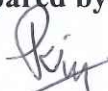

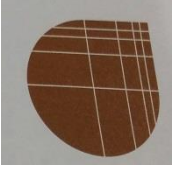


ASRAMA RAYA SDN BHD

**STANDARD OPERATING PROCEDURE
MAINTAINING PLANT COMMUNITIES
AND RESTORE ITS HABITAT FEATURES**

AR/SOP 9/ Maintaining Plant Communities /V3	
Prepared by  Name: Pong Kuan Kin Position: Research Assistant Date: 19-05-2022	Approved by  Name: Chan Kim Men Position: Forest Manager Date: 30-05-2022
Version No.	3
Relevant FSC Indicator	6.6.1, 6.6.2, 6.6.3
Approval Date	30-05-2022

CONFIRMED
30 MAY 2022

	ASRAMA RAYA SDN BHD		Ref.	AR/SOP 9/Maintaining Plant Communities/V3
	Policy/Procedure/ Title	Standard Operating Procedure Maintaining Plant Communities and Restore Its Habitat Features		
	Relevant Indicator	6.6.1, 6.6.2, 6.6.3		
	Prepared by	Research Assistant	Approved by	Forest Manager
	Version No.	3	Approval Date	30-05-2022

1. PURPOSE

To maintain the plant communities and maintain, enhance or restore habitat features found within native ecosystems in which the Management Unit is located.

2. SCOPE

This SOP applies to forest management team who responsible to maintain the plant communities and restore their habitat features found in ARSB HS Petuang concession.

3. RESPONSIBILITIES

The forest management team and forest workers are responsible for:

- Develop a plan to maintain the plant communities.
- Maintain, enhance or restore their habitat features found in ARSB HS Petuang concession.

The Forest Manager are responsible for:

- Training of staff and forest workers.
- Ensuring the implementation of this procedure.
- Monitoring effectiveness of the procedure.

4. PROCEDURE

4.1. Maintaining Plant Communities

1. Chose selection cutting as the silvicultural system (individual or groups of un-even aged trees are harvested to make space for natural regeneration) in ARSB HS Petuang concession.
2. Select and mark common and commercial trees before harvesting.
3. Harvest those marked trees based on the cutting limits which have been approved by Terengganu State Forestry Department (TFSD).
4. Use Logfisher (long cable timber harvester) to pull log from deep, narrow ravine and landed on log landing/ logfisher trail. The logfisher able to reduces soil disturbance especially in steep areas.
5. Do not harvest mother trees, rare and endangered tree species and protected tree species listed by TFSD.
6. Do not harvest trees which is found to be main sources of food and breeding niches for birds.

4.2. Maintaining, Enhancing or Restoring Plant Habitat Features

1. Select restoration methods which is the gap planting for restoring the plant habitat features before conducting the restoration.
2. Chose high quality tree species and seedlings for replanting before conducting the restoration.
3. Selection of the tree species are priority over high-quality local species such as Meranti (*Shorea* spp.), Meranti Seraya (*S. curtusii*), Meranti Tembaga (*S. leprosula*), Meranti Sarang Punai (*S. parvifolia*), Balau (*Shorea* spp.), Bintangor (*Calophyllum* spp.), Keruing (*Dipterocarpus* spp.), Mersawa (*Anisoptera* spp.), Kembang Semangkok (*Scaphium* spp.) and Kempas (*Koompassia malaccensis*).
4. Select logged-over forest areas, open areas, log fisher trails / skid trails for the restoration.
5. Determine the number of tree, height and diameter sizes of the tree species before conducting the restoration.
6. Prepare and refer a topographic map to determine the location of restoration areas.
7. Record the geographical positioning system (GPS) of the restoration area using Garmin GPS tracker.
8. Seed collection and seedling production.
9. Plant the tree.

4.2.1. Gap planting

1. Select open area along logfisher trails should be selected for gap planting / replanting.
2. Areas to be planted are more than 0.5 ha in size regardless of shape or line planting is about 3m x 3m.
3. Use tractor-loader backhoe for making planting holes.
4. Select and plant quality and healthy seedlings of dipterocarps species and commercially valuable non-dipterocarps species on the soils of the open area.
5. The selected mother tree species must be 45 - 60 cm diameter breast height (DBH) from regeneration sampling (RS) species.

