

Rattan Plantation and Management

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INTRODUCTION

Thailand the member of the Southeast Asian countries located between 5-20 N. latitude and 97-106 E. longitude that having the climatic condition of tropical monsoon of both per humid type in the southern and southeastern region and tropical monsoon type in other regions.

The covering vegetation of moist and dry tropical forest has the great biodiversity. There are all kinds of rattan species distributed mostly all over the country in the moist area of the tropical monsoon type forest and the per humid type forest.

Therefore Thai people know how to use and had been used rattan for their living since long time as a by product from the forests. From the anthropological records, it was shown that Thai people had been used rattan for weaving to make all kinds of utensils more than 3000 years ago. During the period of the last three-decade, rattan furniture was established for exportation, so tremendous amount of rattan had been exploited from the natural forest without proper management causing degradation of the resources. Later on, the rattan furniture industry has to depend more for raw material from other countries such as Malaysia, Indonesia, and Myanmar. The rattan furniture industry once contributed approximately 1,000 million baths from exportation, but now dwelled to only 300 million baths. This industry contributed a lot of jobs to local people for many decades and even now it also important for local economy if develop properly. The main obstacle is the raw material which is not reliable if depend only on the importation. The management of the natural forest might also face the dead end as Thailand imposes on the logging ban policy and most of the good

forest is under the protected areas. The only solution might be rattan cultivation out side the forest or in the forest plantations in order that the raw material for all rattan utilization is secured. The cane rattan raw material not only use for furniture industries but it also use for various other things that needs for local living and economy. The rattan canes are used for all kinds of handicrafts, weaving, and utensils. The rattan shoots are the good food for local people, which is very important not less than bamboo shoots. The rattan development can be combined for both shoots and canes production to provide food and raw material for local living and at the same time improving the local economy together with environment as its production require some kind of permanent trees vegetation for the support and for their good habitat for growing. The development of rattan resources and utilization on a sustainable basis can contribute to the good environment, local and general economy of the country.

SPECIES DIVERSIFICATION

There are diverse species of rattan in Thailand of which it consists of about 60 species in 6 genera distribute to every part of the country.

Rattan resources diversity and distribution

The approximately 60 species of rattans in Thailand belonging to 6 genera are belonging to the genus, Calamus, Daemonorops, Korthalsia, Plectocomia, Plectocomiopsis, and Myrialepis (Bhodhipuks and Ramyarangsi 1989). Dransfield (personal communication, Vongkaluang 2002) have recorded 83 species of rattans belonging to 7 genera for the whole country. Most of the species belonged to the genus

Calamus while the species in other genus occur in very limited quantity.

The species that distribute in the per-humid climatic type in the south and southeast region of the country are as follow:

- 1. Genus : CALAMUS L.**
Species :
- (1) *C. acanthophyllus*
 - (2) *C. arborescens*
 - (3) *C. axillaris*
 - (4) *C. balingensi*
 - (5) *C. blumei*
 - (6) *C. buosigonii*
 - (7) *C. burkilliana*
 - (8) *C. caesius*
 - (9) *C. cambojensis*
 - (10) *C. castaneus*
 - (11) *C. concinnus*
 - (12) *C. desiflorus*
 - (13) *C. diepenhorstii*
 - (14) *C. erectus*
 - (15) *C. erinaceus*
 - (16) *C. exilis*
 - (17) *C. floribundus*
 - (18) *C. godefroyi*
 - (19) *C. gracilis*
 - (20) *C. insignis*
 - (21) *C. javensis*
 - (22) *C. kerrianus*
 - (23) *C. laevigatus*
 - (24) *C. latifolius*
 - (25) *C. longisetus*
 - (26) *C. luridus*
 - (27) *C. manan*

