Conclusion of the workshop and the scopes of the study of biodiversity and carbon in Deramakot RIL sites

Kanehiro Kitayama[1] and Ying Fah Lee[2]

1 *Center for Ecological Research, Kyoto University, 509-3 Hirano 2-Chome, Otsu, Shiga, 520-2113 Japan*
2 *Forest Research Centre, Forestry Department, P. O. Box 1407, 90715 Sandakan, Sabah, Malaysia*

We foresee, when the Kyoto Protocol comes into effect, that the biomass stock will increase in inland and wetland ecosystems through the clean development mechanism (CDM) according to the following scenario: 1) the conversion of non-forests or less-productive open wood stand to fast-growing tree plantations, 2) the increase of agro-forestry practice, 3) the restoration of native forests and 4) the enrichment planting in recovering ecosystems. Among these scenarios, the conversion of non-forests or open forests to fast growing plantations will be implemented in the largest area in Monsoon Asia to achieve the fastest yield per unit area per unit time. This scenario is envisaged particularly in the humid tropics where land conversions took place in the last three decades.

Fast-growing plantations are typically of mono-culture with the lowest level of biodiversity of trees and accompanying fauna. These forests are in many cases of introduced exotic species. Although such forests achieve the most efficient carbon stocking at a shortest time-scale (e.g. 10 years to a few decades) for the first few rotations only, the long-term effects to the global environments can be quite damaging due to 1) the accumulated litter which will produce dissolved organic matter to soil and stream water, 2) the emission of nitrous oxides and nitrogen oxides from leguminous tree plantations, which will not reduce but exacerbate the global warming, 3) increasing the risk of forest fire by higher stocking of fuel load, 4) depleting soil minerals, and 4) the loss of biodiversity which will sustain the ecological health.

These ecological disasters can be prevented in many cases by practicing enrichment planting or restoring native forests thereby biodiversity and biological linkages are kept. For instance, the greater tree species richness may lead to faster decaying of litter, reducing dissolved-carbon loading to stream and the risk of forest fire. Due to the constraints of the current CDM rules, carbon credit is restricted to reforestation and afforestation only. The most efficient way to reconcile carbon stocking with the protection of biodiversity and ecosystem health in tropical rain forests is the truly sustainable management of production forests and the conservation of protected forests. Particularly, the role of production forests to conserve biodiversity and carbon cannot be overstated because their areas are huge and have *de facto* become the reservoir of biodiversity if logging damage is modest. In this sense, the certified production forest of Deramakot can become a pilot site where we can study and demonstrate how to manage biodiversity and carbon.

This workshop has successfully illustrated the importance of the sustainable management of the production forests with reduced impact logging in carbon sequestration and biodiversity conservation. Moreover, most speakers have demonstrated the importance of research, particularly of long-term one. We highlight the following remarks as workshop findings.

1. Reduced impact logging can be effective in increasing carbon stocking as above-ground vegetation by 70 ton carbon/ha on average in comparison to conventional logging.
2. The use of satellite data in evaluating carbon

and biodiversity at a landscape level can be an alternative to ground survey for some taxonomic groups.

3. Reduced impact logging can be effective in maintaining tree-species richness and the regeneration of dipterocarp trees.
4. Strict compliance with reduced-impact-logging guidelines can be effective in limiting logging damage in logged-over lowland mixed dipterocarp forest and in sustaining clean water and the habitat for biodiversity.
5. The natural salt licks in Deramakot can be hot spots of mammalian diversity because a cascade of food web (herbivores to carnivores) appears to be formed. Preservation of such salt licks should be incorporated into forestry planning.
6. The abundance of some insect groups at a higher-taxonomic level can be used as the bio-indicator for assessing the effects of logging especially in the understory.
7. The composition of soil fauna can be used as a bio-indicator for assessing the effects of logging.
8. Long-term monitoring of permanent sample plots can increase the profile and credibility of sustainable management of forests including biodiversity and carbon by developing the baseline and additionality scenarios.
9. The participation of local people can be incorporated in sustainable forestry though such systems as slash-and-char. This system can convert wood wastes into economically valuable goods and prevent forest clearance in the surrounding areas.