4.2.2. Enrichment Planting

4.2.2.1. Work Activities Leading to Enrichment Planting

1. Conduct Post-Felling (Post-F) within two to five years after a compartment is harvested. Refer Manual Perhutanan 2003 Jilid III (2005) (see Bab 8: Silvikultur Hutan Asli - Inventori Hutan Selepas Tebangan) for more details and information.
2. Examine and evaluate the post-F inventory summary. Conduct ground truthing on at least 10% of the total inventory plots.
3. Interpret the post-F inventory summary with the site inspection which emphasize the following aspects:
 - Distribution of the poles and seedlings
 - Species and sizes of poles and seedlings
 - Distribution of the poles and seedlings
 - Open areas resulting from establishment of log landings, temporary sheds for logging operators, etc.
4. Based on the examination and interpretation above, suggestion for enrichment planting will be made by the District Forest Officer (DFO).
5. The Assistant State Director of Forestry (ADFO) responsible for the silviculture will further investigate on the ground at least 20% of the total area concerned to confirm the actual need the enrichment planting in the area.
6. Enrichment planting must be carried out no later than three (3) years after the implementation of post- inventory.
7. Careful ground checks of the area to be rehabilitated through enrichment planting need to be done in order to get a general picture of the general ecology and the vegetation status.
8. Ideally, the area will be divided into small workable blocks of the 10 -15 ha.

- **Preparation Before Conduct Enrichment Planting**

1. Prepare maps of the proposed compartment based on the topographic map of scale 1:50000. For ease of management each compartment need to be divided into small planting blocks each of size 10-15 ha.
2. Prepare map of enrichment planting area (scale 1:5000). The map of the enrichment planting area contains the following information:
 - a) Title of the plan
 - b) Compass bearing
 - c) Plan scale
 - d) Forest district
 - e) Forest reserve
 - f) Compartment no.
 - g) Size of compartment
 - h) Key plan of scale 1:50000
 - i) Topographic sheet no.
 - j) Boundary of the enrichment planting area
 - k) Bearing and distance from station to station
 - l) 20-meter interval contour lines
 - m) Forest roads, log landings and rivers / streams (if any)
 - n) Enrichment planting blocks
 - o) Number and size of enrichment planting blocks
 - p) Legend
 - q) Reference point and boundary starting station of enrichment planting block as well as bearings and distances from reference point to boundary starting station if reference point and boundary starting station are not located in the same place
 - r) Name, position and signature of officer responsible for the preparation of the plan together with the date
 - s) Name, position and signature of officer certifying the plan and the date
3. Prepare of enrichment planting block area (scale 1 :500). The plan of the enrichment planting block area contains the following information:
 - a) Title of the plan
 - b) Compass bearing
 - c) Plan scale
 - d) Forest district
 - e) Forest reserve
 - f) Compartment no.
 - g) Size of compartment
 - h) Key plan of scale 1:50000
 - i) Boundary of the enrichment planting area
 - j) Forest roads, log landings and rivers / streams (if any)
 - k) Enrichment planting blocks
 - l) Number and size of enrichment planting blocks
 - m) Legend
 - n) Starting line of the block enrichment planting block
 - o) Site lines, bearings and distances
 - p) Planting rows, distance, position as well as number of planting holes
 - q) Plant species

- r) Name, position and signature of Officer responsible for the preparation of the plan together with the date
 - s) Name, position and signature of Officer certifying the plan and the date.
4. The enrichment planting team must consist of six (6) people to perform the following work:
 - a) marking and clearing the boundaries of enrichment planting block
 - b) 'rentis' along the areas
 - c) cleaning and marking planting lines and site of planting holes
 - d) prepare planting holes and seedlings.
 5. Submit one (1) copy of the plan of enrichment planting area and enrichment planting block area to team leader.
 6. The team leader will determine the location of the temporary nursery in the field and obtain the seedlings and fertilizer supplies.
 7. The team leader must prepare and bring the following equipment:
 - a) plan of enrichment planting area and enrichment planting block area
 - b) measurement tape (2 units)
 - c) compass (2 units)
 - d) knife
 - e) paint and brush or ribbon
 - f) stationery
 - g) excavator
 - h) containers
 8. Once the reference point for the boundary starting station of the enrichment planting block is marked, the boundaries of the enrichment planting block will be marked and cleared as follows:

- **Enrichment Planting Work Boundary Demarcation and Certification**

1. Identify the position of the reference point on the ground. Based on this reference point, the team leader will identify and mark the position of boundary starting station.
2. Mark boundary stations using round wooden spikes or PVC pipes (unplasticized poly vinyl chloride pipe) about 10cm in diameter and planted with top soil approximately 1.3m high.
3. Mark station spikes with red paint and station alphabet on the top.
4. Mark the trees along the border with one (1) ring of red paint at a distance of approximately 10 m between each tree.
5. Clear the boundary to a width of not less than 1 m.