- (28) *C. micranthus*
- (29) *C. multirameus*
- (30) *C. myrianthus*
- (31) *C. ornatus*
- (32) *C. oxleyanus*
- (33) *C. palustris.*
- (34) *C. pandanosmus*
- (35) *C. pauciflorus*
- (36) *C. peregrinus*
- (37) *C. radulosus*
- (38) *C. rotang*
- (39) *C. rudentum*
- (40) *C. scipionum*
- (41) *C. siamensis*
- (42) *C. speciosissimus*
- (43) *C. spectatissimus*
- (44) *C. tenuis*
- (45) *C. thwaitthesis*
- (46) *C. tigrinus*
- (47) *C. tomentosus*
- (48) *C. viminalis*

2. Genus : **DAEMONOROPS Bl.**
 Species :
 - (1) *D. angustifolia* (Griff.) Mart
 - (2) *D. brachystachys* Furtado
 - (3) *D. calicarpa* (Griff.) Mart
 - (4) *D. didymorphylla* Becc.
 - (5) *D. geniculata* (Griff.) Mart.
 - (6) *D. grandis* Mart.
 - (7) *D. kunstleri* Becc.
 - (8) *D. lewisiana* (Griff.) Mart.
 - (9) *D. monticola* (Griff.)
 - (10) *D. sabut* Becc.
 - (11) *D. schmidtii* Becc.
 - (12) *D. verticillaris* (Griff.) Mart.

3. Genus : **KORTHALSIA Bl.**
 Species : (1) *K. grandis* Ridley
 (2) *K. laciniosa* (Griff.) Mart.
 (3) *K. rigida* Blume
 (4) *K. scaphigera* Griff. ex Mart.
4. Genus : **MYRIALEPIS Bl.**
 Species : (1) *M. scortechinii* Becc.
 (2) *M. paradoxa* (Kurz.) Dransfield.
5. Genus : **PLECTOCOMIA Mart. ex Bl.**
 Species : (1) *P. griffithii* Becc.
 (2) *P. macrostachya* Kurz.
 (3) *P. pierreana* Burret.
 (4) *P. geminiflorus* (Griff.) Becc.

DISTRIBUTION AND ECOLOGY OF RATTAN IN THAILAND

The species that distribute in the moist forest of the monsoonal climate type in the northeast, the north and the central region of the country are as follow:

- CALAMUS** : *C. acanthophyllus.*
C. erectus
C. viminalis
C. siamensis
C. tenuis
C. guruba
C. poilanei
C. acanthospathus
C. gracilis
C. henryanus
C. solitarius

C. tetradactylus
C. laoensis
C. flaggellum
C. rudentum
C. palustris
C. nambariensis
C. wailong

DAEMONOROPS: *D. jenkinsiana*

MYRIALEPIS: *M. paradoxa*

KORTHALSIA: *K. laciniosa*

From the rather large number of species of rattan and their distribution to cover many parts of the country, the resources of rattan in Thailand are quite important not only for the country but also for the international rattan germ plasm. It can be seen that most of the important economic species in the world can be found in Thailand, such as *Calamus manan*, *Calamus wailong*, *Calamus tetradactylus*, *Calamus gracilis*, *Calamus ornatus*, *Calamus palustris*, *Calamus javensis*, *Daemonorops sabut*, *Calamus caesius*, *Calamus guruba*, *Calamus nambariensis*, *Calamus poilanei*, *Calamus latifolius* etc.

The important commercial species in Thailand as reported by Wanida Subansenee 1996 included the follow.

- (1) *Calamus manan*
- (2) *Calamus wailong*
- (3) *Calamus peregrinus*
- (4) *Calamus longisetus*
- (5) *Calamus erectus*
- (6) *Calamus latifolius*

- (7) *Calamus caesius*
- (8) *Calamus axillaris*
- (9) *Calamus blumei*
- (10) *Calamus pandanosmus*
- (11) *Calamus myriantus*
- (12) *Deamonorops sabut*
- (13) *Calamus siamensis*
- (14) *Calamus densiflorus*
- (15) *Calamus palustris*

Ecology of some rattan species of potential for planting in Thailand

Calamus palustris

This species normally grow in the evergreen forest some can grow in the dry evergreen forest so this species can have very wide distribution almost every part of the country. When it grows in the dry evergreen forest the associate species can be bamboo, Aquillaria, Irvingia, and other dry evergreen species. It can grow on the valley and up on the hill slope to hill top. It has wide distribution and can be found in regenerated forest, young secondary forest, and old rubber plantation near village. It grows up to 900 m. altitude.

