

Synthetic approach on the rehabilitation of degraded tropical forest

Shigeo Kobayashi

Graduate School of Asian and African Area Studies, Kyoto University

46 Shimoadachi-cho, Sakyo-ku, Kyoto 606-8501, Japan

Tel: +81-75-753-7832, E-mail: ksige@asafas.kyoto-u.ac.jp

1. INTRODUCTION

The expectation for many healthy forest functions, such as the mitigation on global warming, biodiversity maintenance, etc. which tropical forest has, is realized important for the sustainable forest management. However, the 12.5 million ha of forest disappeared every year, and more the forest where is expanded 5.1 million ha was harvested and has formed the lower valued secondary forest in the world. The needs of the socio-economics and research on the disappearance and degradation of tropical forests for global environment are international issues such as the global warming prevention measure, sustainable forest management, biodiversity conservation, desertification prevention, ISO of woods etc. And they are closely connected with a series of international treaties, which are discussed in COP6 (Kyoto Protocol), the Montreal Process (Criteria and Indicators), ITTO2000 (sustainable forest management). IPCC discusses also It agrees also a climate change on the source of greenhouse gas sequestration containing land use, land use change, and forestry. Furthermore, the International Tropical Timber Organization (ITTO) has published the rehabilitation guideline of the degraded tropical secondary and primary forests. In order to rehabilitate the tropical forest, the rehabilitation technology in the landscape level of these ecosystems needs to be developed.

2. OBJECTIVE:

Therefore, I have focused on (1) the development of the rehabilitation technology of degraded forest, such as a logged-over forest, a secondary forest, and degraded shrub forest, and evaluation of biodiversity, (2) rehabilitation of the degraded land and the rubber plantation etc., the clarification of the secondary trees characteristic, and the evaluation of the catalytic effect introduced by the natural forest corridor to the early tree of growth artificial plantation, and development of the site management method. Moreover, (3) while performing research on land resources management planned decision on the landscape level by evaluation and local community participation of a forest rehabilitation management option of the socioeconomic adaptation possibility. (4) In order to perform existing exchange of network information and synthesis of a project, international network is performed with a database, the rehabilitation technology for the environmental conservation of an area is unified, and the purpose is attained. The research site are located at Thom Pha Phun- Thailand, Pasoh-Malaysia, Bukit Soehart EF-Indonesia, Lae-Papua New Guinea, Nam Ha-Lao, Pucallpa-Peru, Sanpaulo-Brazil, and Erdorado-Argentina. I'll focused on the site of Thom Pha Phun, Thailand in this report.

3. RESULTS and DISCUSSION

Rehabilitation of the expanded degraded land at the place of natural resources supply is the subject that should be carried out immediately for the human life with indispensable use of natural resources. Forest values are losing by decreasing and degraded forests in the tropics such as historical, ecological and socioeconomic values. Therefore, I consider how to rehabilitate in technically and socio-economically. This research is aimed to rehabilitate degraded tropical forest which consists of 4 subjects.

(1) Development of the rehabilitation technology of degraded forest, such as a logged-over forest, a secondary forest, and degraded shrub forest, and evaluation of biodiversity-low valued degraded forest:- The processes of secondary forest succession provide important information for the rehabilitation of degraded tropical forests. Among of them, pioneer populations play key role of logged-over forest dynamics. The study site is located at Thong Pha Phum in Kanchanaburi, Thailand and consists of primary tropical mixed deciduous forests, logged-over forests and grasslands where have a dry season and occur frequent forest fires. This study aims to clarify the pioneer population dynamics of wild banana (*Musa acuminata*), *Bauhinia virdencens* and *Sterculia macrophylla* compared with a bamboo (*Cephalostacyum pergracile*) dominated undergrowth of a primary forest and to clarify the role of pioneer populations as “succession facilitators” for controlling the direction on a logged-over forest succession. However, wild banana population reduces spatial occupancy and density under steady state without secondary fire disturbance. Bamboo takes over its dominance accompanied with some shade tolerant tree seedlings. The reduction of wild banana population territory and the recruitment of other shade tolerant species are obviously dynamical phenomena which is controlling the succession direction on a logged-over tropical seasonal forest.

