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## **I. INTRODUCTION**

Rattan is a non-wood forest product of Indonesia; it is foreign exchange earner commodity and a cash crop for local people.

Indonesia has been the home to 316 rattan species of 7 genera. In the past all rattans harvested originating from those naturally grown with the exception for small-diameter irit and sega rattan which have been cultivated by Dayak ethnic in Kalimantan Island since 1850s.

In the beginning, all rattans were used for rob fastener and traditional fish traps. Although, in line with changing of attitude, interest and economic development, rattan are being used for many kinds of products such as furniture, chairs, rack, room separated, baskets, beds, cupboard, webbing, sofa set, and so on.

Today, rattan cultivations by local community are still constrained by a number of technical and managerial aspects. This Manual is intended to overcome some problems that may arise in the development of rattan cultivation.

## **II. RATTAN PLANTS**

### **II.1. CHARACTERISTICS OF RATTAN PLANT**

- a. The size of cane is not too large.
- b. Cane is softy, long and many nodes, less than 10 cm to 60 cm.
- c. End nodes shorter than upper nodes.
- d. Shape of cane almost round or round but sometimes rectangular is found.
- e. Length of cane varies reaches more than 100 m.
- f. Length of cane diameter varies small diameter 3 mm and large diameter more than 18 mm.



Picture 1. Rattan plant



Picture 2. Rattan shoots

- g. Leaves are pulled with very strong thorns and curving inside, sheath is coarse when being held.
- h. Dicotyledons, except genus *Khorthalsia*.
- i. Position of flower is lateral; and terminal on canes.
- j. Fruit is generally one kernel, except *Calamus koordersianus* has 2–3 kernels per fruit.
- k. Germination rate varies according to species.

## II.2. HABITAT REQUIREMENTS

Growth habitat (location) where rattan plantation can be carried out are areas of production forest, reforested, protection forest, conservation forest (except restricted zone, national park and nature reserve), rubber estates, privately-owned forests or others supporting trees are found.

The requirements of rattan plantation site are:



Picture 3. Location of rattan plantation

- *Having wet climate minimum rainfall 1,500 mm per annum.*
- *Growth well on slightly open canopies.*
- *Dry months vary from 1–3 months.*

### III. RATTAN CULTIVATION

#### III.1. Species Selection

In cultivation rattan of high economic and prospective values should be prioritized. While in the grouping of rattan plantations can be distinguished as solitaire or clump, prefer mother trees and also based on the shape of leaf, flower and fruit.

Solitaire rattans are as follows:

- *Calamus manan*
- *Calamus pallidus*

Clumps rattans are as follows:

- *Calamus caesius*
- *Calamus trachycoleus*
- *Ceratolobus sp.*
- *Khorthalsia sp.*

#### III.2. Factors To Consider In Species Selection

- Market demand
- Having economic aspects
- Skills of local community
- Suitability to the growing habitat
- Productivity rate per unit area
- Growing rate
- Resistance to pests and diseases
- Capable of fulfilling local community needs.



Picture 4. Group of solitaire rattan



Picture 5. Group of clumps rattan

### III.3. Recommended Rattan Species For Development

Recommended rattan species to cultivate are as follows: rattan manau (*Calamus manan*), rattan sega (*Calamus caesius*), rattan irit (*Calamus trachyvaleus*), rattan semambu (*Calamus socipionium*), rattan Tohiti (*Calamus inops*), rattan batang (*Calamus zolinerti/D. robustus*), rattan pulut merah (*Calamus flabelloides*), rattan Jernang (*Daemonoros draco*).

### III.4. Seed Production

The sequences of rattan seed preparation for nursery purpose are as follows:

|   |                  |   |                        |
|---|------------------|---|------------------------|
| 1 | Fruit Collection | 3 | Seed Storage           |
| 2 | Fruit Handling   | 4 | Nursery Site Selection |

### III.5. Characteristics Of Mature Fruit

The characteristics of matures fruit are as follows: (1) colors of fruits are yellowish, reddish (irit rattan), blackish brown (manau rattan); (2) Old seeds are blackish brown and hard; (3) Fruit peels are found under mother trees.

### III.6. Seed Handling

The first method in handling fruits is as follows:

- 1) Fruits are picked from branches and put into wet gunny-sack.
- 2) Keep the moisture condition by watering the gunny-sack until seedling site.
- 3) Soak the fruit about 5 days until the peels and fruit flesh get rotten.
- 4) Clean the fruit from peels.
- 5) Place the clean seeds in a basket and put at shady places.

