the other sides. But the increasing basic density was observed from the pith outward in all height levels.

Key words: Wood physics, Pine

KRIT SAMAPODDHI, SUTHI HARNSONGKRAM
Grouping of Thai hardwoods
Royal Forest Department, Thailand, 16, 1972, English

At the various International Forestry Conferences, references had often-times been made to the non-commercial or secondary, or lesser-known species of tropical hardwoods so abundantly growing in the tropics left idle and un-utilized, and recommendations had frequently been made emphasizing and encouraging research into the utilization aspects of these timbers.

This report consists of two parts. Part I describes "Secondary Species of Hardwoods" and Part II is "Proposed Grouping of Thai Commercial Timber".

Key words: Hardwood, Less-known species

CHAVAJIT URAPEEPATANAPONG
Production and utilization of rubber wood in Thailand:
II. Wood utilization and economic aspects
Thai Journal of Forestry, Thailand, 8(3), 257-268, 1989, English

Utilization trends of rubber wood in Thailand were increased from 1.48 million m³ in 1976 to 2.55 million m³ in 1982. The current survey in 1987 showed that there were 4.53 million m³ of stack volume equivalent to 3.05 million m³ of solid volume being utilized, i.e., 30.43% as fuelwood, 11.02% as charcoal, 16.68% as particleboard, 1.83% as pole and pile, and 40.04% as furniture and other wood products. The amount of wood utilized accounted for 42.25% of total wood produced, while the remaining 57.75% was leftover at the plantation sites.

Prices of rubber wood varied with types of using, size, quality, and locality. Normally, average purchasing price in the East was at least two times higher than in the South. Besides domestic consumption, sawn rubber wood was exported to Japan, Taiwan and Korea at the FOB price of 18,758 baht/m³ for superior lumber for furniture making. The export volumes were increased from 1,696 m³ in 1984 to 58,820 m³ in 1987. Problems and factors limiting rubber wood utilization were discussed.

Key words: Wood work, Charcoal, Fuelwood, Particleboard

WANTANA YOOSUKH, UDOM SITTIPHUPRASERT, APAI RANANAND
Natural durability of palmyrah and nibong palm stems
Thai Journal of Forestry, Thailand, 9(3), 227-236, 1990, English

Field tests on the resistance against marine borers and open field graveyard of nibong and palmyrah were undertaken during July 1988 to November 1990. Marine trials were conducted by exposing the untreated and 3% CCA treated panels to the seawater for a period of 21 months. Inspections were made every 3 months. The graveyard tests were made at 2 sites representing northern and southern part of the country. Teak and yang (*Dipterocarpus alatus*) were used as reference species. Inspections were made every 6 months.

Key words: Wood quality

6-2 Non-timber Products

ECOSYSTEMS RESEARCH AND DEVELOPMENT BUREAU (ERDB)
**Patchouli/kablin (*Pogostemon cablin* Benth.), lemongrass (*Cymbopogon*
flexuosus (Steud.) Wats.)**
RISE Res. Inf. Series on Ecosystems, ERDB, DENR, Philippines, 3(9),
22, 1991, English

This volume focuses on lemongrass [*Cymbopogon flexuosus* (Steud.) Wats.] and patchouli (*Pogostemon cablin* Benth.), two species of known medicinal values. These species also can be used as a good crop for checking soil erosion.

Patchouli is an aromatic undershrub also found in cultivation throughout the country. It is observed to flower freely only in the Philippines; and is known for its medicinal values locally and internationally. Its leaves

and tops, when used in baths, have an anti-rheumatism action. Like lemongrass, it is also a good diuretic and carminative. Patchouli is used in making shampoo while its oil is considered one of the most important ingredient in preparing perfumes.

Lemongrass is an aromatic grass found on abundance in commercial scale in most parts of the Philippines. Its oil is used for isolation of citral used for manufacturing vitamin A and when mixed with equal quantity of pure coconut oil produces liniments for lumbago, chronic rheumatism, sprains and other body pains. It is also good for checking menstrual disorders.

Key words: Minor forest products, Soil conservation, Vegetation

ECOSYSTEMS RESEARCH AND DEVELOPMENT BUREAU (ERDB)

Anahaw (*Livistona rotundifolia* (Lam.) Mart. var. *luzonensis* Becc.)

Limuran (*Calamus ornatus* Blume ex Schult var *philippinensis*)

**RISE Res. Inf. Series on Ecosystems, ERDB, DENR, Philippines, 3(8),
20, 1991, English**

Limuran and Anahaw are species that belong to the *Palmae* family. A very important rattan species, Limuran is considered first class, commanding a high price in the market. The canes are sold as raw poles which are made into furniture. The fruits of Limuran are eaten by wild pigs, wild cats, deers and monkeys, as well as man. The cabbage (ubod) when roasted, is a delicious dish. Freshly cut stems yield edible sap. Limuran is found in Cagayan, Bataan, Laguna, Quezon, Sorsogon, Mindoro, Surigao and in the Pollilio, Basilan and Negros Islands.

Anahaw, also called as the fan palm, is known for its circular, fan shaped pleated leaf blades. The stems of Anahaw are harvested at the age of 14-16 years when the plants are about 10-12 m tall and 20-25 cm in diameter. It is often planted as an ornamental but the mainstem and leaves have economic uses. It grows mostly under the canopy of dipterocarp and mixed species forest. It also thrives in brushlands, under coconut plantations and forests at low to medium altitudes.

This volume provides more detailed information including silvicultural techniques.

Key words: Tree species, Reforestation, Rattan, Under planting

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT

**Rattan, proceedings of the national symposium/workshop on rattan,
Ecotech Center, Lahug, Cebu City, June 1-3, 1988**

**Philippine Council for Agriculture, Forestry and Natural Resources
Research and Development (PCARRD), Philippines, 182, 1990, English**

Rattan, climbing species of the family *Palmae* or *Arecaceae* is one of the most economically important nontimber species found in the Philippine forest. It provides a natural and versatile raw material for the manufacture of strong and sturdy furniture, handicrafts, and novelty items. During the last two decades, these rattan products rapidly gained popularity and wide acceptance both locally and abroad.

In response to the growing needs of the industry, a national symposium/workshop on rattan was held on June 1-3, 1988 at ECOTECH Center, Lahug, Cebu City.

The objectives of the symposium/workshop were: (1) to assess the state of the art of Rattan R and D; (2) to assess the current rattan industry situation (status, problems, needs and prospects); (3) to determine the status of rattan resources and their management; (4) to assess the current policies on rattan production and utilization; (5) to encourage the establishment/development of rattan plantations; and (6) to promote/validate the proposed grading rules for rattan canes.

General and specific recommendations were drawn by participants coming from the academe, research community, rattan industry, government agencies, and private sector.

This publication will be useful as a guide for rattan production ventures.

Key words: Rattan, Minor forest products, Wood work

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT

Profile of selected non-timber forest products, Book series No. 67

Philippine Council for Agriculture, Forestry and Natural Resources

Research and Development (PCARRD), Philippines, 66, 1988, English

This publication focuses on Philippine non-timber forest products commonly utilized for cottage industries and other non-timber forest products that have potentials for development. Profiles of these forest products center on description, uses, processes, and methods used for extraction into raw materials. To ensure their continued supply, available technologies on the propagation of each species are presented. The commercial utilization of these species is also highlighted with the presentation of available technologies on their processing and product development.

Based on the listing of researches coordinated and monitored by PCARRD, species that have received substantial attention in research included bamboo, rattan, lukmoy, and selected palm species. The rest of the species covered in this publication have yet to be studied more extensively.

Key words: Non-timber products, Forest utilization, Harvesting, Silviculture technique

MANOLITO U. SY

Abating rattan shortage through improved harvesting techniques

**Canopy International, Ecosystems Research and Development Bureau, DENR,
Philippines, 13(6), 1&4, 1987, English**

Ecosystems Research and Development Bureau (ERDB) is conducting a study, "Survey and evaluation of existing harvesting methods and techniques for rattan".

In this study, actual harvesting within areas covered by rattan permits/licenses is observed phase by phase. To determine the degree of wastage in the extraction process, random measurements are conducted on rattan poles cut.

From the results of the study, it is envisioned that comprehensive guidelines for rattan harvesting process shall be formulated for rattan permittees and plantation owners. For a renewable resource like rattan, appropriate harvesting system could mean more and better poles. Also, immature canes and wildlings would be saved for future crops. And the raw material shortage of the rattan industry may then be alleviated.

Key words: Rattan, Minor forest products, Harvesting, Evaluation, Cutting

**PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES
RESEARCH AND DEVELOPMENT**

**State of the art and abstract bibliography: papaya research,
Bibliography series No. 14**

**Philippine Council for Agriculture, Forestry and Natural Resources
Research and Development (PCARRD), Philippines, 99, 1988, English**

This publication presents the status of papaya research and development program in the Philippines. Specifically, it gives an overall picture of the following issues: 1) Past Activities, 2) Current Activities, and 3) Research and Development Gaps. Discussions are presented by discipline starting from crop improvement to economics and marketing.

The component of this publication presents a compilation of abstracts of papaya researches conducted in the country from 1912 to 1986. These abstracts were gathered from journals, reports, proceedings of workshops and symposia, theses and the like. For easy reference, the entries are arranged by discipline, with authors listed in alphabetical order.

Key words: Non-timber products, Fruit, Fruit tree

FAO REGIONAL OFFICE FOR ASIA AND PACIFIC (RAPA)

Sericulture development in Asia

**RAPA Publication 1989/5, FAO Regional Office for Asia/Pacific, Bangkok,
Thailand, 179, 1989, English**

Sericulture is one of the oldest agro-industries of Asia. It originated in China several thousand years ago. Over the years, it spread to several parts of Asia.

Asian sericulture continues to account for over 90% of the global silk production and, therefore, developments in Asia, in the sector of sericulture, are of considerable interest not only to Asia but to the world as a whole. In this publication, an attempt has been made to present the progress and problems of sericulture

development in three sections. The first section contains paper dealing with the progress and problems of sericulture in selected countries of Asia. The second section comprises papers dealing with the regional situation. Finally, there is a section dealing with the global strategy for sericultural development.

