

# **Patterns of plant-animal interactions and plant diversity in relation with spatial distribution of land use around Lambir Hills National Park**

Kuniyasu MOMOSE<sup>1</sup>, Michi KAGA<sup>2</sup>, Miyako KOIZUMI<sup>2</sup>, Hiroshi TANAKA<sup>3</sup>, Keiko KISHIMOTO<sup>3</sup>, Takashi MATSUMOTO<sup>3</sup>, Takao ITIOKA<sup>3</sup>, Michiko NAKAGAWA<sup>4</sup>, Mitsunori YOSHIMURA<sup>4</sup>, Masahiro ICHIKAWA<sup>4</sup>, Lucy CHONG<sup>5</sup>, Tohru NAKASHIZUKA<sup>4</sup>

<sup>1</sup> Faculty of Agriculture, Ehime University, Matsuyama, 790-8566, Japan

<sup>2</sup> Graduate School of Asian and African Area Studies, Kyoto University, Kyoto, 606-8566, Japan

<sup>3</sup> Graduate School of Humanity and Environment, Kyoto University, Kyoto, 606-8566, Japan

<sup>4</sup> Research Institute for Humanity and Nature, Kyoto, 602-0878, Japan

<sup>5</sup> Forest Research Center, Sarawak Forest Cooperation, Kuching, Sarawak, Malaysia

We studied the effects of land use patterns on plant species diversity and plant-animal mutualistic interactions in the processes of plant reproductions. We settled 33 plots of 0.1 ha having various land use histories: young fallow, old fallow, old rubber plantation, remnant forests, and primary forests. Referring our previous works about plant reproductive ecology, relations among land use types, these distributions, characteristics concerning plant reproductions, and plant species diversity were analyzed using GIS.

Pollination systems and seed dispersal systems were clearly different depending on land use. Such patterns were explained from plant reproductive intervals, which are related with mortality of plants, and habitats required by mutualistic animals. In remnant forests, plants with gravel seed dispersal systems increased, because sink-source balances changed.

In summery, secondary forests are not suitable habitats for plants with long reproductive intervals, and remnant forests are not suitable habitats for plants with long-dispersed seeds. Primary forests are indispensable for plants with such the combination of reproductive characters to regenerate. Only plants with limited types of reproductive characters can invade to human-affected areas or can remain in remnant forests.

However, the spatial distribution of forests modifies the above general conclusion. Plant diversity of remnant forests or old fallows increased if there were relatively large areas of primary vegetation within the surrounding area with a radius of 600 m. In remnant forests or old fallows neighbored by primary forests, plant species compositions and reproductive characteristics tended to be similar with primary forests. On the other hand, areas of remnant forests themselves and ages of old fallows did not significantly affect species components and diversity. Thus, people can continue to use rich biological resources in human-affected areas surrounding primary forests, if primary forests are well conserved.

The villagers used plants common in secondary forests for foods and materials consumed in everyday life and plants found in primary forests for enchantments or constructions during rare events or crucial moments. Such differences were also reflected in folk tails and naming systems of wild plants. Because, secondary forests were rich in species with frequent reproduction and higher values of "r" (potential population growth rate), plants in secondary forests hardly become extinct even under intensive use. If primary and secondary forests are neighboring, flora of the latter became richer affected by the former. Because people walk around secondary forests much more frequently, some rare species were also collected mainly from secondary forests neighboring to primary forests. Thus, populations of useful rare species in primary forests, which are seed sources of the populations in secondary forests, are kept intact.