- 6) Let seeds germinate in wet gunny-sack surface and/or sow directly on germination beds.
- 7) Move germinating seeds into poly-bags containing soil-organic compost mixture media (1:1).
- 8) Keep them until ready to plant (7–8 months).



Picture 6. Mature rattan fruits

The second method in handling fruits is as follows:

- 1) Clean seeds by soaking them for 2x24 hours and dry them in a bamboo screen for 2 hours.
- 2) Put the seeds in a transparent plastic bag, the amount of seed is in accordance with the plastic size.
- 3) Cover them by folding the tips and silk or warmed them with candle lights.
- 4) Store the seeds in room temperature until they germinate (40 days having shoots and roots).
- 5) Germinating seeds can be moved for maintenance purpose in nursery site or planted directly at the planting sites.

The third method in handling fruits is as follows:

- 1) Break the peels and allow 1–2 days until the peels get rotten.
- 2) Clean the peels and fruit flesh.
- 3) Plant clean seeds directly on plastic bags containing growing media.
- 4) Place them under shade.
- 5) Maintain them until ready to plant.

### III.7. Seed Storage

Fruits can endure for about 3 weeks (peels and flesh get rotten) in the form of cleaned seeds. They cannot be stored for a long time and since they do not resist moisture loss, otherwise the embryo will dye and will

not grow. Hence, ensure that the time period from mother trees until seedling sites is less than 15 days.

Storage method:

|                                    |                                    |
|------------------------------------|------------------------------------|
| ✓ Temperature 10–14 <sup>0</sup> C | ✓ Inside the closed plastic bags   |
| ✓ Humidity 45–55%                  | ✓ Temperature 10–14 <sup>0</sup> C |
| ✓ Germination Rate 76% in 3 months | ✓ Humidity 45–55%                  |
|                                    | ✓ Germination rate 95% in 3 months |

## IV. NURSERY ESTABLISHMENT

### IV.1. Location

The requirements that should be met for nursery field are:

- a. Flat area with maximum slope 5%
- b. Available sources
- c. Climate and latitude should fit with technical requirements
- d. Seedling location should free from water logging and pests/diseases
- e. Location should be in the middle of or near to planting areas, open transportation access, and close to labor force locations.

### IV.2. Activity Stages

Rattan seedlings being planted are generally coming from seeds and natural regeneration forest.

#### IV.2.1. Nursery from Seeds

Method of germinating seeds and producing seedlings are as follows:

- 1) Rattan seeds are put in the basket.
- 2) Store at humid places.
- 3) Water every day.

- 4) Planting spacing 20x20 cm.
- 5) Having been one month old seeds would germinate (germination height is less than 5 cm), then plant seedlings at seedbeds.
- 6) Having leaves of 7–8 (aged 8–12 months) take seedlings by revolving them, then plant.



Picture 7. Rattan nursery

Methods of germinating seeds at the sowing beds:

- 1) For large seeds (such as rattan manau), seeds are planted, copper valve upside, with spacing of 2x4 m.
- 2) For small seeds (such as rattan sega/irit), seeds are sowed.
- 3) Prepare plastic bag with size 15x20 cm or 8x16 cm, provide holes at lower part and fill with weaning media.
- 4) When germination reaches 2–3 cm high, prior to first leaf develops, transfer them to plastic bags with watered-media.
- 5) Plastic bags are put on weaning bed field, under roofs.
- 6) Light requirement for growth is less than 50%
- 7) Seedlings are shaded at the nursery site until they reach 8–12 month age.



Methods of germinating seeds in plastic bags:

- 1) Make available plastic bags, make holes at lower tips, and fill with growing media.
- 2) Seeds are sowed in plastic bag with media watered in advance in order to maintain humidity.
- 3) Seedlings are ready to plant at 8–12 month age.

#### **IV.2.2. Nursery Establishment from Natural Plants**

Natural rattan wildings with 15–20 cm height or having 2–3 leaves which are collected from natural sites are sheltered at the nursery for 2–3 months until they are ready to plant. Make sure the root and soil indicted.

### **V. PLANTING**

#### **V.1. Planting Site Selection**

The requirements for rattan cultivation site are as follows:

- a. Climate, soil, and topography are suitable for rattan species environment.
- b. Having sufficient number of trees as supporting trees.
- c. It is preferable that supporting trees for rattan to climb are those of deciduous ones or trees having thin crown.