Key words: Non-timber products, Sericulture

FAO REGIONAL OFFICE FOR ASIA AND PACIFIC (RAPA)

Report of the regional expert consultation on sericulture development in Asia

RAPA Report 1989/1, FAO Regional Office for Asia/Pacific, Bangkok, Thailand, 35, 1989, English

The Regional Expert Consultation on Sericulture in Asia was held from 7 to 10 February 1989 at FAO Regional Office in Bangkok. The objective of the Consultation was to provide an overview of the status of sericulture in the region and to generate conclusions and recommendations for development of Sericulture in Asia. Specifically, the Consultation attempted to evaluate constraints and possibilities for promoting sericulture development through intra-regional cooperation; discern technical, organizational and research problems related to sericulture and identify the roles of governments, parastatal and other organizations, also international agencies for the promotion and development of silk production in Asia.

This publication is a report of the said Consultation.

Key words: Non-timber products, Sericulture

PHILIPPINE COUNCIL FOR AGRICULTURE, RESOURCES RESEARCH AND DEVELOPMENT

State of the art and abstract bibliography of mango researches

VOLUME 2, Crops Bibliography Series No. 12

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Philippines, 35, 1986, English

This publication aims to provide research information inputs of particular commodities for sound research planning and decision making, and highlights the abstracts of mango researches published in the Philippines from 1920 to 1984. This is an addendum of the first volume published by PCARRD in 1984.

The major topics discussed in this volume include varietal improvement, propagation, crop protection, postharvest handling, processing and utilization, and marketing.

Key words: Fruit tree, Non-timber products, Fruit

PHILIPPINE COUNCIL FOR AGRICULTURE, RESOURCES RESEARCH AND DEVELOPMENT

State of the art and abstract bibliography of mango researches,

Crops Bibliography Series No. 3/1984

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Philippines, 69, 1984, English

This publication presents the abstracts of mango researches published in the Philippines from 1911 to 1983. In some instances, publications of Filipino researchers abroad were included. Journals, bulletins, reports, proceedings of workshops and symposia, terminal reports, thesis and reviews were consulted in the preparation of this manuscript. The abstracts are intended to complement the state of the art for mango, presenting the historical developments in different disciplines of mango research in varietal improvement, propagation, cultural management, crop protection, postharvest handling, processing and utilization, and marketing.

Key words: Fruit tree, Non-timber products, Fruit

PHILIPPINE COUNCIL FOR AGRICULTURE, RESOURCES RESEARCH AND DEVELOPMENT

Shiitake mushroom production on wooden poles

Technology, Philippine Council for Agriculture and Resources Research and Development (PCARRD), Philippines, Vol. 7, No. 5, 16, 1985, English

Shiitake mushroom is well known for its food and medicinal values. It is a highly priced delicacy in luxurious restaurants and at home. It is recognized to store a number of health promoting substances that have beneficial effects as anti-viral, anti-tumor and for reduction of cholesterol level in the blood.

The shiitake mushroom production technology can be applied in areas where tree species suitable for cultivation of mushroom abound. Latest research and development efforts by research institutes show that this species of mushroom can be commercially raised in the Philippines.

This publication provides a technology package for shiitake cultivation.

Key words: Mushroom, Minor forest products, Fungus, Inoculation

WILLIAM R. PALAYPAYON & PAFANEL T. CADIZ

Rattan production at the village level

Technology, Philippine Council for Agriculture and Resources Research and Development (PCARRD), Philippines, Vol. 10, No. 2, 16, 1988, English

Rattan can be grown underneath forest trees. It is well known for its multifarious uses: as food, ornamental and furniture. In 1985, the rattan industry generated US\$95 million in foreign exchange from rattan furniture exported to other countries. Production of rattan at the village level offers a solution to the fast declining supply of raw materials for various rattan based industries.

The results of research and development efforts of the Ecosystems Research and Development Bureau (ERDB) of the Department of Environment and Natural Resources (DENR), indicated the potential of mass planting rattan in existing tree plantations, secondary forests, brushland or even coconut plantations as secondary crop.

This publication provides a package of technology on rattan cultivation to promote rattan farming at the village level.

Key words: Rattan, Minor forest products, Under planting, Multiple purpose forestry

PHILIPPINE COUNCIL FOR AGRICULTURE, RESOURCES RESEARCH AND DEVELOPMENT

The Philippines recommends for rubber 1977

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Philippines, 80, 1977, English

The Philippines Recommends series consists of compilations of general usable information on the production of particular commodities as well as other items of interest about the commodity. They also include technical information from both local and foreign sources and practical experiences by researchers and producers.

Rubber is a tropical tree crop which requires a warm humid equable climate (20° to 35° C) and a fairly distributed annual rainfall of not less than 200 cm (80 inches) for its optimum growth and productivity.

This publication provides a great deal of information about soil and climatic requirements, nursery management, establishment and maintenance of budwood, cultural requirements, intercropping, pest and disease control, tapping and bark management, etc.

Key words: Non-timber products, Silvicultural technique, Plantation

PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH

The Philippines recommendations for mango, PCARRD Technical Bulletin Series No. 38

Philippine Council for Agriculture and Resources Research (PCARRD), Philippines, 70, 1978, English

Mango (*Mangifera indica* L.) is one of the major export fruit commodities of the Philippines. Several mango cultivars are grown in the country but the most important are the Caravao and the Pico, distinguished by the fruit.

The ideal growing conditions for mango are: distinct wet and dry seasons with at least 5 months dry period, elevation below 600 m (although mangoes are known to thrive in the Carite highlands), and a well-drained, deep loamy soil with a pH range of 6 to 8.

This book deals with the recently advanced technology of mango production in the Philippines.

Key words: Fruit, Fruit tree, Non-timber products

PCARRD

The Philippines recommends for Papaya
Philippine Council for Agriculture Resources Research and
Development (PCARRD), Philippines, No.27A, 58, 1984, English

This bulletin is an updated version of the Philippines Recommends for Papaya which the Philippine Council for Agriculture and Resources Research and Development (PCARRD) published in 1977. The production statistics, fruit composition, boron fertilization to correct fruit lumpiness, estimated cost and returns analysis, references and figures were updated. Latest information on oriental fruit fly, spider mites and thrips were added.

Key words: Fruit, Fruit tree, Minor forest products

PCARRD

The Philippines recommends for bamboo
Philippine Council for Agriculture Resources Research and
Development (PCARRD), Philippines, No.53, 70, 1984, English

This publication integrates all available information and technologies on the plantation establishment, maintenance and utilization of bamboo in the Philippines. Some research findings particularly on the utilization of bamboo which are applicable to the country are discussed. The technologies included here generated by various government agencies.

Key words: Bamboo, Minor forest products

PCARRD

The Philippines recommends for Cassava
Philippine Council for Agriculture Resources Research and
Development (PCARRD), Philippines, No.19-A, 62, 1983, English

Cassava is a tropical crop grown mainly between latitudes 15° N and 15° S, although its cultivation may extend between 30° N and 30° S. Cassava grows best under between 25° C and 29° C temperature, and in a warm humid climate, with rainfall of 1000–2000 mm per annum.

Spider mites (*Tetranychus telarius* L. and *Tetranychus kansawa* Kishida) are considered the most serious acarine pests which usually attack cassava during the dry season. The contents are as follows. Environmental Adaptation, Selection of Cultivars, Cultural Management, Pests, Harvesting and Storage, Processing and Utilization, and Economics of Cassava Production.

Key words: Agro-forestry, Non-timber products

PCARRD

The Philippines recommends for CACAO
Philippine Council for Agriculture Resources Research and
Development (PCARRD), Philippines, No.40-A, 85, 1989, English

The Philippines Recommends for Cacao presents the latest technology practices in commercial plantations and of the research institutions. It includes information on marketing and processing. It promotes the use of high-yielding clones and improved management practices.

The contents are as follows. Nursery Management, Establishment of Cacao Plantation, Fertilizer Management in Cacao Plantation, Pest Management, Harvesting and processing of Cacao, Quality and Grading of Beans, Marketing of Cocoa, Economics of Cacao Technologies, and Rehabilitation of Cacao Plantation.

Key words: Silvicultural technique, Agro-forestry, Under planting, Non-timber products

PCARRD

The Philippines recommends for rattan
Philippine Council for Agriculture Resources Research and
Development (PCARRD), Philippines, No.55, 61, 1985, English

In the Philippines four genera of rattan are found. According to size, they are: *Calamus*, *Daemonorops*, *Korthalsia*, and *Plectocomia*. So far, 69 species are known, distributed among these four genera: *Calamus*-48, *Daemonorops*-14, *Korthalsia*-5, and *Plectocomia*-2.

Rattan plantations can be established by vegetative or reproductive methods. Suitable areas for rattan development are brushlands or forest lands generally covered with brush which are not scheduled for reforestation within the next ten years. About processing, grading and classification, drying, and bending are explained. Preservative processes of rattan are brushing, spraying, dipping, steeping and cold soaking.

Key words: Rattan, Planting, Minor forest products

SOMKID SIRIPATANADILOK

Variation lignin content of six species of Thai rattan

Thai Journal of Forestry, Thailand, 2(1), 212-238, 1983, English

Lignin content was analyzed from six species of large cane rattan. The species selected were *Calamus mana*, *Calamus* sp., *C. longisetus*, *C. rudentum* and *C. scipionum*. Samples were collected at the fifth internode and at every other ten internodes up to the top internode of the cane. The lignin content found fluctuated even within the single cane of each individual species but there was no fixed pattern of variation among the species. These non-specific patterns of variation reveal that there is no relationship between age of the cane and amount of lignin deposited in the cane.

