Site selection for shifting cultivation by the Iban of Sarawak, Malaysia with special reference to indicator plants

- A case study in Mujong River-

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Introduction

The importance of indigenous knowledge has been recently receiving considerable attention in the context of environmental management and sustainable development. In Sarawak, Malaysia, various ethnic groups have conducted shifting cultivation for rice production. Many researchers have reported their profound knowledge on plants useful for various purposes such as for food, medicine, timber and fiber with their own classification systems of these plants. It has also been found that these groups investigate vegetation condition or particular plant species (indicator plants) as important and easily perceptible criteria when they select sites suitable for shifting cultivation. However, there was no detailed survey carried out so far from the viewpoint of ecology. The objective of this study is to clarify the indigenous knowledge of the Iban people, who is the largest ethnic group in Sarawak, about the site selection method with special reference to indicator plants in secondary forests, and to analyze the relationships between the indicator plants and the properties of soils where they grow.

Materials and Methods

Field survey was conducted at 5 longhouses of the Iban located on the bank of Mujong River, which is a sub-tributary of the Rajang River, the longest river of Sarawak. Twenty five sites suitable and 17 sites unsuitable for shifting cultivation were selected based on the perception of the land owners with their knowledge of indicator plants. Vegetation survey was conducted at a 10×10 or 20×20 m^2 quadrate in the sites. The frequency of occurrence for all plants, plant density, and tree's diameter were recorded based on the Iban's nomenclature. Within the quadrate, soil survey was also conducted and soil samples were collected from the depths of 0-10 and 30-40 cm for determining the physico-chemical properties. By using a plant list which was inventoried from the results of vegetation survey, the land owners were asked whether each plant indicated fertile or infertile land. Two indices were defined for further analysis, as follows:

Relative frequency of occurrence of the plant observed (%)
= Num. of unsuitable sites where the plant was observed /
Total num. of suitable and unsuitable sites where the plant was observed

Iban's interpretation of plant (%)
= Num. of the people who answer the plant indicating infertile land /
Total num. of people who answer the plant indicating fertile or infertile land

Results and Discussion

The Iban considered the growth of indicator plants (particularly trees) to be the most important criterion for site selection with other criteria such as soil condition and accessibility to the site. According to the vegetation survey, although totally 252 kinds of plants were

observed including 136 types of trees and 18 type of grasses, only 70 plants were commonly observed at more than 5 sites out of 42 sites surveyed. Among them, 8 kinds of plants including 1 tree, 2 ferns, 2 shrubs and 3 grasses were perceived to indicate infertile land based on the index of the Iban's interpretation of plant. The plants which were strongly perceived to indicate infertile land were Lalang (*Imperata cylindrica*), Kemunting (*Melastoma polyanthum*) and Rumput Belanda. When the two indices, the Iban's interpretation and the relative frequency of occurrence, were compared, it was found that the plants which the Iban perceived indicating infertile land occurred mostly in the unsuitable sites while some of the plants indicating fertile land occurred mostly in the unsuitable sites. Relative density of the plants indicating infertile land was high in the unsuitable sites at early stages of fallow from 1 to 5 years. In contrast, at the later stages of fallow, plants indicating fertile land dominated both in suitable and unsuitable sites. However, the growth of trees was considerably higher in the suitable sites than in the unsuitable sites in terms of the diameter. Thus, at the early stage of fallow, the Iban discriminate land fertility based on the presence of the indicator plants indicating infertile land. With increasing ages of fallow, the Iban discriminate land fertility based on the tree growth.

Significant differences were observed in several soil properties between the suitable and unsuitable sites. For example, the contents of exchangeable K at both depths and Mg at the depth of 30-40 cm were higher in the suitable sites than in the unsuitable fields. In contrast, the Al saturation at the depth of 30-40 cm was higher in the unsuitable sites. The content of exchangeable NH_4 was higher in the suitable sites than in the unsuitable sites while the C/N ratio was higher in the unsuitable sites, indicating higher N availability in the suitable sites. On the other hand, some of the unsuitable sites showed a high value of available P. It might be possible that these differences in soil properties are reflected by the composition and growth of indicator plants. Further studies should be done in order to clarify the indigenous knowledge of the indicator plants in relation to the soil properties.