Picture 8. Seedlings from natural plants



Picture 9. Instant planted seedlings

Supporting trees requirements:

|                         |   |
|-------------------------|---|
| ✓ Large Diameter Rattan | Strong-stemmed high climbing trees, positioning first and second layer crowns |
| ✓ Small diameter rattan | Medium-size climbing trees, positioning third layer crown                     |

## V.2. Land Setting

- a. Land preparation
- b. Boundaries setting pattern
- c. Defining boundaries which are not allowable to open, such as gorge, river banks, water spring, land which requires drainage facilities, inspection roads, waterlogged field, and areas designated for other infrastructure development.
- d. Field inspection results should be mapped.
- e. Clear boundaries marks should be provided.

## V.3. Establishment Of Inspection Roads And Working Huts

Inspection road should connect each other; road cross-sections are sloped to the outer side to prevent ridge erosion.

In each compartment there should be working hut for equipment storage rest areas and overnight, situated at the centre of plantation compounds, and at the transportation road sides.

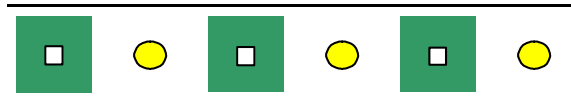
#### V.4. Field Preparation

Field preparation is meant to provide pre-conditions for accelerating plantation growth.

|                        |   |
|------------------------|---|
| ✓ Weeding              | Improvement of soil physics characteristics |
| ✓ Drainage arrangement | Arrangement for light requirements          |

#### V.5. Planting Techniques

|                         |                                     |
|-------------------------|-------------------------------------|
| ✓ Row system            | Ordered climbing trees              |
| ✓ Cesspool/group system | Supporting trees are not in cluster |

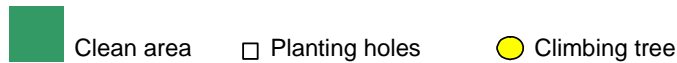


Picture 10. Cesspool/Group system



Picture 11. Row system

Remark  
:



#### V.6. Land Clearing And Preparation Techniques

Two techniques of land-clearing and land preparation that can be chosen are:

- (1) Cesspool/Group System; land preparation around planting holes at radius 100x100 cm.
- (2) Row System; land clearing with 1–2 m width, land preparation around planting holes of 20 cm depth, radius 100x100 cm.

### V.7. Planting Space

Are the following items needed to be taken into consideration in determining planting space?

- Tree habitat (number of clumps)
- Harvesting facilities at the end of the cycle
- Cane production per hectare.

Planting spacing for small diameter rattan

|                |  |
|----------------|--|
| Cesspool/Group | 10 x 10; 6 4 m                               |
| Row system     | 6 x 2 m; 7 x 7 m; 9 x 2 m; 5 x 5 m; 3 x 15 m |

Planting spacing for large diameter rattan

|                |  |
|----------------|--|
| Cesspool/Group | 10 x 10; 6 4 m                               |
| Row system     | 6 x 2 m; 7 x 7 m; 9 x 2 m; 5 x 5 m; 3 x 15 m |

### V.8. Seedling Transportation To The Planting Field

- Seedlings must be watered before transporting them to the field
- Transportation time should be
- During transportation time, seedlings tending should also be done
- Seedlings which are directly planted should be tended by watering
- Avoid the seedlings defects during transportation and unloading.

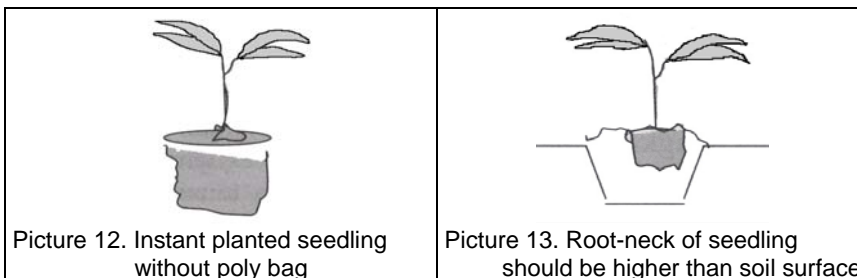
### V.9. Planting Time And Technique

- Should be during sufficient and well-distributed rainfalls

- Should be done in the morning, afternoon times or cloudy situations.