Key words: Rattan, Wood chemistry

THAI NATIONAL DOCUMENTATION CENTRE

Abstracts on medicinal plants in Thailand

Thailand Institute of Scientific and Technological Research,

Thailand, TISTR BIBLIOGRAPHICAL Series No. 6, 107, 1980, English

This publication are incorporated the abstracts of research report, university theses, as well as articles taken from periodicals. In addition, interesting information on the same plants as can be found in all Thai reference books are also included.

In total 282 publications are introduced.

Key words: Ground floor plant, Minor forest products

THAI NATIONAL DOCUMENTATION CENTRE

Abstracts on medicinal plants in Thailand (No. 2)

Thailand Institute of Scientific and Technological Research,

Thailand, 203, 1986, English

This second number of "Abstracts on Medicinal Plants in Thailand" had been compiled again as part of the contribution of the Thai National Documentation Centre (TNDC) to the UNIDO/TIII/82/006 Project entitled "Assistance in the Production of Pharmaceuticals from the Thai Traditional Pharmacopocia" being carried out by the Pharmaceutical and National Products Department.

Information included in this book was gathered from periodical articles, technical reports, university theses, conference, proceedings and replies to the questionnaires from some government agencies and academic sector.

In total 407 publications are introduced.

Key words: Ground floor plant, Minor forest products

PREECHA KIATGRAJAI

Charcoal production by mound kilns

Thai Journal of forestry, Thailand, 7(1), 1-17, 1988, Thai

Charcoal product on of 2-3 years old *Leucaena leucocephala* by rice-husk, sawdust and earth mounds at thickness of covering matters from 7.5 to 22.5 cm, results means of charcoal yield and properties from 27 tests as follows; charcoal yield 30.8%, charcoal density 0.33 g/cc, heat of combustion 7651 cal/g, volatile matter content 15.3%, fixed carbon content 82.3%, ash content 2.4%, time required to boil 14 min., and heat utilization 33.9%.

Analysis of variances of the means confirm that both types and thickness of covering matters do not affect charcoal yield and properties at 95% confidence interval.

Key words: Charcoal, Non-timber products

HIROYUKI WATANABE et al.

A case study on rational forest management

Thai Journal of Forestry, Thailand, 9(3), 219–226, 1990, English

The structure and management of the tea producing forest in northern Thailand were studied in the area around Ban Pah Pae, Chiang Mai, where the remaining forests are defined as Hill Evergreen and Mixed Deciduous Forests. Locations of trees and tea trees (*Camellia sinensis* var. *assamica*) were mapped, tree species were identified and their DBH, height and crown sizes were measured.

Key words: Multiple purpose forestry, Non-timber products, Agro-forestry

7. SOCIAL FORESTRY

JEFFREY Y CAMPBELL

Women's role in dynamic forest-based small scale enterprises

Community forestry case study 3

FAO, Rome, Italy, 68, 1991, English

Forest-based small scale enterprises (FBSEs) encompass an incredibly wide range of activities; the collection of forest products as diverse as fuelwood, fruits, leaves, gums, resins and butterflies; their processing by hand or simple machinery, whether in the courtyard of a rural house or in a small urban factory; their marketing at every level from household consumption and bartering to the international export market. They are by nature location specific. They differ based upon resource availability, the products' end use, market and labour accessibility and local social and economic conditions.

Case studies from the Indian State of Karnataka examine women's involvement in two FBSEs that have had to confront changing markets and technologies. Initially the major characteristics, issues and constraints that have been identified for FBSEs in general are outlined. Following this, the unique impact of these and specific gender-related constraints is discussed.

Key words: Social forestry, Minor forest products

JEFFREY Y CAMPBELL

Case studies in forest-based small scale enterprises in Asia

(Rattan-Matchmaking-Handicrafts), Community forestry case study 4

FAO Regional Office for Asia and the Pacific (RAPA), Thailand,

93, 1991, English

Case study one is Rattan industries in east Kalimantan, Indonesia. Kalimantan supplies 50% of the world's raw rattan. This study by Nancy Lee Peluso examines the collection, first-stage processing and trade of rattan in the province of east Kalimantan. Both geography and ethnicity influence the rattan trade.

Case study two is the safety match industry in India. J.C. Tandon examines the entire Indian match industry in great detail. A concerted effort by the Indian government to give incentives to the small-scale sector involved in match production has limited the participation of large scale producers to one firm, a partially owned subsidiary of the Swedish Match Company.

Case study three is forest-based handicrafts industry in Indonesia. Rattan is featured again in the case study by Satyawati Hadi, this time with a focus on manufacturing furniture and handicraft goods in Java. The rattan furniture and carved wooden furniture industries are both examined as examples of vigorous, expanding FBSEs in Indonesia.

Key words: Rattan, Social forestry, Non-timber products

MAHARAJ K. MUTHOO, MAFA
Trees and forests in rural land use
FAO, Rome, Italy, 220, 1991, English

This booklet is a modest contribution to the Tenth World Forestry Congress, especially to discussion Area, devoted to the role of trees and forests in land management. The managing areas in this booklet are Africa, Asia and the Pacific, Europe and the Mediterranean, Latin America and the Caribbean, and North America.

The title of papers on every area are as follows: Africa, integrating wild life into rural land use in Zimbabwe, introducing trees into the land use of the West African Sahel, the role of forestry in land use in Senegal, and using trees for desert control in Mauritania; Asia and the Pacific, forestry in the integrated land use of Bhutan, social forestry as a land use in India, and promoting forestry as a land use under the Philippines social forestry programme; Europe and the Mediterranean, the outlook for forestry as a land use in Europe and agrosylvopastoral practices in Mediterranean Europe; America and the Caribbean, threats to forestry as a land use in the Brazilian Amazon, conservation and development of using forestry to protect the land in Haiti; North America, forestry as a land-use issue in Canada, and America's great outdoors.

Key words: Social forestry, Forest land conservation

W. MELLINK, Y.S. RAO, K.G. MACDICKEN
Agroforestry in Asia and the Pacific
FAO Regional Office for Asia and the Pacific (RAPA), Thailand
304, 1991, English

As many as 50 concerned professionals met to discuss agroforestry in the Asia-Pacific Region at the FAO Regional Office, Bangkok, from 15 to 18 May 1990. The participants were from 12 countries: Bangladesh, China, India, Indonesia, Laos, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand and Vietnam.

The consultation discussed the following substantive agenda items:

- Strategies for agroforestry promotion;
- Agroforestry systems and technologies;
- Programs and constraints;
- Economics of agroforestry.

Key words: Agroforestry, Social forestry, Forest utilization

PRAKASHI M. SHINGI, et al.
Studies on social forestry in India
FAO Regional Office for Asia and the Pacific (RAPA), Bangkok, Thailand,
240, 1990, English

This volume contains eighteen papers. An attempt is made here to summarize these papers and highlight only the important viewpoints. These papers present a valuable collection of descriptive material, trend analysis, case studies, conceptual frameworks, review of literature, instructive comparisons, field inquiries, positive criticisms, programme evaluations, organizational issues, model building, strategy formulations, operating procedures, ideological overtones, empirical data base, and useful recommendations. Given such a wide spectrum of orientations, it is difficult to group these papers and themes in a coherent fashion. The contributions are therefore organized in the following sequence: (a) issues related to project formulation and implementation (2 papers); (b) issues related to project management (8 papers); (c) issues related to impact (2 papers); (d) special issues (3 papers dealing with improved stoves, natural vegetation, and women's participation); and (e) issues related to making social forestry a people's programme (3 papers on people sponsored people's programme, government sponsored people's programme, and need for organizational restructuring to undertake a promoter's role).

Key words: Social forestry, Community forestry

NAPOLEON T. VERGARA & NICOMEDES D. BRIONES
Agroforestry in the humid tropics, its protective and ameliorative
roles to enhance productivity and sustainability

**Environment and Policy Institute, East-West Center (US) and
SEARCA (Philippines), 259, 1987, English**

The "Regional workshop on the Roles of Agroforestry in Site Protection and Amelioration" was held in Los Baños, Philippines, in September 1985 under the joint sponsorship of the East-West Environment and Policy Institute, the Forest Research Institute and the other organizations concerned.

This publication is a compilation of the materials presented at the workshop. It covers a wide array of agroforestry system viz. effects of agroforestry on soil and water conservation and on productivity, management strategies to enhance soil conservation and productivity, qualification of some agroforestry impacts, and some models of agroforestry systems.

Key words: Agro-forestry, Removal of soil, Erosion, Forest land conservation, Soil conservation

JEROME F. SISON

**Technical analysis and packaging -- Baseline survey -- Field
document No.4**

**Department of Environment and Natural Resources (DENR) and FAO,
Philippines, 76, 1987**

The project of integrated social forestry programme was designed with a view to strengthen and support Integrated Social Forestry in the Philippines. It should be noted that Integrated Social Forestry is a key and high priority national programme of the Department of Environment and Natural Resources. The project will be implemented for a period of three years. The three selected project areas are located in: Atimonan, Quezon for Luzon, Sagay, Negros Occidental for Visayas and Cabadbaran, Agusan del Norte for Mindanao.

This report provides the very fundamental baseline data for two project areas -- one in Quezon Province and the other in Agusan del Norte.

Key words: Social forestry, Forest utilization, Multiple purpose forestry

NAPOLEON T. VERGARA & RODOLFO A. FERNANDEZ

**Social forestry in Asia, factors that influence program
implementation**

**Southeast Asian Regional Center for Graduate Study and Research in
Agriculture (SEARCA), Philippines, 361, 1989, English**

The Hawaii-based East-West Center and the Los Baños-based SEARCA, cognizant of the lack of understanding of socioeconomic-institutional factors and their impacts upon social forestry implementation efforts, joined hands to conduct a workshop in Los Baños, Laguna, the Philippines, in April 1987. This volume developed from that workshop and is published by SEARCA so that the information generated and synthesized can be made available to upland development project planners and implementors in the region.

