

## Rehabilitation and recreation of degraded forest area in the tropics based on soil properties

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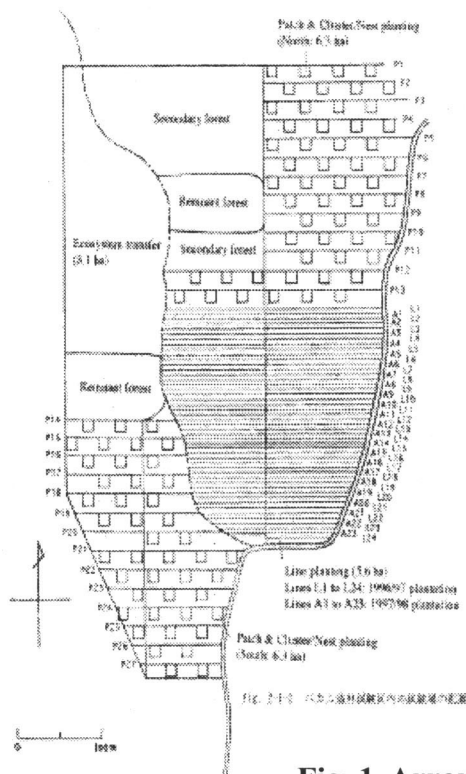
Most of the upland soils in the tropics could be considered as moderately to strongly weathered soils with strong acidity. The distribution is very extensive on the hill and mountain excluding lowland or coastal areas. Ferralsols, Nitisols, Alisols, and Acrisols (FAO/UNESCO, 1974) or Ultisols, Alfisols or Inceptisols (Soil Survey Staff, 1992) are the major soil types on this region. Among them, Alisols showed a strong acidity due to high content of exchangeable aluminum together with high activity clays in soils. On the other hand, Ferralsols, Nitisols, and Acrisols contain low activity clay with certain amount of exchangeable aluminum. In both cases, acidity due to the presence of exchangeable aluminum would be the strongest constraint for crop cultivation together with low fertility caused by strong weathering. In addition, mountainous region is universally utilized for agricultural practice by the local people, and therefore, productivity of crops is generally very low.

When the local people open this type of land and continue to use it for several years, depletion of organic matter in the surface soil by both decomposition and soil erosion as well as accelerated acidification in the subsurface soils proceed quickly due to high temperature and humidity and heavy rain. Once degraded by these processes, the soil could not be utilized any more and be left for fallow for several years. For the next crop cultivation, at least more than 4 years would be necessary to have an appropriate regrowth of the vegetation. The time necessary for it differs depending on the climate and soils.

Ecosystem rehabilitation project by tree planting has been attempted since 1995 in Bakam Forest Reserve (BFR) and Niah Forest Research Station, Miri, Sarawak, Malaysia. In BFR, line planting method and patch & cluster/nest planting method were adopted for this purpose for 1st (December 1996 to February 1997) and 2nd (December 1997 to February 1998) plantings (Fig. 1). Because the severe drought occurred at the beginning of 1998 (during 2nd plantation), adaptability to such a droughty condition of *Koompasia malaccensis* and *Parashorea smithesii* followed by *Dryobalanops aromatica* and *D. lanceolata* were found to be higher, based on the ecophysiological properties of 9 domestic tree species.

At Niah Forest Research Station, 20 species were planted on March to April in 2000 using "Island-corridor" plantation scheme. This scheme seems to be an improved system for planting trees for ecosystem rehabilitation, compared with the patch and cluster/nest planting scheme adopted in BFR. The growth of the seedlings of seven species among 20 species planted has been monitored since January, 2000 till now. This new planting scheme aims at to guarantee the higher survivorship of planted seedlings against drought and high temperature by higher local density.

Rehabilitation of the degraded ecosystem could be achieved as the increase in sensitivity and subsequent recovery to the environmental change. Soil weathering status was suggested as the most important soil factor to evaluate the current status of degradation.



**Fig. 1. Arrangement of planting plot in BFR.**

**REFERENCES**

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