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学位論文題名	Impact of silvicultural system on genetic diversity of <i>Shorea parvifolia</i> in the tropical secondary forest, central Kalimantan, Indonesia (インドネシア中央カリマンタンの熱帯二次林に生育する <i>Shorea parvifolia</i> の遺伝的多様性における林業システムの影響)
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【論文の内容の要旨】

Lowland dipterocarps forest in the Southeast Asia is one of the most species-rich in the terrestrial ecosystem in term species richness and endemics, and dominated by dipterocarp species and the woods of dipterocarps have a vital role as tropical timber market of the Southeast Asian countries. Forest management by silvicultural treatment, i.e. selective logging, will harvest the large and commercial tree with 30 years cutting cycle. The main objectives of selective logging is to maintain growing stock and a new regeneration / remnant tree for the next cutting cycle. An application of silvicultural system probably effects on the genetic diversity and the mating system pattern of remnant tree, i.e. *S. parvifolia* trough increasing the distance among conspecific, and decreasing the potentially genetic exchange among remnant tree. Therefore, it will increase the inbreeding and loss genetic diversity of remnant tree. In order to evaluate the impact of silvicultural system and/or the number of logging rotations and enrichment planting (artificial regeneration) on genetic were investigated. In addition, the mating system pattern of *S. parvifolia* in the different the number of logging rotation was being assessed to measure the number of possibility pollen donor and the distance of pollen travel among remnant tree. This study was conducted in the lowland of dipterocarps forest at Sei Seruan block of PT Sari Bumi Kusuma (PT SBK) concession, Central Borneo (00° 38'– 01° 07' S and 111° 54'–112° 26' E). The species as

the subject of a research was *Shorea parvifolia* as the emergent dipterocarp species in lowland dipterocarp forest.

EFFECTS OF DIFFERENT SILVICULTURAL SYSTEMS ON THE GENETIC DIVERSITY OF *Shorea parvifolia* POPULATIONS IN THE TROPICAL RAINFOREST, INDONESIA

This study evaluated the effects of silvicultural systems with differing logging rotations and enrichment planting regimes on the genetic diversity of *Shorea parvifolia*, an abundant and ecologically important tree in Southeast Asian rainforests. The species as the subject of a research was *Shorea parvifolia* as the emergent dipterocarp species in lowland dipterocarp forest. The sample was collected in four silvicultural systems: 1) primary forest (PF), 2) the first rotation of selective logging of trees > 50 cm in dbh (R1), 3) the second rotation of selective logging of trees > 50cm in dbh (R2), and 4) the second rotation of selective logging of trees > 40cm in dbh (R3). . On the other hand, enrichment planting using native species, *S. parvifolia*, will be evaluated as one of additional treatment to increase the genetic diversity in the logged forest.

The result showed that the number of private alleles was not significantly different among treatments ($P < 0.05$) . The other genetic diversity parameters were not significantly different between PF and the other silvicultural systems. The EP population had moderate genetic diversity in terms of N_e , R_s , and the number of rare alleles. The genetic diversity of logged forests was increased by EP, especially with respect to R_s and the number of rare alleles. However, the selective intensive second-rotation (R3) logging of individuals > 40 cm in dbh resulted in a sizable reduction in the number of reproductive trees and a dramatic decrease in the numbers of rare and private alleles, suggesting a negative impact on the genetic diversity of the remaining tree population. Enrichment planting with *S. parvifolia* in the logged forest improved some genetic parameters, significantly increasing the number of rare alleles in R3 in particular.

THE IMPACT OF LOGGING ROTATION ON MATING SYSTEM AND BIPARENTAL INBREEDING OF *Shorea parvifolia* IN THE LOWLAND DIPTEROCARPS FOREST

The selective logging reduces the basal area and reproductive tree without consideration of their abundance or any potential effects on the genetic diversity of the remnant trees. It may affect on the pollen dispersal and mating system patterns of remnant tree in the lowland dipterocarp forest, especially *S. parvifolia*. To evaluate the effect logging rotations with multi rotation on mating system of *S. parvifolia* in the

logged forest, the sample is collected from 3 populations that was primary forest (PF), first rotation (R1) and second rotation (R2) of selective logging (the limit diameter of selective logging in R1 and R2 was > 50 cm in diameter at breast height (dbh)).

The result showed that the selective logging with multi rotation was significantly impact on the pollen differentiation (Φ_{ft}) ($P < 0.05$). Although the estimate of average pollen distance (δ) was not statistically different among treatments ($P > 0.05$), classified as low level of pollen dispersal due to high the number pollen donor inside the plot. The selective logging with multi rotation was significantly different multilocus outcrossing rate (t_m) ($P < 0.01$) among population, although the out-crossing rate of all populations was still high, more than 89.4%. It suggested that removal of large mother tree in forest harvesting with multi logging rotation reduced the number pollen donor and genetic diversity of reproductive remnant tree implied to increase biparental inbreeding.

Conclusions:

□ Selective logging with multi rotation and the limit dbh for cutting > 50 was gradually decreases the genetic diversity and has a small effect on the mating system of *S. parvifolia* in logged lowland dipterocarp forest.

□ The enrichment planting with native species could improve quality of logged in genetic diversity perspective

The selective logging with multi rotation could preserve the density of reproductive tree and maintain outcrossing of *S. parvifolia* rate in the logged forest.