This volume is divided into six parts. Part I consists of two introductory chapters that expound on the sociocultural and institutional processes that must be considered in charting a social forestry program. Part II discusses the key sociocultural factors influencing the adoption of social forestry programs in the Philippines. Part III focuses on the socioeconomic factors affecting the success of social forestry programs in Indonesia, Malaysia, Nepal, and the Philippines. Part IV discusses the institutional factors and their impacts upon social forestry programs, bringing into focus the experiences of Bangladesh, India, Indonesia, the Philippines, and Thailand. Part V contains the major output of the workshop: Recommended strategies and policies toward effective implementation of social forestry programs in developing Asian countries.

Key words: Social forestry, Multiple purpose forestry

**PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH
AND DEVELOPMENT**

Agroforestry in perspective

**Philippine Council for Agriculture and Resources Research and
Development (PCARRD), Philippines, 81, 1983, English**

The Philippine Council for Agriculture and Resources Research and Development (PCARRD) believes that agroforestry is just one logical step towards a concrete natural resources research program. We realize to

a greater extent that the country's research capability must never be lopsided and that we cannot ignore the need to fortify our programs in natural resources which are as vital as agriculture to our nation's economy.

Together with all sectors of society, PCARRD hope to evolve a program of using agriculture and forestry to fashion a stable and socially beneficial use of land and resources, capable of providing the people living in and adjacent to the forests with the basis for a viable, sustainable way of life. Such an approach marks a sharp departure from the boom-and-bust history of much of tropical forest use.

PCARRD convened the Agroforestry Symposium-Workshop to place agroforestry in perspective as it harnessed the involvement of authorities in this field from the public and the private sectors.

This publication is a proceedings of the Symposium-Workshop.

Key words: Agro-forestry, Social forestry, Social and economic analysis

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT

Home gardening program in the Philippines, book series No. 69

Philippine Council for Agriculture, Forestry and Natural Resources

Research and Development (PCARRD), Philippines, 89, 1988, English

Current efforts focussed on improving and promoting home gardening as a source of cheap and nutritious vegetable/fruit crops could well be the future direction of research and technology development for backyard gardening. Sustained and institutionalized, the practice could help alleviate the country's persistent malnutrition problem.

This publication, Home Gardening Program in the Philippines, documents the proceedings of the Seminar and Consultation on the Home Gardening Program of the Philippines sponsored by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

This volume provides a review of ongoing backyard gardening projects, its relevance to present needs, and the directions the Philippine home gardening program can take to effectively pursue its efforts to achieve short- and long-term goals. Also presented are such significant topics as the contribution of backyard gardening to family nutrition and income, the role of vegetable breeding and the inclusion of fruit production in home gardening, and the socioeconomic aspects relative to this program.

Key words: Agro-forestry, Social and economic analysis, Intercropping

RODEL D. LASCO

The forest in agroforestry systems

Canopy International, Ecosystems Research and Development Bureau, DENR,

Philippines, 16(1), 5&11, 1990, English

At present, agroforestry is widely recognized as the most suitable alternative to destructive upland farming. It can be defined as the raising of woody perennials in conjunction with agricultural crops and/or livestock in a sustainable manner.

For the purpose of this discussion, a forest is defined as a terrestrial ecosystem predominated by trees. This is taken to mean natural forests in contrast to man-made forest plantations.

Natural forests do have a role to play in agriculture and agroforestry. However, most indigenous agroforestry systems practiced by tribal forest dwellers are not given much attention. Because of this, a potential source of information for agroforestry system design is being neglected. It is therefore recommended that these indigenous practices be documented and analyzed. The principles and practice we might discover could have a significant impact on our agroforestry system design and development.

Key words: Agro-forestry, Shifting cultivation, Forest utilization, Evaluation

FILOMENO V. AGUIAR

Social forestry for upland development: Lessons from four case studies

ipc Report, Institute of Philippine Culture, Quezon City, Philippines, 207,

1982, English

This study focuses four social forestry projects: the Kalahan Educational Foundation, the BFD Communal Tree Farm, the Buhí Watershed/Agroforestation project, and Celophil's Forest Protection Incentive Plan. It looks into the socioeconomic condition of the upland communities concerned and each project's

historical background. Popular participation and its interaction with program results are given special emphasis.

Among the crucial issues that emerged are the upland population's insecure land access, their low levels of living, the unequal market structures, and the inadequate social and physical services delivery. These conditions were found to affect the pattern of resource utilization and the quality of the people's involvement in the project. In addition, low rates of participation in decision making had negative consequences. However, the reasons for program results were site-specific. From these findings are discussed several implications for the BFD's social forestry program, and the elements of a basic strategy are outlined in the end.

Key words: Social forestry, Forest protection, Forest management, Forest policy

NATHANIEL DELA PEÑA, VICENTE SARMIENTO et al.
Community forestry in the Philippines
Philippine Lumberman, Philippines, 16-19 & 36, 1990, English

For the purpose of this report, community forestry shall be defined as any situation that intimately involves local people in forestry activities as integral part of rural development. This definition is mainly borrowed from FAO, with some modification, however, to stress that rural development cannot rely on forestry alone.

Although attempts at community forestry in the Philippines date back as far as 1916, a lack of true commitment to rural development by the Government as well as inadequacies in project implementation by the line agencies have long been the reason for outright failures or not so enthusiastic successes of social forestry programs and projects. Fortunately, significant changes are taking place since recent times, letting the authors hope that traditional forestry and social forestry will both find their respective places and importance in trying to manage the remaining forest resources of the Philippines based on sound and socially acceptable principles.

Key words: Community forestry, Social forestry, Forest management, Forest policy

STEPHEN F. SIEBERT & JILL M. BELSKY
Some socio-economic and environmental aspects of forest use by lowland farmers
in Leyte, Philippines and their implications for agricultural
development and forest management
Philippines Quarterly of Culture and Society, Philippines, 13, 282-296,
1985, English

Public forests in central Leyte, Philippines, provide an important source of annual food crops, perennial cash crops and rattan and timber to lowland farmers. Household economic dependence upon and uses made of forest resources are associated with relative access to lowland-based activities, especially production of irrigated rice. Households unable to procure sufficient food staples utilize adjacent public forests to cultivate subsistence food crops and to collect forest products. Households able to procure a larger portion of their food staples from low-land-based enterprises depend less upon forests and utilize them primarily for supplementary food production and perennial cash cropping. Current forest farming and forest product collecting activities, especially in annual food crop producing farms, result in erosion, soil degradation and gradual destruction of the indigenous flora. The importance of the introduction of appropriate specific soil conservation, agroforestry and forest management resources is assessed.

Key words: Social and economic analysis, Soil conservation, Agro-forestry, Environmental conservation

PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH
AND DEVELOPMENT
The Philippines recommends for agroforestry, 1986, PCARRD
Technical Bulletin Series No. 59
Philippine Council for Agriculture, Forestry and Natural Resources
Research and Development (PCARRD), Philippines, 90, 1986, English

Agroforestry is a system of land management whereby forest and agricultural products are produced on appropriate and suitable areas simultaneously or sequentially for the soil, economic and ecological benefits of the community. However, it has not spread widely in the past decades. Instead the destructive practice of shifting cultivation has prevailed, resulting in the rapid destruction and denudation of forest areas. Realizing that

this problem is socio-economic in nature, the government now adopts human approach - that of all allowing kaingineros to remain in the forest but discouraging them from encroaching or shifting to other public forest area by keeping them productive in a way that would minimize forest denudation and soil erosion.

Research-based agroforestry practice answers this problem - a farming system that shows potential in reclaiming and improving the productivity of marginal hilly lands.

In this publication, PCARRD has pooled the expertise at the country's research agencies to package recommended practices for agroforestry.

Key words: Agro-forestry, Social forestry, Multiple purpose forestry, Degraded forest, Shifting cultivation

CHRISTINE HAUGEN, LEE MEDEMA & CELSO B. LANTICAN

Multipurpose tree species research for small farms: Strategies

and methods, proceedings of an international conference held

November 20-23, 1989 in Jakarta, Indonesia

Forestry/Fuel Wood Research & Development Project (WFRED) and

International Development Research Center (IDRC), 217, 1990, English

While a great deal of interest has been expressed in multi-purpose tree species (MPTS) in recent years, little has been published on the use of MPTS on small-scale farms. Furthermore, most of what has been published has not been oriented toward the needs of small-scale farmers, or based on research methods in which the results are unique to specific conditions and which are not appropriate in other situations, are therefore unavailable to small farmers for implementation.

The international conference was held to play an important role in the search for appropriate strategies and method for orienting multipurpose tree species research for small-scale farmers. The conference was divided into four general topic areas: determining end uses, demand and market potentials; evaluating the supply of products; determining extension, implementation, and training needs; and orienting research efforts to small-scale farm needs.

Key words: Social forestry, Agro-forestry, Multiple purpose forestry, Study and training

FAO

Planning self-help fuelwood project in Asia

FAO Regional Office for Asia/Pacific, Bangkok, Thailand, 84,

1987, English

This report is an outcome of the FAO Regional Workshop on Planning Self-Help Fuelwood Project in Asia, held in Thailand from 2-13 February, 1987. The workshop was organized by the Forestry Policy and Planning Service, FAO, and the Royal Forest Department (RFD) of Thailand. The workshop included thirteen participants from five countries.

The term "self-help" implies that the active role is primarily played by villagers. It is they who identify the needs, define the project, carry it out, and receive the main benefits. Briefly, the purpose of the workshop was to introduce participants to concepts and methods of self-help forestry planning. The workshop was organized into two main topics. The first week concentrated on "understanding the role of trees in rural communities". The main focus was therefore on the many products and services rural communities derive from trees and forests. In week two, the focus shifted to local participation - in needs assessment, project identification, implementation, monitoring, and evaluation - in short, in all stages of project development.

Key words: Community forestry, Social forestry, Fuelwood, Multiple purpose forestry

FAO

Forestry and nutrition: a reference manual

FAO Regional Office for Asia/Pacific, Bangkok, Thailand, 114, 1989, English

Forests and farm trees make significant direct contributions to the food security of rural populations. Many studies have emphasized the importance of the trees role in enhancing agricultural productivity, through maintaining soil fertility and stability and protecting water supply. During the past several years an informal working group of FAO has been working to assist member countries to more fully understand the dynamics of the relationship between forestry, food security and nutrition. This reference manual is the first of several

documents to be developed and backstopped by this group. It was commissioned with the idea that to better understand how forestry projects could further food security and promote better nutrition, more would have to be known about the research already undertaken.

