

Vegetation recovery after shifting cultivation in Sarawak

- Effects of burning strength on early stage of the secondary succession -

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Shifting cultivation has been one of a major agricultural activity in Sarawak, Malaysia. The shifting cultivation with a long enough fallow period has been considered to be in harmony with the forest environment and the increase of waste lands or the degradation of tropical rain forest has never happened in the traditional shifting cultivation. However, recent explosion of population density and involvement into world commercial activities made fallow length shorter and the increase of rural land area is resulted.

In Sarawak, Malaysia, the area of cultivated land changed from forest were doubled (from 28,000 ha to 57,000 ha) and the forest land decreased from 9,100,000 ha to 8,000,000 ha during 1963 and 1991 (Keong, 1998). In this condition, the annual rate of land conversion to shifting cultivation is 75,000 – 150,000 ha, which is 0.6 – 1.2 % of the total land area and 2.7×10^6 ha is either under use or has been used at least one for shifting cultivation, which is 22 % of total land (Teng, 1993). The present land-rotation system consists of continuous rice cropping for 2 years or more with a shorter fallow period of about 5 years. This system with shorter fallow period accelerates wide expansion of degraded land. Once the rural land is formed in tropical area, the rehabilitation of the degraded area is very difficult due to the violent run off caused by heavy rain and deathly dry and hot soil surface by strong sunshine.

The vegetation recovery process after burning is an important knowledge to rehabilitate the degraded land before the condition become fatal. There are a considerable number of studies on the vegetation recovery after shifting cultivation or forest burning for tropical rain forests. However, none of them analyzed the effect of a burning strength on the vegetation recovery process after shifting cultivation, although the strength can control by man and hence the most important keys to build up a proper management plan of shifting cultivations. The purpose of this study is to make clear the effects of fire strength in shifting cultivation on early stage of secondary succession.

This study was carried out as a part of study series for sifting cultivation conducted in Sarawak, Malaysia. In this paper, we focus on early stage of secondary succession (one or two years after burning), because the early stage is the most important phase not only to whole recovery process itself but also to rice cropping which carried out one or two years after burning. A suitable burning strength concerning to vegetation recover should be a good criteria to make a proper management system in shifting cultivations.

Four study sites, Sabal, Balai Ringin and Niah, were selected to compare site effects on vegetation recovery. In order to analyze the effect of burning strength on vegetation recovery, we conducted experimental shifting cultivation in which the burning strength differed as 0, 100, 200 and 300 ton/ha in Sabal, Balai Ringin and Niah and 0, 20, 100 ton/ha in Bakam, by given amounts of vegetation biomass were burned as fuel. The number of germination and growth of the germinated seedlings in terms of diameter, height and biomass were measured.

Species composition of germinated seedlings was surveyed. The germination test for buried seed conducted in Niah and Bakam.

The number of germination decreased with burning strength but the growth of the seedlings was promoted by burning. The growth was the best in moderate burning strength in first year while the best in stronger burning strength in second year after burning. Such site factors as original biomass, soil property and invasion of exogenous species also affects to the germination and growth of seedlings. Buried seeds were almost killed by the burning. Species composition of the germinated seedlings was changed in burned sites from unburned sites.

Stronger the burning strength resulted in less the number of germination and faster the growth of germinated seedlings within the burning strength studied. Reduction of the number of germination is preferable to crop cultivation in terms of less weed. On the other hand, promotion of the growth is considered to provide a good site condition either for crop or germinated seedling which contributes vegetation recovery. It is concluded that a burning in shifting cultivation promotes both crop production and vegetation recovery when the burning strength is properly managed.

REFERENCES

- Keong, V. P., 1998. Changes in land use. In *The encyclopedia of Malaysia*, Vol. 1. *The Environment*(S. Sani ed.): 90-91. Archipelago Press, Singapore.
- Teng, S. C., 1993. Shifting cultivation of hill paddy – A traditional method of utilizing and managing natural soil fertility for rice production in Sarawak. Technical Paper 9, 21 pp., Soil Division, Research Branch, Department of Agriculture, Sarawak, Kuching.