Planting sequences:

|   |                                       |   |                              |
|---|---------------------------------------|---|------------------------------|
| 1 | Tearing plastic bag                   | 3 | Remove the Plastic bag       |
| 2 | Place seedlings inside planting holes | 4 | Heaping soil until root-neck |



## VI. RATTAN MAINTENANCE

### VI.1. Replanting

- Replanting is necessary if the growing percentage is below required minimum
- Done on died, withered, broken plantations
- Done in first and second years of rainy season
- Repeat while sufficient amount of rainfall
- Use seedlings from nursery
- At the end of third year, minimum growing rate of 60% should be achieved.

### VI.2. Weeding

- Freeing the plantation from weeds, such as grasses and undergrowths

- Crown pruning
- Done periodically
- Equipped with hoeing
- Done in first and second years
- Done every 3 months until the plantations reach 3 year old
- Clearing rows/lines around planting clumps of 1 meter width.

### VI.3. Pest And Diseases

Rattan of *Palmae* species is generally less resistant to insects.

- Fungi infestation of *Colletotrichum gleosporoides* can be eradicated by Bayleton (0.02%), with spraying interval of 10 days.
- Fungi infestation of *Rhizoctania solani* on root neck of manau rattan plantations at the nursery, it can be eradicated with Captafol 4.5 grams per liter or Capan 1.8 grams per liter.

Commonly found pests and diseases attacking rattans are as follows:

| Rattan   | Pests or diseases         | Plant part attacked  |
|--|---------------------------|--|
| Rattan sega ( <i>C. caesius</i> )  | Fungi and worm            | Damaged leaves and broken at the tips  |
| Rattan manau ( <i>C. manan</i> )   | Infestation pest          | Swollen at lower parts of cane   |
|  | Infestation Beetle Larvae | Black-spotted at cane nodes  |
|  | Infestation Grasshopper   | Attack leaves  |
| Rattan manau ( <i>C. manan</i> ), irit ( <i>C. trachycoleus</i> ) and sega ( <i>C. caesius</i> ) | Leaf fungi disease        | Tips of young manau rattan hollowed and brown ring/spots on, irit ( <i>C. trachycoleus</i> ) and sega ( <i>C. caesius</i> ) rattan |

#### VI.4. Fire Prevention

Involving smallholder's rattan in terms of fire preventing is an effective way to protect rattan garden from the fire hazards.

Methods of fire prevention toward rattan garden, as follows:

##### Yellowbelt

- Clearing dry grasses and wood residues around rattan yards by establishing canals or drainages of 2–5 meter width.

##### Greenbelt

- Establishing fire breaks with fire-resistant trees.
- Establishing fire observation tower equipped with alarm equipments, such as gong, 1 (one) fire tower for each 1.000 hectares and built at high and strategic places.

### VII. RATTAN COLLECTING AND HARVESTING

Mean annual increment growth (MAI) of most rattans has not been known yet, some of them are as follows:

| Species        | Mean annual increment                |
|----------------|--------------------------------------|
| Rattan sega    | 1.75–1.90 m and 5–6 m (first 5 year) |
| Rattan irit    | 1.25 m                               |
| Rattan semambu | 0.11 m                               |
| Rattan manau   | 1.2–3 m                              |

The characteristics of rattan which is ready to harvest are:

- The leaves and thorns are already broken.
- The thorn color has changed into black or blackish yellow.
- Part of the cane is no longer wrapped with leaf midribs and become green in color.

Rattan harvest method usually applied by local people is as follows:

- Thorn and leaf midrib sticking to rattan canes are cleared by knocking with upside part of chopping knife.
- Rattan canes which are free from thorns and leaf midribs are cut at 1–1.50 meters distance from cane base.
- Having been released from thorns and leaf midribs keep the cane away in order to facilitate the works.
- Cane which tip portions sticking to climbing trees can be released by using pluming pole with knife at the tips or cut by climbing on trees.
- Canes which are already cut according to market demand to be pulled
- Along with rattan cane pulling, thorns and leaf midribs are cleared.
- Canes which are already been pulled and bundled be transported to concentrating sites.

Generally, small-diameter rattans such as irit and sega, at 7–10 years old are sufficient to produce marketable quality rattans. Cane production per clump at 5 years old on suitable land condition are as follows:

| Species     | Total (pieces) |
|-------------|----------------|
| Rattan irit | 30             |
| Rattan sega | 20             |



Picture 14. Rattan smallholder