This document contains literature from a variety of relevant disciplines and includes material which may be useful for selecting specific forestry activities to strengthen food security. In the presentation of the bibliography, the subject areas in which more research is needed are highlighted.

Key words: Forest resources, Multiple purpose forestry, Minor forest products, Forest utilization

FAO

**Forestland for the people, a forest village project in northeast Thailand
FAO Regional Office for Asia/Pacific, Bangkok, Thailand, 84, 1989, English**

This publication is one of a series of case studies of FAO-assisted community forestry projects. The series forms part of FAO's Forestry for Local Community Development (FLCD) Programme.

The purpose of this study is two-fold. The first is to provide a detailed analysis of the processes and achievement of an FAO-assisted project to rehabilitate a degraded area in the Khao Plu Luang National Reserved Forest in Northern Thailand through the community forestry approach. In this respect, the study is written for development planners and foresters in Thailand as a means of helping these national experts evaluate the results of their efforts in this area. The second, more far-reaching purpose of the case study is to draw attention to elements of international relevance. Although it refers to a single, specific campaign, many of the experiences reported in the case study can be applied in wide variety of socio-economic conditions.

This study has been made possible by a special contribution from the Swedish International Development Agency (SIDA).

Key words: Community forestry, Social forestry, Intensive forestry, Agro-forestry, Social and economic analysis

FAO

**Case studies of farm forestry and wasteland development in Gujarat, India
FAO Regional Office for Asia/Pacific, Bangkok, Thailand, 61, 1988, English**

The case studies presented in this document were carried out by Dr. Shobhita Jain. In doing the studies, she first places each case study in relation to the market economy. Her findings and insights shed light on the complexities of successful farm forestry and on the danger of generalizing, especially on such issues as trees replacing food crops or conflicts of goals between the forest service and participating farmers. The success she describes of large-scale farmers includes current efforts to diversify species for a broader market. Small scale farmers, on the other hand, are found to be in need of support services such as market information and assistance in the organization by buying and selling cooperatives.

This is one of a series of case studies produced by the Community Forestry Unit of the Policy and Planning Service of FAO. The case study series is being funded by the Swedish International Development Authority.

Key words: Community forestry, Social forestry, Intensive forestry, Agro-forestry, Social and economic analysis

ZHU ZHAOHUA, CAI MANTANG et al.

Agroforestry systems in China

**Chinese Academy of Forestry and International Development Research
Center (IDRC-Canada), Singapore, 216, 1991, English**

Agroforestry has a long history in certain areas in China. According to Chen Yung (1943), agroforestry was practiced 1,700 years ago in Shanyang County. It is recorded that it was 300 years ago that forest farmers intercropped agricultural crops under young plantation of Chinese fir in Southern China and this practice has been reintroduced recently in Southeast Asia described as Taungyan System.

Agroforestry is a production system of artificial plant communities. It also includes fishery and animal husbandry. The main attention should be devoted to explore the relationship between plant, animal and the environmental factors when studying this integrated production system. In order to select suitable plant material for an agroforestry system, besides fully using currently available varieties or cultivars of crop plants and forest

trees, it is also important to explore new sources through plant breeding and other improvement programmes. In this proceedings, the major agroforestry models in China are outlined. The publication of this volume will be a great contribution to help the understanding of China's agroforestry by other scientists outside China.

Key words: Agro-forestry, Multiple purpose forestry, Intercropping

FAO REGIONAL OFFICE FOR ASIA AND PACIFIC (RAPA)

Five perspectives on forestry for rural development in the Asia/Pacific Region

RAPA monograph: 1986/1, FAO Regional Office for Asia/Pacific, Bangkok, Thailand, 65, 1986, English

One of the events organized by the FAO Regional Office for Asia and the Pacific (RAPA) in connection with the International Year of the Forest was the Regional Symposium on Forestry for Rural Development. The symposium was held at the RAPA premises on 2 October 1985 and was attended by 200 persons representing government organizations concerned with environment and energy, universities, etc.

The speakers at the symposium included five top level decision makers from the four important sub-regions of the Asia-Pacific Region: South Asia; Far east; Southeast Asia; and the Pacific.

This publication is a compilation of the papers presented at the Symposium.

Key words: Social forestry, Forest development, Reforestation, forest utilization

FAO REGIONAL OFFICE FOR ASIA AND PACIFIC (RAPA)

Agroforestry, initiatives by farmers in Thailand

RAPA Publication: 1989/13, FAO Regional Office for Asia/Pacific, Bangkok, Thailand, 129, 1989, English

Over the years, farmers of Thailand have amply demonstrated their genius for practicing sustainable forms of agroforestry. They continue to follow the tradition and derive sustainable benefits in terms of goods and services, including some cash surplus from these productive forms of land use.

This publication details 50 agroforestry farms from the four geographic regions of Thailand: North, North-east, Central and the south. For each farm a brief account is given and crops grown on the farms.

The purpose of the publication is to recognize what exists as "indigenous knowledge" with the farmers of Thailand.

Key words: Agroforestry, Intercropping, Multiple purpose forestry

RP-JAPAN FORESTRY DEVELOPMENT PROJECT OF THE PANTABANGAN AREA

Rules and regulations on social forestry (from 1982 to 1988)

RP-Japan Forestry Development Project of the Pantabangan Area, Philippines, 306, 1989, English

The Integrated Social Forestry Program of the Bureau of Forest Development (BFD) of the Ministry of Natural Resources is the official embodiment of social forestry in the Philippines. The program has started to accelerate in 1982.

This publication provides rules and regulations from 1982 to 1988 on the Integrated Social Forestry Program in the Philippines. It is useful information as a guideline in the Integrated Social Forestry Program.

Key words: Social forestry, Agro-forestry, Multiple purpose forestry, Forestry law

NOBUMITSU MIYAZAKI

An interim report for social forestry programs of RP-Japan Forestry Development Project - Watershed Management in Carranglan, Nueva Ecija, Philippines

RP-Japan Forestry Development Project-Watershed Management, Philippines, 1989, English

This publication is an interim report of RP-Japan Forestry Development Project-Watershed Management. The project extended to implement its Upland Family Based program to uplift socio-economic conditions of forest occupants.

Outline of the projected works is as follows:

(1) Census of forest occupants, (2) enlightenment campaign of the social forestry activities to the forest occupants, (3) perimeter and parcellary survey, (4) processing and issuance of certificate of stewardship contract, (5) development of agro-forestry farms, (6) training program for the forest occupants, and (7) monitoring and evaluation.

Key words: Social forestry, Agro-forestry

PCARRD

The Philippines recommends for integrated farming system 1976
Philippine Council for Agriculture and Resources Research and
Development (PCARRD), Philippines, 92, 1979, English

In the Philippines, various crops are grown in a given area showing the diversity of the farming systems practice. Various crops are raised in a given parcel of land at the same time. However, area allocation to the planting of these crops differ and the combination of cropping patterns are not properly ascertained.

Farming systems takes into consideration all farming attributes and weigh these according to the best means they can be utilized. They may advocate the raising of two or more different crops, livestock or even fish in a given area at the same time or in sequence in a year.

This publication is primarily intended for use by extensionists in their task of helping the farmers increase farm productivity.

Key words: Agro-forestry, Non-timber products

AMNUAY CORVANICH

The role of women in FIO's forest villages
Forest Industry Organization, Thailand, 6, 1980, English

Forest village establishment is a system employed by the Forest Industry Organization (FIO), as a means to counteract the recurring problem of shifting cultivation practiced by a segment of the Thai people.

It was first utilized by the FIO in 1967 when it embarked on its own reforestation programme implementation.

Using the habitual instinct of these shifting cultivators as a basis for its annual reforestation programme, the FIO made trials in collecting the offenders in secure settlements with additional infrastructures such as electricity, water supply, school for young children, medical care and roads.

Each of the FIO's reforestation units was settled by a number of about 100 families. A piece of ten rai (4 acres) of land to be reforested was assigned to each family to work on planting forest trees.

The information on male and female labourers of the FIO's forest villages is given in this report.

Key words: Social forestry, Reforestation, Community forestry, Shifting cultivation

DALE WTHINGTON et al.

Multipurpose tree species for small-farm use
Proceedings of an international workshop held November 2-5, 1987
in Pattaya, Thailand
Winrock International Institute for Agricultural Development, USA,
281, 1987, English

This workshop, the first of its kind in Asia, focused on advancing biological and social-science research on Multipurpose tree species for small-farm use (MPTS), with the ultimate goal of improving the livelihood of small farmers in Asia.

Over 40 participants from eight Asian countries participated in this multidisciplinary and multidonor effort. Six major sessions, consisting of paper and posters, focused on the following:

- o small-farm use of multipurpose tree species,
- o role of Eucalyptus on small farms,
- o nitrogen-fixing trees as MPTS for small-farm use,
- o fruit trees and other woody perennials,
- o socio-economic considerations for MPTS research, and
- o research strategies to fill information gaps.

Key words: Multiple purpose forestry, Eucalypt, Tree species, Nitrogen fixation, Fruit tree, Social forestry

MONTEE PHOTHITAI

Agroforestry in Thailand, Perspective of Forest Industry Organization

Forest Industry Organization, Thailand, 11, 1990, English

The total land area of Thailand is about 514,000 km², and nearly 80% of the country's 52 million people live on agricultural earnings. Most forest lands are thus cleared for agricultural purposes, causing forest resources to diminish from 53.33% of total land area in 1961 to 28.03% in 1988.