Calamus caesius

This species usually can be found in the low land on alluvial flats, seasonally flooded river banks, and margins of freshwater or peat swamp forest, but not in permanent swamps. In Borneo, where the greatest morphological variation occurs, it is also found on drier sites up to 800 m. above sea level. On these drier sites, growth is less vigorous. Although it flourishes under mild and seasonal flooding, the seedlings can not withstand severe flooding.

Calamus javensis

It is very widespread, occurring from the lowlands to about 2000 m. altitude, and is found on a wide range of soils in tropical rain forest. The chamber formed by the lower most pair of the leaflets is sometimes an ant-infested.

Calamus manan

It is usually confined to the hill dipterocarp forest and is rarely found in lowland dipterocarp forest (mainly near steep slopes). It can grow between latitudinal range of 50-1000 m. and is mostly abundant between 600-1000 m. altitude. Seedlings are abundant in hill forest.

Calamus tetradactylus

This species occurs in the lowlands to hill slopes under 600 m. altitude in primary or secondary tropical forests and in subtropical broadleaved forests to the south of latitude 23° 30' N. The most favorable niche for this rattan is wet hollows and mountain valleys, but young seedlings may not be able to withstand severe flooding. In general, ecological requirements of *C. tetradactylus* for normal growth are as follows: air temperature of 20-30 °C (-2 °C and lower may kill seedlings), more than 1300 mm annual rain fall with relative humidity of over 78%, 50% sunlight, fertile and damp soil with medium to high amount of humus and pH value of 4.5-6.5.

Calamus wailong

This species is found in the altitudinal range of 600-900 m. on slopes in tropical ever green hill forest where relative humidity is high all year round, with average annual temperature of 20-21 °C, and tropical red loamy soils.

Daemonorops margaritae

This species is found from the lowlands to the hill below 1000m altitude, in primary or secondary tropical rain forest and subtropical broadleaved forest. In general, the eco-physiological requirements for optimum growth are: air temperature of 20-32 °C (-3 °C or lower may kill young seedlings); more than 1500 mm. annual rainfall with over 80% relative humidity; 30-50% shade; fertile and damp soil with medium to high amount of humus contents (2.5-4.5%) and pH 4.5-6.5. Seedlings require more sunlight than others for optimum growth.

Daemonorops sabut

D. sabut is very characteristic of alluvial or freshwater swamp, mostly in lowlands, but also up to 400 m. altitude.

THE SILVICULTURAL KNOWLEDGE OF RATTAN AND ITS IMPORTANT FOR COMMERCIAL DEVELOPMENT

Calamus caesius

The establishments of plantation normally use seedlings 40-50 cm. tall for planting out in the field. Rubber trees, Lagerstroemia sp. and fruit trees have been used to provide shade and support by smallholders. Large-scale commercial planting has been carried out under plantation forest. There is solid information in Thailand shown that *C. caesius* can be planted successfully under rubber plantation. The commercial plantation normally adopted a spacing of 2x8 m. or 2x10 m.

Seedlings production for planting normally starts with seeds, after germination they will be transplanted and potted in black polythene bags of about 15 cm deep and 15 cm in diameter when the shoots have emerged the spear like protuberances about 1cm in length. Seedlings are nursed in these bags for at least 9 months under partial shade of plastic net to provide about 50% of normal light. After hardening under the full sunlight for 1 month then they are ready for planting out in the field.

Plantation maintenance is by circle-weeding manually for 2-3 years since planting. The conditions for optimum growing require about 50% sunlight. The overhead canopy of the supported trees should be manipulated in order to provide light for optimum growth. Clearing the paths along the planting rows should be maintained to allow easy access and maintenance. The application of organic fertilizer should improve further growth.

