

5. Enrichment Planting in Logged-Over Forests*

5.1 Justification

This method is commonly used in logged-over forests (mainly evergreen), by planting commercially important indigenous tree species, mainly dipterocarps. Dipterocarps have shown a wide range of survival rates and generally seedlings planted under partial shade survive better than those planted in open areas.

Past experiences with enrichment plantings have been varied (Adjers *et al.* 1995). The responses have been promising in situations where care has been taken to use good planting stock and where weeds and over-storey cover have been controlled. In other situations, particularly where the canopy cover is too great, many of the planted seedlings stagnate or are overcome by weed competition and the approach has failed (Ramos & Delamo. 1992). Methodologies need to be developed for the specific conditions present at each site. Enrichment may be especially difficult in old regrowth forests where a canopy of pioneers is well established.

5.2 Implementation

5.2.1 Line Planting:

- Planting lines are created at intervals of 10m. The forests should be opened to a 2 m width and the planting points are 3 m apart.
- Non-commercial small trees, shrubs and undergrowth along the lines are cleared. Non-commercial trees in the lines are selectively ring-girdled to open up the upper canopy.
- It is recommended to use tall plants raised in larger polythene bags. They may have a better chance of survival against the weeds.
- In line planting, different line directions have been recommended. For practical efficiency, it is best to lay the lines at a 90 degree angle to the main access for easier distribution of the seedlings and also it is easier to relocate during maintenance.

Decisions on line width, time of line opening, etc., are matters for research in particular sites with a particular (group of) species. An example from a 15 year trial in Tapah Hill Forest Reserve, Malaysia, showed that different times of girdling to open the canopy have different effects on growth performance of Dipterocarp seedlings planted. The treatment adopted for the trial was poison-girdling of all trees within a zone of 0.9 to 1.8 m on either side of the planting lines. Based on the result, it is recommended to open the canopy at the time of planting or at three months after planting.

5.2.2 Gap Planting:

For gap planting, many methods have been tested in different places with different results. The following is an example from Carles Garcia and Jan Falck (2003):

A 20 x 20 m grid is created by cutting systematic lines 20 m apart. Stakes placed at every 20 m along the line indicate the quadrat centre. Each quadrat is 20 by 20 m, and is further subdivided into sub-quadrats of 10 by 10m.

Within each sub-quadrat, the gap is located at the most suitable place for planting. The field crew has to decide whether planting is necessary in the sub-quadrat based on the

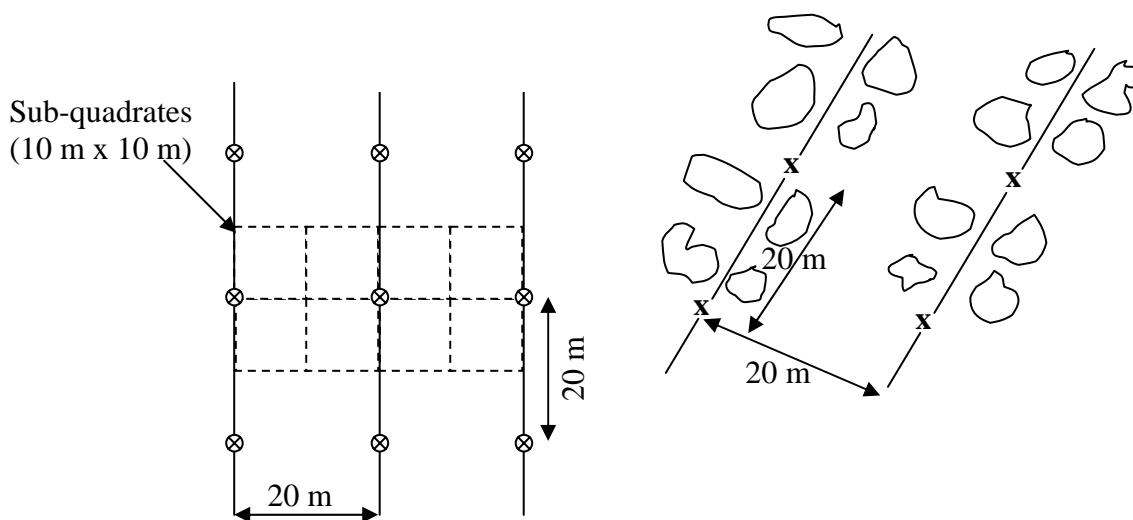
(*): This section was extracted and modified from Carles Garcia and Jan Falck (2003).

presence or absence of natural regeneration. If there are fewer than five seedlings of commercial species within the sub-quadrates, it should be planted. In gaps of about 3-4 m diameter, a cluster of three seedlings is planted, each 1-1.5 m from the gap centre.

The choice of planting gaps inside the sub-quadrates rest on the crew according to certain criteria:

- The spot already has a natural gap to minimize further opening;
- The spot is suitable for planting, i.e. away from obstacles, e.g. rocks, streams, steep slopes, buttresses of big trees, etc.;
- If there is no natural gap, create one by girdling some undesirable trees.

Two rounds of shade adjustment may be necessary. After 1-2 years following planting the overhead shade has to be opened. The second round should be about four years after planting. Identification of the appropriate timing for early shade removal is an important silvicultural tool, to ensure good growth and survival of the seedlings. Any delay in the early treatment to release the planted seedlings from overhead shade will be detrimental to the future development of the trees.



Decisions on the widths of planting lines and gaps to optimize plant growth have always plagued the manager's mind. In general, wider openings are better but more costly (Adjers et al., 1996, cited in Carles Garcia and Jan Falck, 2003). Also there is a risk of promoting weed growth causing more shading to the planted seedlings.

Both line planting and gap planting are suitable methods but it has been suggested that line planting provides less favourable light conditions for seedling growth as compared to gap planting. Gap planting has also been found more efficient and effective than line planting in terms of cost and keeping the undergrowth suppressed.

Please refer to Appendices and Annex below:

- Appendix 1 – Species selection
- Appendix 2 – Seed procurement
- Appendix 3 – Nursery operation
- Appendix 4 – Plantation operation
- Appendix 5 – Tending the plantation
- Appendix 10 – Some tree species producing non-timber forest product
- Annex 1 – Seed requirement calculations