The Taungya System has been applied in forest plantation area which have problem with illegal land clearing, by the Royal Forest Department. In the early periods, it was found that the Taungya System was not fully successful, because, in many cases, the farmers paid most of their attention only to the crops when price increased, neglecting forest trees. In 1967, the Forest Industry Organization initiated the project called Forest Village System Plantation by which the Taungya System of Planting was modified and named The Modified Taungya System. The system is aimed at settling the landless people in communities and as a source of labor for plantation work.

Key words: Agro-forestry, Plantation, Land-use

BILL MACKLIN, DALE O. EVANS

**Perennial *Sesbania* species in agroforestry system
(Proceeding of a workshop in Kenya)**

The Nitrogen Fixing Tree Association (NETA), U.S.A., 242, 1990, English

The purpose of the workshop was to set a course for future research and development activities with perennial *Sesbania* species. The specific objectives of the workshop were to:

- . Assess the present state-of-the-art regarding the botany, natural history, biological nitrogen fixation, genetics, and germplasm of perennial *Sesbania* species.
- . Assess the present state-of-the-art regarding management and utilization of perennial *Sesbania* species in agroforestry systems.
- . Define priorities, methodologies, and responsibilities for collaborative research, development, and networking with perennial *Sesbania* species.

Twenty-seven papers were presented in three sessions: Basic biology and Germplasm, Management and Utilization, and Regional Case Study Reports.

Key words: Agro-forestry

8. OTHERS

PREM B.L. SRIVASTAVA

Forest education in the Asia-Pacific region

**FAO Regional Office for Asia and the Pacific (RAPA), Thailand, 1989/12,
115, 1989, English**

This summary paper was based on original contributions which were presented as country papers on the status of forestry education at an Expert Consultation on Forestry Education in the Asia-Pacific Region, organized by the FAO Regional Office during 1988.

At the outset, institutes offering professional education are explained, that is, growth, staff development, entry requirements, student intake, number graduated, admission of foreign students, short courses, and facilities.

In the next place, curriculum development, research, linkages, innovations and problems of every college/university are described.

Key words: Research study, Study and training

KAZUHIRO ISHIZUKA

**Thai forestry and forest soil research appendixes
Research and Training in Re-forestation Project, RFD, Thailand,
1991, English**

There are 10 appendixes in this book. The title of each appendix is as follows; (1) Thailand national forest policy, (2) How to increase the natural forest resource for the rural development of Chachengsao Province, (3) Contents of workshop of re-forestation project, (4) Contents of training textbooks, (5) Explanation of research budget proposal in the fiscal year of 1987-1991, (6) Contents of annual forest meeting (1982-1985), (7) Research and training equipment, (8) Report of research project conducted by the forest soil division (1984-1986) and 5 year research plan in 2nd phase (1986-1991), (9) Instruction manual of Topcon Reflective Stereoscope, and (10) Method of soil physical analysis.

Key words: Forest management, Research study, Study and training, Forest policy

M. ISHIZUKA

**Development of the software for silviculture research
Research and Training in Re-forestation Project, RFD, Thailand,
1991, English**

This report is aimed to introduce technical equipment to be applied for the forest research activities. Two reports and three user's guide are compiled. They are as follows: Development of the Software "Fish Eye (BKK)", Photographic Estimation of Photosynthetically active radiation in *Eucalyptus camaldulensis* plantation, Fish Eye (BKK) User's Guide, WALTER User's Guide, and SILVICS User Guide. Development of Software "Fish Eye (BKK)" is described to evaluate a computerized technique for the estimation of photosynthetic photo flux density (PPFD) in *Eucalyptus camaldulensis* Plantations using the hemispherical photograph. The study was conducted in the spacing trial plots of *E. camaldulensis* at Rachachaburi Experiment Station in central Thailand. 10-minute average measurement and estimations of PPFD were made in six sites with different tree-spacings on several days from April to July under the various weather conditions.

Key words: Eucalypt, Crown density, Research and Development

K.J. WHITE

**Teak, some aspects of research and development
FAO Regional Office for Asia and the Pacific (RAPA), Thailand,
1991/17, 53, 1991, English**

This book consists of two parts. The contents of part one are as follows: silvicultural characters of Teak, timber and non-timber uses, Teak as an exotic, environmental impacts. Part two deals with regeneration and silviculture, artificial regeneration, mensuration, Teak research priorities.

The paper presents an information update of the ecology and cultivation of Teak and was prepared as background information for the CHINA/ESCAP/FAO Regional Seminar on Research and Development of Teak, held at Guangzhou and Urumqi 20-27th March 1991.

Key words: Silvicultural technique, Regeneration, Artificial Regeneration, Research and development

SALLEH MOHD. NOR

**Forestry research in the Asia-Pacific, FORSPA publication: 1
FAO, Rome, Italy, 54, 1992, English**

This is a status report on forestry research for tropical forestry in the Asia-Pacific region. The background paper for the Bellagio II task Force: "Forestry Research Needs and Opportunities in Tropical Asia" (1988) is a source for this report.

The contents of this report are as follows. Forest Resources of Tropical Asia, Status of Research on Asian Tropical Forestry, Constraints to Accelerated Forestry Research in Asia, and Strategies for Improvement of Forestry Research.

Key words: Research and development, Research system

RAPA

**Report on round-table on standardization of design principles for silkworm rearing house and instruments for sericulture development
FAO Regional Office for Asia and the Pacific (RAPA), Thailand,
1990/24, 58, 1990, English**

The Round Table was held from 19th-23rd November 1990, convened in the FAO Regional Office for Asia and the Pacific in Bangkok, Thailand.

The objective of the Round Table was to have information exchanges and technical discussion on the standardization of design principles for silkworm rearing houses and instruments for tropical and temperate countries in Asia, to enable quality cocoon and raw silk production.

There were six country delegates attending from six countries, People's Republic of China, India, Republic of Korea, People's Democratic Republic of Korea, Thailand and Vietnam.

Key words: Sericulture

RAUI, B. ALAMBAN, ERLINDA H. BELÉN

**Manual of Instructions, Meteorological and Phenological Observation
in Agriculture and Forestry
Philippine Council for Agriculture, Forestry and Natural Resources
Research and Development (PCARRD), Philippines, 84/1989, 114, 1989,
English**

In December 1987, the Philippine Council for Agriculture Forestry and Natural Resources Research and Development (PCARRD) and the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) conducted a forum - workshop on Maximizing the Utilization of Agrometeorological Data for Development. A follow-up workshop on Recommended Methodologies for Agrometeorology/Forest Meteorology was held in May 1988 to finalize this Manual of Instructions for Meteorological and Phenological Observations in Agriculture and Forestry.

This manual therefore, consolidates the standard methodologies on agrometeorology/forest meteorology specifically, the instrumentation; climatological and phenological observations and data management.

Key words: Phenology, Meteorology

MARUJA V. LORICA, ANDRE L. ACEDERA, et al.

**Research management in agriculture and natural resources in the
Philippines
Philippine Council for Agriculture, Forestry and Natural Resources
Research and Development (PCARRD), Philippines, No. 82/1989, 370, 1989,
English**

The 1988 Workshop on Research Management in Agriculture and Natural Resources in the Philippines was held in the Development Academy of the Philippines, Tagaytay City on June 13.

This workshop consists of three modules. Module I is selected issues in research management, for example, Organizational design issues in agricultural research in the Philippines, priority setting and resource allocation in agricultural research and so on. Module II is planning for research and development in agriculture and natural resources. The title of module III is building and managing the national research system in agriculture and natural resources.

Key words: Research system, Research and development

THE APPLIED COMMUNICATION DIVISION OF PCARRD

**Abstract bibliography of Philippine researches in agriculture,
forestry, fisheries and mines
Philippine Council for Agriculture and Resources Research and
Development (PCARRD), Philippines, 183, 1981, English**

The abstracts are classified into five research areas: Agriculture, Biological sciences, Natural Resources, Physical Sciences and Socioeconomics.

Forestry is described in Natural Resources. The abstracts of forestry are 35 papers, and are classified into 5 research areas: Bamboo, Rattan, Fuelwood and Other Non-timber Forest Products, Timber Products, Parks and Wildlife, Pulpwood, Fiberboards and Paper Products, and Reforestation and Forest watershed.

Key words: Research and development, Non-timber products, Reforestation, Watershed, Industry of forest products

ASIAN DEVELOPMENT BANK

Sector paper on forestry

ADB, Philippines, 67, 1989, English

During the last few years, the emphasis given to forestry by the Bank and the global community has shifted from production to conservation. Three events influenced this shift: the Tropical Forest Action Plan (TFAP), the Strategy Meeting on Tropical Forests, and the report of the World Commission on Environment and Development.

A major concern of the Bank has been the shift in emphasis that addresses the broader issues of deforestation, forest conservation and forest management. The workshop on forestry development and perspectives was held in May 1987. Some of the major recommendations from the workshop were that the Bank take a lead role in promoting forestry in the region and adopt a more comprehensive approach to forestry development.

In light of the above, the objectives of this Sector Paper are primarily twofold: (i) to provide an analytical review of the Bank's experience in forestry development since 1978; and (ii) to outline the direction of the Bank's future lending program in forestry. The Paper is broadly divided into three parts: (i) Forestry in the Asian and Pacific Region; (ii) the Bank's Approach to Forestry in the Asian and Pacific Region; (ii) the Bank's Approach to Forestry Development; and (iii) the Bank's Future Strategy in Forestry Development.

Key words: Forest development, Sustainable management of forest, Forest land conservation

RAMON V. VALMAYOR

The making of the Philippine agriculture and resources research system: a case for the developing world

Philippine Council for Agriculture and Resources Research and Development (PCARRD), Philippines, 166, 1985, English

There was no mechanism for planning and implementing research projects on a national scale. Research did not respond to national goals, concentrating on rice, corn, and sugarcane, even as the national program pressed for an agribusiness approach to export crops, foodgrains, livestock, fisheries, forestry, and the "second generation" problems of the cereal industry.

PCARRD's inception was therefore directed towards doing away with waste and duplication and the usual chaos of *ad hoc* arrangements within the research community. Its task was to define the goals, purposes and scope of agriculture and natural resources research in a country which was then, as it is today, a nation of many moods and gaieties; a nation of extremes, of want in the midst of plenty.