Calamus manan

In general plantations establishment is from seedlings. The seedlings will be transplanted at the stage of spear like protuberance appearing. The transplanted seedlings are potted in the poly bags like other rattans seedlings and raising for at least 12 months under 50% sunlight before ready to be planting out. Seedlings require plenty of moisture without waterlogged. The commercial rattan plantations can be established in the rubber plantations at the spacing of 8x3m. The experience in Thailand shown that at the age of more than 9 years after intercropping with rattans the latex production and growth of rubber trees were reducing. *Calamus manan* is very robust so the supported trees should be further studied. The trees canopy manipulation to allow 50% light is necessary for vigorous growth of rattans. The maintenance is by circle-weeding 3-4

times a year up to the age of 3 years. The application of organic fertilizer can enhance growth.

Calamus palustris

This species can be cultivated by using seedlings produced from seeds similar to other species. The plantation can be intercropped quite successfully with teak. Clumps had been seen in old rubber plantation.

Calamus tetradactylus

Propagation is normally done by seeds. Germination percentage of fresh mature seeds can reach 98%. Normal nursery practice in China is first soak seeds in clear water for 1-3 days, then sow seeds in clean sand beds under shade. After 50-70 days, young seedlings with primary leaves unexpanded can be transplanted into potting bags containing soil with mixed nutrient (the ratio of forest topsoil to pond mud to composted manure is 50:50:1). The seedlings have to be placed in the nursery under semi- shade which is the optimum light regime for *C. tetradactylus* seedlings.

For maintenance, the seedlings must be watering to keep high moisture all the time, but has to avoid water logging, loosening soil, applying fertilizer in order to ensure fast and healthy growth. Seedlings 15-18 months old with 7-9 leaves are ready for planting out in the field. Smallholder plant *C. tetradactylus* intercropped with fruit trees and around gardens. Commercial planting, it has been intercropped in lowland forests logged over forest, scrub, forest plantations and rubber plantations. Site preparation involves thinning the forest canopy to permit 40-50% light penetration, cutting and cleaning planting lines and preparing planting holes. Seedlings need organic manure for optimum growth and must be hardening for at least 1 month by increase light and reduce watering before out planting.

Planting needs to be carried out in the beginning of the rainy season. Optimum spacing is still unknown, but normally used 1x3 m, 1x4 m, and 2x3 m. Seedlings are planted singly or in groups of 2. It has the capacity to grow well under full sunlight, but young leaves may be scorched. It gives the highest yield when planted as a sole crop. The general knowledge of rattan planting could help for future development.

RESOURCES DEVELOPMENT

In Thailand the development of rattan plantation for shoots production is rather progress. There are commercial plantations which have been established in an area of more than 5000 rais with well establish technique for seedlings production, planting maintenance and harvesting as report by Kangkan, Y. The successful species are *Calamus siamensis*, *Calamus viminalis*, *Clamus tenuis*, and some other species of less popular. The development of the resources for canes production from the natural forest is unlikely to be feasible as most of the remaining appropriate forests for canes production are under the protected area of tightly control for conservation. Rattan plantation for commercial canes production is still in the developing stage with no solid out come and need a lot of effort for the development. There is still no case of successful commercial canes production plantation. This topic is the challenge for future rattan development in Thailand in spite of various research and attempt.

There have been many research on rattan dealing with seeds collection, seedlings production and plantation establishment. Seed production areas of some important species also have been established in various locations.

Plantation trial in rather large area of *Calamus caesius* was established in the south. The plantation trials in the rubber plantations also have been done but still no commercial plantation occur. The result of the research show that plantation establishment for canes production is rather difficult and effort demand for the success. There are more works to be done on the selection of appropriate species to be planted in specific area for commercial canes production. Time constrain for this resources production need to be reduced to make it more feasible commercially. The establishment of plantation for canes production needs more research.