4.2.2.2. Enrichment Planting Method

1. Once the boundary of enrichment planting block is marked and cleared, determine and mark the position of enrichment planting block.
2. Mark and plant the starting line using round wooden spikes or PVC pipes about 10cm in diameter with the top of the ground about 1.3 m high (these spikes are marked with yellow paint at the top and written below the letter "PGT", enrichment planting block numbers and bearing of site line).
3. Mark the end of the site line using round wooden spikes or PVC pipes about 10 cm in diameter and planted with the top of the ground about 1.3 m high (these spikes are marked with yellow paint at the top and written below the letter "END GT", enrichment planting block numbers and bearing of site line).
4. Mark the site line and the base line as follow:
 - a) the site line is in a north-south direction
 - b) the distance between the planting rows is 10 m
 - c) mark the starting of the planting line above the site line with a round wooden spike or PVC pipe about 5 cm in diameter and planted with the top of the ground approximately 1.3 m high
 - d) mark the spike with yellow paint at the top and written below the line number of the planting.
5. Once the site line and the base line are marked, forest workers are responsible to clearing the 'rintis', cleaning and marking the planting lines as well as marking the planting hole as follows:
 - a) Clearing the 'rintis', cleaning and marking planting lines:
 - planting line is 90° from the site line (in an east-west direction)
 - clear the plants at least 1m wide and plants less than 10 cm in diameter and cut close to the soil
 - mark the end of the planting line using round wooden spikes or PVC pipes about 5 cm in diameter and plant with the top of the soil about 1.3 m high
 - mark this spike with red paint about 10 cm wide at the top and written below the planting line number.
 - b) Marking the site of planting holes:
 - The distance between the planting holes is 3m
 - Mark the base of the planting hole with a bamboo spike about 2cm wide with the top painted blue
 - Plant spikes with the top of the soil about 1 m high
 - Write the site number of the planting hole at the top of the spike (below the painted part)
 - planting hole site does not necessarily follow the specified distance. The planting hole site can be changed, if at the site of the plant hole site there are large trees, tree stumps, ravines, rocks or other obstacles. If the plant hole site had to be changed due to such obstacles, priority planting is 1 m to the right of the crop line but the estimated crop distance is calculated starting from the site of the original hole set.

6. Mark the enrichment planting block plan should be marked as follow:
 - plant hole site that cannot be planted due to rocky or other reasons
 - plant hole site that does not need to be planted because there is already an original sapling of the species of choice (the species of choice also need to be recorded).
7. Divisional Forest Officer (DFO) will check on the all the preparation of enriching planting blocks including planting lines, base lines, planting holes, etc.

- **Preparation of Plant Holes**

1. Crop holes are provided at sites that have been marked with spikes during the preparation of crop blocks (these spikes should be re-piled next to the provided crop holes).
2. Planting hole size is 15 cm in diameter and 30 cm deep.
3. Before planting, rock phosphate fertilizer must be sown into the planting hole (approximately 50gm perforation).
4. If planting holes cannot be provided at the marked site due to obstructions such as roots, rocks or others, planting holes can be altered preferably not exceeding 1m to the right of the crop row.
5. If there are native seedlings of selected species around not more than 1 m from the site of the marked plant hole, then the plant hole should not be provided because the seedlings do not need to be planted.

- **Planting**

1. Remove the planting pit carefully so that the pot media does not relay before the seedlings are planted.
2. Insert the seedlings carefully into the planting hole and then completely replanted properly using the soil of the excavated hole.
3. Attach the pot to the end of the plant site spikes.

References

Sheikh Ibrahim, S. A. (2006). A Manual of Enrichment Planting in Logged-Over Forests in Peninsular Malaysia: Malaysian-ITTO Project on sustainable forest management and development in Peninsular Malaysia: PD 185/91 Rev. 2 (F)- Phase II. Forestry Department Peninsular Malaysia, Kuala Lumpur, Malaysia.

Manual Perhutanan 2003 Jilid III (2005). Kuala Lumpur: Forestry Department Peninsular Malaysia.

Appendix 1.
Relevant resource person

No	Name	Address	Name/Phone No.
1	Terengganu State Forestry Department	Tingkat 8, Wisma Negeri, 20200 Kuala Terengganu	Dato' Norhaidi bin Yunus 09-6222444
2	District Forest Office of West Terengganu	Batu 21, Jalan Besar Ajil – Kuala Berang, 21800 Ajil, Terengganu	Mr. Mohd Hafiz bin Hamzah 09-6811259
3	Forest Research Institute of Malaysia (FRIM)	Institut Penyelidikan Perhutanan Malaysia, 52109 Kepong, Selangor	Dr. Hamdan bin Omar / Dr. Wan Shukri / Dr. Aisyah 03-62797200
4	Raznada Enterprise	134B, Tingkat 1, Jalur Bangsa Sdn Bhd, Jalan Sultan Zainal Abidin, 20000 Kuala Terengganu.	Abdul Razak Husin 014-8351511