The history of PCARRD is the history of the national research system. This book documents that history. It captures the experiences of a research community determined to create an impact on national affairs, and reflects on the role of PCARRD in the future.

Key words: Research system, Research and Development

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT

Technology transfer for sustainable development, Proceedings of the dialogue among the Association of Foundations

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Philippines, 88, 1989, English

In an attempt to bring together the government and the nongovernment organizations, a dialogue among the Association of Foundations on technology transfer for sustainable development was held on 15 November 1989. The dialogue aimed to strengthen the ties among the government and the nongovernment organizations through the Association of Foundations; identify specific technologies which may be applicable to the NGOs and

their projects; and formulate feasible work programs at the national, regional, and provincial levels.

This publication records the experiences of both the government and the nongovernment sectors in their involvement with research and development projects.

Key words: Research and development, Sustainable management of forestry, Forest management

RICARDO T. BIÑA, ROBERT S. JARA & CELSO R. ROQUE
**Application of multi-level remote sensing survey to mangrove forest
resource management in the Philippines**
NRMC Research Monograph No. 2, Philippines, 16, 1980, English

To provide synoptic and updated information on the areal extent, distribution and ecological conditions of mangrove forest in the country, a gross inventory was made by the use of LANDSAT.

The data obtained from LANDSAT imageries proved useful. These include: topographic maps, hydrographic maps, field survey and fishing statistics. The computerized processing of LANDSAT multispectral data provided two significant inputs for decision making: a synoptic view at 1:250,000 scale of the current distribution of mangrove forest in the entire archipelago, and quantitative areal measurements of the mangrove stands. In several cases, it was observed that the scale of 1:125,000 to 1:250,000 is a sufficient base reference to delineate areas for conservation of mangrove forest.

Key words: Mangrove, Forest inventory, Distribution, Area

SAMUEL R. PENAFIEL
**Net primary productivity and vegetation characteristics of a
Pinus grass community**
**Sylvatrop, Philippine Forest Research Journal, Philippines, 4(3),
167-177, 1979, English**

There are 89 species representing 20 families found commonly associated with Benguet Pine (*Pinus insularis*) forests of which 77% are known to be eaten by livestock. Among the grass species, *Themeda triandra* Forssk and *Andropogon annulatus* Forssk var. are the most dominant both in open and forested areas. A tall grass species *Miscanthus sinensis* was found growing in pure swards and forming a distinct community type in the area.

The primary productivity of the range plants were determined at 90 and 180 day cutting intervals for the wet and dry seasons. In open areas, NPP was 0.97 tons/ha and 0.28 tons/ha for dry season in 90 and 180 days growing period. Under Benguet Pine canopy, NPP ranges from 0.34 to 0.48 tons/ha/90 days for the wet season. Low light transmission ration which ranges from 19 to 68%, and high rate of Benguet Pine needle litterfall at approximately 3 tons/ha/yr, are the limiting factors on the productivity of understory plants in the pine forest.

Key words: Pine, Floor plant, Biomass, Plant community, Undergrowth

DAVID HOWLETT & CAROLINE SARGENT
**Technical workshop to explore options for global forestry management
Bangkok, April 1991, proceedings**
**International Institute for Environment and Development, Thailand,
349, 1991, English**

Global interest in forest resources has broadened recently to include all forest biomass (tropical, temperate, boreal), and the need for sustainable provision of a wide range of forest services, including forest products, biofuels, carbon stock and sinks, biodiversity, and maintenance of hydrological cycles. While nations have sovereign control over their forests, the global resource aspects of forest are being increasingly recognized.

At the invitation of the Royal Thai Government, over 80 experts from than 20 developed and developing countries, and 11 international organizations and nongovernment organizations gathered in Bangkok on a wide range of issues related to global forest management. The topics discussed included national issues related to the management of temperate, boreal and tropical forests; the need to develop a global consensus for collaborative technical assessments and action to safeguard local, national and international benefits from the services of forests; preliminary discussions of methods to estimate the costs of achieving goals at the national and international level and associated economic issues; and further action needed to promote a constructive and action

oriented approach to tackling global forest problems.

Key words: Sustainable management of forest, Global forestry management, Ecosystem

ASIAN DEVELOPMENT BANK

Sector paper on forestry

Asian Development Bank, Philippines, 67, 1989, English

The forest resources of the 29 developing member countries of the ADB in the Asian and Pacific region provide innumerable products of vital use and are a source of livelihood to a large segment of the population. Such resources are equally important in ecosystem conservation and environmental protection.

By December 1988, the ADB had financed 18 forestry development projects totaling \$434.64 million or 6 percent of the Bank's lending to the agriculture and agro-industries sector. In addition, the ADB provided technical assistance of \$16.04 million to 45 projects. Apart from exclusive forestry projects, the Bank has included some \$10.87 million to forestry components in various irrigation, rural development and tree crop development projects.

This book reviews the forest and forestry activities, and also the bank's approach to the forestry development in the Asian and Pacific region. It mentions, based on the review findings, the bank's future strategy for forestry development in the region.

Key words: Forest development, Forest utilization, Multiple purpose forestry

FAO REGIONAL OFFICE FOR ASIA AND PACIFIC (RAPA)

Forest sector, National development plan strategies of developing countries in Asia-Pacific Region

RAPA Monograph Number 11, FAO Regional Office for Asia and the Pacific (RAPA), Thailand, 94, 1984, English

This publication is a compendium of extracts on forest sector policies and strategies in 15 developing countries of Asia-Pacific region for which information was readily available. In the case of most of the countries, the extracts are verbatim reproduction from the official government documents relating to the national development plans. No attempt has been made to edit the text. A comprehensive list of contents is prepared in respect of various countries to enable a quick reference to any significant aspect of forest policy/programme.

Key words: Forest policy, Forest development, Forest management

ASIAN DEVELOPMENT BANK

Guidelines for social analysis of development projects

Asian Development Bank, Philippines, 141, 1991, English

The Guidelines comprise three parts: (i) the main text of the document which elucidates the general principles of social analysis, at both macro and project levels, and then proceeds to apply these at each stage of project processing; (ii) appendices which deal with the specialized aspects of social analysis in different sectors and in greater procedural detail; and (iii) an Operation Summary of the main text, as a separate booklet which can serve as an easy reference guide and handbook for staff on a day-to-day basis. The guidelines are also intended for use by development and academic institutions, NGOs, bilateral and other multilateral organizations.

Key words: Social and economic analysis, Guideline, Social forestry

K.G. MACDICKEN, SATHIT WACHARAKITTI, C.B. LANTICAN

Issues for forestry research networking in ASIA

Thai Journal of Forestry, Thailand, 8(2), 191-201, 1989, English

Deforestation in tropical countries has great impacts to forested area decreasing, species diversities and to national socio-economics. The integrated research networks on multipurpose tree species can foster network research, communication and training for the region. Network development is a time consuming and expensive process, one which demands extensive coordination and communication among interested institutions and individuals. Therefore, integrated research networks on multipurpose tree species supported by the Forestry/Fuelwood Research and Development Project which can foster network research, communication and

training has been set up to provide a basis and model for expanded collaboration in forestry research in Asia.

Key words: Research system, Research and development, Multiple purpose forestry

APPENDIX

LIST OF INFORMATION RESOURCES

PHILIPPINES

Forest Management Bureau Library

Address: Visayas Ave., Diliman, Quezon City, Philippines
Tel: 982491 Fax.: 921-9060 Telex:
Identification of parent organization: Forest Management Bureau (FMB), Department of Environment and Natural Resources (DENR)
Type of service: Library
Geographic coverage of information resources: National - Philippines
Subject coverage: Forestry; agro-forestry; environment; ecology; watershed; wildlife and mangrove; forest laws and regulations, etc.
Types of indexes provided for access to the services: Subject and personal author indexes
Size of present collection relevant to forestry: 2,500 volumes including journals, serials, forest laws and statistics
Identification of target users: FMB officials, government and private researchers, individual researchers and students
Date of establishment of the services: 1975
Types of services provided for users: Quick reference services; library loan
Charge of services: Free services
Procedure required for applying services: Application form
Types of periodical publications available to users: Forestry statistics; annual reports
Procedure required for applying the publications and their charges: Direct application; charge for forestry statistics

Ecosystem Research and Development Bureau (ERDB)

Address: College, Laguna 4031, Philippines
Tel: 2229, 2269 Fax.: Telex: 40860 PARRS PM
Identification of parent organization: Department of Environment and Natural Resources (DENR)
Type of service: Library; research and development information services
Geographic coverage of information resources: National - Philippines
Subject coverage: Environment; natural resources; ecosystem types, e.g. forest, grassland and degraded area, upland farms, coastal and freshwater zones, etc.
Types of indexes provided for access to the services: Author index; subject/title index
Size of present collection relevant to forestry: Approximately 24,000 volumes (includes all books, journals, newsletters, etc.)
Identification of target users: Researchers of ERDB and DENR; forestry industries; individual researchers and students
Date of establishment of the services: 1974
Types of services provided for users: Quick reference services; library loan (staff only)
Charge of services: No-charge
Procedure required for applying services: Application form
Types of periodical publications available to users: Sylvatop (research journal); CANOPY (semi-technical publication); How-to manual (guide on package technologies); RISE (series of compiled information to support major programs of the DENR)
Procedure required for applying the publications and their charges: Application to Bureau Director or authorized representative; some of publications -- charge

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)

Address: Los Baños, Laguna, Philippines
Tel: 50014-19 Fax.: 6309450016 Telex: 40860 PARRS PM
Identification of parent organization: Department of Science and Technology