FUTURE POTENTIAL

It is well known that rattan is very important to socio-economy and environment of the country since the old days. The depletion of the resources shall effect to the rural life and economy. At present rattan can contribute more than 300 million baths annually in the rattan furniture industry. The development of rattan resources on the sustainable basis would contribute to the well living of local people and the general economy as well as the good environment of the country as it can supply food and generate income from the production and utilization.

TREND IN FUTURE DEVELOPMENT

The resources development and effective utilization of rattan will be the main objectives of future development to emphasize canes production to support furniture industry and handicraft. The management to combine canes production and other products will be the trend for development as

canes production solely might not be feasible economy. This can be combined with shoots production or fruit tree or forest tree plantation, rubber plantation or other crops production or non-wood forest product. The best quality canes species only must be selected for the plantation establishment for effective utilization and good value added products in order that the development will be feasible economy. The supported trees should be selected not only for good support but must also generate income to the farmers at the same time. The potential species that should be consider for future development are *Calamus manan*, *C latifolius*, *C palustris*, *C rudentum*, *C caesius*, *C javensis*, *C blumei*, *C laevigatus*, *C poilanei*, *C gracilis*, *C tetradactylus*, *C acanthosphus*, *C solitarias*, *C henryanus*, *Daemonorops sabut*, *Daemonorops margaritae*, and other unknown local species of very good canes quality.

Germplasm collection of these potential species should be an urgent task for the development along with small plantation trial in the respective sites. Seed orchard or seed production area of all the potential species should be established at the same time in order to secure seeds supply for future plantation establishment. Genetic selection of these species for commercial purpose also should be done to improve the quality and needs characteristics.

Sites selection is very important for the success of rattan planting. The most require criteria are relative humidity and soil moisture content regime of the site. In general rattan need rather high humidity and moisture almost all year round, but some species can tolerate certain degree of drought period. Light intensity is another constrain of which most species need approximately 50 to 60 percent of full sunlight if lower or more than this range it might not

grow or die. Site could be selected or manage to fulfill these condition for good growth.

Planting system

Rattan growth for canes production require specific condition for growth and good canes quality which are as follow:

1. Support trees
2. Optimum light 50-60 percent of full sunlight
3. Rather moist soil
4. Relative humidity of around 70 percent or more.

The planting system should provide those requirements. In Thailand the planting system that could be provide the requirement for rattan plantation are as follow:

1. Fringe of the forests
2. Rubber plantations
3. Fruit orchards
4. Swamp area along the river banks
5. Dikes of paddy field
6. Tree plantations

The supported trees for some rattan growing are *Gmelina arborea*, *Tectona grandis*, *Pithecellobium dulce*, *Largetroemia sp.*, *Hopea odorata*, *Dipterocarpus alatus*, *Arthocarpus sp.* and *Acacia sp.*

REFERENCE

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Rattan Fruits



Fruits of *C. viminalis*



Fruits of *C. longisetus*



Fruits of *C. caesius*

Seed Processing for Germination



Selection ripe fruits



Pounding with sand for 2-3 minutes



Cleaning to separate seeds

Seed Germination of *C. viminalis*



Germination bed by farmer



Seedlings ready for transplanting



Potted in black plastic bags



Seedlings for distribution to farmer under government support

Rattan in the South



Rattan furniture from natural resource



Calamus manan is confined to natural rainforest in the south



Calamus ceasius at government conservation area

Rattan Species in the North East



Calamus tenuis



Calamus siamensis



Calamus viminalis
Shoot producing species

Shoot Producing Plantation



Planting between the rows of vegetable plants



Shoot producing plantation of *C. viminalis*



Plantation of *C. siamensis* for shoot and cane production

Edible Shoots



Edible shoots and food of *Calamus viminalis*



Preserved rattan shoots for sale
Products by ITTO Rattan Project (PD24/00 Rev.1(I)) trainees

Utilization



Furniture and handicrafts