Experimental planting for restoration of tropical rainforest ecosystems in Sarawak, Malaysia

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Experimental planting for restoration of tropical rainforest has been carried out in Japan-Sarawak Friendship Forest in Niah, Sarawak, Malaysia since 2000. In the site (approximately 70 ha), three types of vegetation, i.e., grassland, secondary forest, and remnant forest, developed as a result of anthropogenic activities (Figure). Seedlings of dipterocarp and other indigenous tree species (20 species, 26316 individuals) were planted by "Island & Corridor Planting Method" in each vegetation type. So far the study indicated that the seedlings planted in secondary forest kept a higher survival rate at the early growing stage (Hattori et al. 2005). Therefore, this study aimed at clarifying the relationship among soil properties, growth performance of planted seedlings, and eco-physiological characteristics of the secondary forest, and finally, developing a restoration technique suitable in the tropical rain forest.

Seventeen Islands (14 m x 14 m; 36 seedlings / plot) in the secondary forest were selected randomly for the research. The planted seedlings were *Dryobalanops beccarii, D. lanceolata, Dipterocarpus tempehes, Parashorea macrophylla, Shorea macrophylla, S. ovata,* and *S. parvifolia*. Height, diameter, and mortality of seedlings were surveyed at 0, 12, and 24 months after planting. Soil samples at the depth of 0-5 cm and 20-25 cm were taken for determination of general soil physico-chemical properties. Soil hardness was evaluated in situ at the depth of 0-60 cm, using a fall-cone type soil penetrometer (HD-60, Daito Green, Japan). Stand structure and species composition of the secondary forest were surveyed. Tree bark of dominant species in the secondary forest, i.e., *Macaranga gigantea* and *M. hosei*, was collected and analyzed to determine the content of Ca, Mg, K, Na, and P.

In the secondary forest, *Macaranga gigantea, M hosei, Ficus stolonifera,* and *Glochidion pubicapsa* were rich in number. Among the content of elements determined using the bark of *Macaranga* species, Ca was the highest, followed by K, Mg, P, and Na. As the tree stem density was higher, the content of soil exchangeable Ca and pH level were lower. This was resulted from a vigorous absorption of soil Ca by the trees in the secondary forest, due to their rapid growth in situ.

On the other hands, soil hardness at the depth of 0-40 and 0-10 cm were correlated with the diameter growth of secondary trees and planted dipterocarp seedlings, respectively. Therefore, soil hardness is one of the most effective indicators for the growth performance of both trees in the secondary forest and planted seedlings, which can be easily predicted by the measurement in the field.

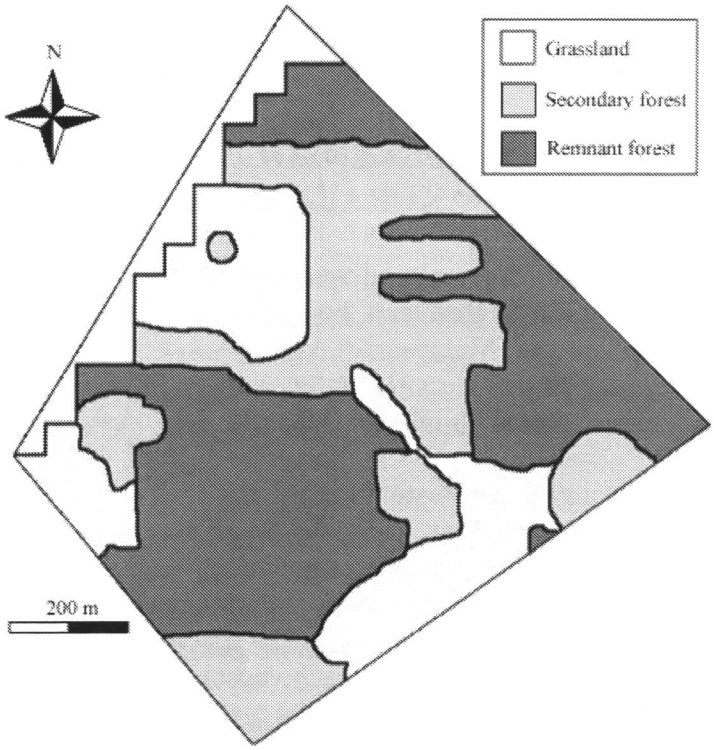

Fig. 1 Three vegetation types in the study site.

REFERENCES

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