Type of service: Scientific literature services and library
Geographic coverage of information resources: National; international
Subject coverage: Agriculture; forestry; natural resources, etc.
Types of indexes provided for access to the services: Acquisition list; abstract bibliography
Size of present collection relevant to forestry: Approximately 8,000 volumes
Identification of target users: Researchers; students; extension workers; policy makers; farmers, etc.
Date of establishment of the services: 1973
Types of services provided for users: Library; dissemination of information, e.g. publication, documentation, training, etc.
Charge of services: Charge for publication
Procedure required for applying services: Correspondence and direct request
Types of periodical publications available to users: PCARRD Monitor; PCARRD publications
Procedure required for applying the publications and their charges: Correspondence and direct request; charge

College of Forestry Library, UP

Address: College, Laguna 4031, Philippines
Tel: 2266 Fax.: 63-94-3206 Telex:
Identification of parent organization: College of Forestry, University of the Philippines at Los Baños
Type of service: Library
Geographic coverage of information resources: National-Philippines; semi-worldwide
Subject coverage: Silviculture; forest mensuration and management; forest environment; forest fire; forest plant biology; forest genetics and breeding; forest mycology and pathology; forest insects and other invertebrates; wildlife and national park; forest protection and soil conservation; nature conservation; wood properties; wood utilization; marketing and trade of forest products, etc.
Types of indexes provided for access to the services: Author index; subject index
Size of present collection relevant to forestry: 25,160 volumes
Identification of target users: Research institutions; educational institutions; timber trade; forest industries; individual researchers and students
Date of establishment of the services: 1909
Types of services provided for users: Quick reference services; library loan; document copying
Charge of services: No charge except photocopy.
Procedure required for applying services: Application form

Philippine Wood Products Association (PWPA)

Address: 3rd Floor, LTA Bldg., 118 Perea St., Legaspi Village, Makati, Metro Manila, Philippines
Tel: 817-6885 Fax.: 817-6884 Telex: 23263 WJCHM PH
817-6751
Identification of parent organization: Philippine Wood Products Association, Manila
Type of service: Library
Geographic coverage of information resources: World-wide
Subject coverage: Institutional aspects of forestry; silviculture; forest mensuration and management; physical environment; forest protection and soil conservation; institutional aspects of forest products and industry; wood properties; logging; timber damage and protection; marketing and trade; wood utilization, etc.
Types of indexes provided for access to the services: Author index; subject index
Identification of target users: Forest industries; individual researchers and students
Types of services provided for users: Quick reference service; photocopy service
Charge of services: Charge or no-charge for photocopy
Procedure required for applying services: Direct request
Types of periodical publications available to users: PWPA News up-to-date
Procedure required for applying the publications and their charges: Direct request; application through

letter; no-charge

THAILAND

Royal forest Department, Main Library

Address: 61 Paholyothin Rd. Jatujak, Bangkok 10900, Thailand
Tel: 5794301 Fax.: Telex:
Identification of parent organization: Royal Forest Department, Bangkok
Type of service: Library
Geographic coverage of information resources: National; International
Subject coverage: Forestry and related subjects; textbooks; annual reports; Thai abstract; abstracts of Master Theses in Thailand; TISTR (Thailand Institute of Scientific and Technological Research) publication; etc.
Types of indexes provided for access to the services: Author index; subject index
Size of present collection relevant to forestry: Approximately 13,000 volumes
Identification of target users: Government officers; researchers; students
Date of establishment of the services: 1896
Types of services provided for users: Book loans (for staff only); quick reference services; photo copying
Charge of services: Free except document copying
Procedure required for applying services: Application form

The Forest Herbarium Library

Address: 61 Paholyothin Rd. Jatujak, Bangkok 10900, Thailand
Tel: 5791534 Fax.: Telex:
Identification of parent organization: Division of Silviculture, Royal Forest Department, Bangkok
Type of service: Library; Publication
Geographic coverage of information resources: National; International
Subject coverage: Forestry; forest ecology; forest mycology; botany; taxonomy
Types of indexes provided for access to the services: Printed indexes of author and subject
Size of present collection relevant to forestry: Approximately 10,000 volumes on botany, taxonomy and related subjects
Identification of target users: Research institutions; educational institutions; government officer; individual researchers and students
Date of establishment of the services: 1951
Types of services provided for users: Book loans (for staff only); quick reference services; photocopying; sale of publications
Charge of services: Charge for photocopies and publications
Procedure required for applying services: Application form
Types of periodical publications available to users: Thai Forest Bulletin (Botany); Flora of Thailand
Procedure required for applying the publications and their charges: Through letter and application form; charge

Central Forest Research Laboratory and Training Center

Address: 61 Paholyothin Rd. Jatujak, Bangkok 10900, Thailand
Tel: 5790230-4 Fax.: Telex:
Identification of parent organization: Silvicultural Research Sub-division, Silvicultural Division, Royal Forest Department, Bangkok
Type of service: Library
Geographic coverage of information resources: National; International
Subject coverage: Forestry and related subjects; text books; reports; magazines
Types of indexes provided for access to the services: Publication list; indexes of author and subject

Size of present collection relevant to forestry: More than 5,000 volumes on forestry and related subjects
Identification of target users: Government officer; individual researchers and students
Date of establishment of the services: 1984
Types of services provided for users: Book loans (for staff only)
Charge of services: Free charge
Procedure required for applying services: Direct request

Faculty of Forestry Library, Kasetsart University

Address: Bangkok 10903, Thailand
Tel: 579-0170 Fax.: Telex:
579-0520

Identification of parent organization: Faculty of Forestry, Kasetsart University, Bangkok
Type of service: Library
Geographic coverage of information resources: World-wide
Subject coverage: Silviculture; forest mensuration and management; physical forest environment; forest fire; forest plant biology; forest genetics and breeding; forest mycology and pathology; forest insects and other invertebrates; forest protection and soil conservation; timber damage and protection; wood utilization; marketing and trade; social forestry, etc.
Types of indexes provided for access to the services: Personal author index; subject index
Size of present collection relevant to forestry: Documents 300; serials 56; monographs 10,000; research reports, bulletins 4,500
Identification of target users: Research institutions; educational institutions; timber trade; forest industries; individual researchers and students
Date of establishment of the services: 1935
Types of services provided for users: Quick reference services; bibliographies; library loan
Charge of services: No-charge
Procedure required for applying services: Application form
Types of periodical publications available to users: Thai Journal of Forestry
Procedure required for applying the publications and their charges: Letter or application form; no-charge

Forest Industry Organization (FIO)

Address: 76 Rajadamnern Nok Avenue, Bangkok 10100, Thailand
Tel: 2823243-7 Fax.: 282-4197 Telex:

Identification of parent organization: Forest Industry Organization, Ministry of Agriculture & Cooperative
Type of service: Publication and other
Geographic coverage of information resources: National - Thailand
Subject coverage: Institutional aspects of forestry; silvicultural; timber trade; forest industries; logging
Identification of target users: Forest services; timber trade; forest industries
Date of establishment of the services: 1947
Types of services provided for users: Information service
Charge of services: No-charge
Procedure required for applying services: Direct request
Types of periodical publications available to users: Occasional publications
Procedure required for applying the publications and their charges: Direct request

Thai National Documentation Centre

Address: 196 Phahonyothin Road, Chatuchak, Bangkok 10900, Thailand
Tel: 5791121-30 Fax.: 662-579-8594 Telex:

Identification of parent organization: Thailand Institute of Science and Technological Research, Bangkok
Type of service: Information centre; documentation centre; library

Geographic coverage of information resources: National – Thailand; International
Subject coverage: Silviculture; forest mensuration; forest genetics and breeding; wildlife and national park; forest protection and soil conservation; timber damage and protection; wood utilization; other uses of forest products; marketing and trade of forest products, etc.
Types of indexes provided for access to the services: Author index; subject index
Identification of target users: Research institutions; educational institutions; ministries and forest services; timber trade; forest industries; individual researchers and students
Date of establishment of the services: 1964
Types of services provided for users: Quick reference services; bibliographies; library loans; photocopying; translation service
Charge of services: Charge for bibliographies, photocopying and translation service
Procedure required for applying services: Application form
Types of periodical publications available to users: Journal; Bibliographies; Occasional publications; Scientific and technical literature relating to Thailand
Procedure required for applying the publications and their charges: Through letter, fax and application form; charge

FAO Regional Office for Asia and Pacific (RAPA)

Address: Phra Atit Road, Bangkok 10200, Thailand
Tel: 281-7844 Fax.: (662) 2800445 Telex: 82815 FOODAG TH
Identification of parent organization: Food and Agriculture Organization of United Nations (FAO)
Type of service: Publication and library
Geographic coverage of information resources: Asian/Pacific region
Subject coverage: Natural resources; crops; livestock; rural development; nutrition; agricultural statistics; food and agricultural policies; fisheries; forestry
Types of indexes provided for access to the services: List of RAPA publications
Types of services provided for users: Information services
Charge of services: No-charge
Procedure required for applying services: Letter, fax and application form
Types of periodical publications available to users: RAPA Monograph; RAPA Report; RAPA Publication
Procedure required for applying the publications and their charges: Letter, fax and application form; no-charge

JAPAN

Forestry and Forest Products Research Institute

Address: P.O. Box 16, Tsukuba Rinri Kenkyu Danchi-nai, Ibaraki, 305, JAPAN
Tel: 0298-73-3211 Fax.: 0298-74-3270
Telex:
Identification of parent organization: Ministry of Agriculture, Forestry and Fisheries, Tokyo
Type of service: Library
Geographic coverage of information resources: World-wide
Subject coverage: Research information on forestry and forest products
Types of indexes provided for access to the services: Computerized index; title index; author index
Size of present collection relevant to forestry: Approximately 170,000 volumes of books, serial publication and pamphlets
Identification of target users: Staff of the institute and forest agency; researchers and students of universities, etc.
Date of establishment of the services: 1947
Types of services provided for users: Book loan; contents services; photocopying; list of recent accession; reading room
Charge of services: Charge for photocopies

Procedure required for applying services: Through letter, application form, telex, fax, etc.
Types of periodical publications available to users: Annual report, bulletin of the forestry and forest products research institute; quick report of important research results; institute letter.
Procedure required for applying the publications and their charges: Through letter or application form, premising the exchange for the publication of other institutes