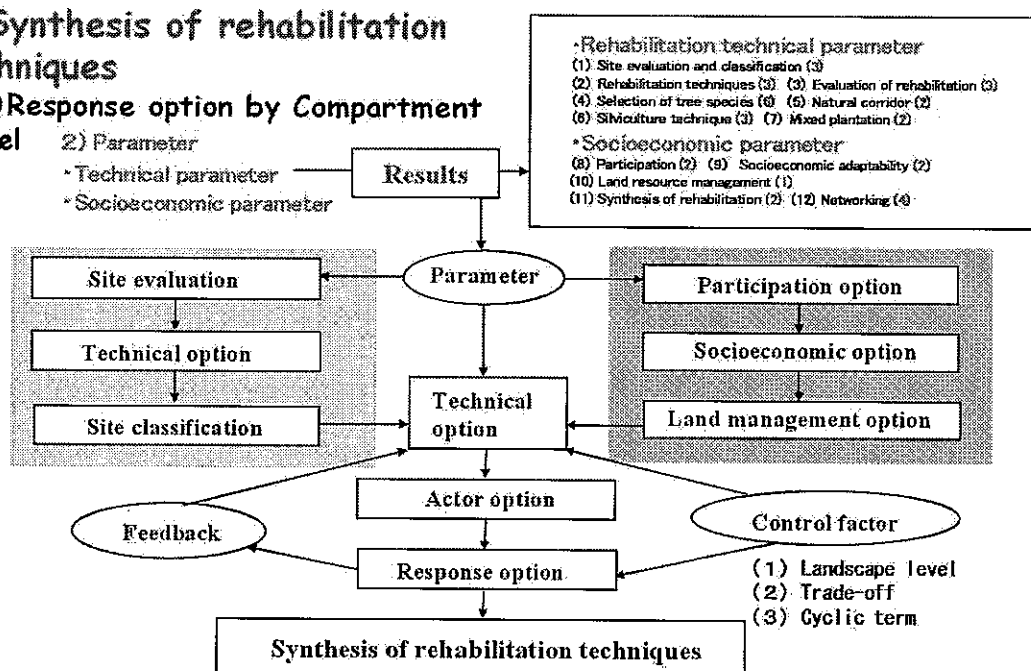
(2) Development of the site management method such as a logged-over forest, a plantation, and a degraded shrub forest, etc.-degraded land:- Forest harvesting and thinning impacts on its ecosystem were surveyed at *Eucalyptus camaldulensis* and *Tectona grandis* Plantation, Thong Pha Phum, Kanchanaburi for the sustainable rotation of plantation. One of characteristic results in this study, the experimental site had already received severe damage on soils at the first forest harvesting which had done to convert from a natural forest to an *Eucalyptus* plantation. After harvesting of *Eucalyptus*, soils and understory biomass were slightly changed, although thickness of A0 & A horizons, hardness of A & B horizons and contents of Cations decreased, bulk density and the saturated hydraulic conductivity rates increased. Severe variations of changes in soil properties was observed at yarding road caused by the compaction of topsoil by a yarding car. On the other hand, topsoils were improved their physical properties caused by the skidding compared with the results of three different study sites. Therefore, it is important for forest plantations that is how to improve and maintain productivity. In the tropics little is known about the potential capabilities for increasing productivity as well as potential factors that may limit yields. Many plantations are undertaken on soils that are very low in nutrients and/or susceptible to degradation. Although the plantation has a potential of high productivity, it may have low yields and degrade the site if managed poorly. Information is urgently required on the factors that control the productivity of plantations under a wide range of soil and environmental conditions, and on ways of managing the site to maintain the productivity of successive tree crops (sustained productivity).

(3) Research on the land resources control program by evaluation and local community participation in municipal affairs of the socioeconomic adaptability of a forest rehabilitation management option: There are many local communities living with the forests in the world where are degraded rapidly and threatened their routine lives in tropics especially. Moreover, people who are living in urban area also recognize the global environment problem related to the degraded forest. Therefore, I tried to clarify differences of the forest recognizing between Thai and Japanese, and between local community and urban citizen by the interview for the rehabilitation of tropical degraded forests. I had carried out the interview at Bangkok, Kanchanaburi, Thong Pha Phun and villages near TPP in Thailand, and Iida city, Takao, Tsukuba, Mishima city and Tokyo in Japan. I had analyzed the interview data according to size of community such as capital, middle size city, small size city and village in each country. Thai people recognized more man-made forest, temperate forest, windbreak forest, environment forest and urban shrub forest than Japanese people of classified forest type of tree species. Japanese people expect existing forest, environment and woods to the forest and Thai people expect existing forest, water and non-timber forest products to the forest. Japanese people consider the forest as carbon sequestration function, and Thai people take into account of the forest as foods and chance of employment. It was observed that how people think about the relation between forest and themselves varied depending on the location of residence as well as the extent of their concerns on forest. The survey shows that people in some areas recognize even a well managed man-made forest as healthy. It is, thus, important for people to know a real forest and necessary for us to provide satisfactory information about it. The conclusion is the rehabilitation techniques must be applied depending on the site specific condition including natural environmental; conditions and socio-economic conditions.

(4) Synthesis of the rehabilitation technology for the environmental conservation of religion: Research on the rehabilitation of degraded tropical forest have been carried out through several approaches in the world. We discussed how to rehabilitate in technically and socio-economically by the project on study of landscape level rehabilitation of degraded tropical forest. One of the final results through the project, we have arrived the compartment model which will be he initiated to response option of rehabilitation techniques. For the synthesis of rehabilitation techniques, the response option by Compartment Model was constructed (Fig.1). Controlling factors consist of landscape level, trade-off, and cyclic term which drive the direction and evaluate the adaptive set of rehabilitation techniques. And controlling factors play the important roles as the driving the compartment dynamics and feedback system. We have selected parameters which are decided results of each sub-theme. In this time, we selected as parameters of rehabilitation techniques and parameter of socioeconomic. Parameters of rehabilitation techniques are selected (1) site evaluation and classification, (2) rehabilitation techniques, (3) evaluation of landscape level rehabilitation, (4) selection of planting tree species, (5) natural forest corridor, (6) silviculture of degraded land, (7) mixed plantation. Parameters of socioeconomic are consisted of (8) local community participation, (9) socioeconomic adaptability, (10) land resources management, (11) synthesis of rehabilitation techniques, and networking.

2 Synthesis of rehabilitation techniques

(2) Response option by Compartment Model



Regional adaptation of rehabilitation of land/policy/environmental conservation

Fig.1 Compartment model for response option of regional adaptation of rehabilitation techniques

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KOBAYASHI Shigeo

KOBAYASHI Shigeo is a Professor of Graduate School of Asian and African Area Studies, Kyoto University. He received PhD in Forest Ecology from Department of Agriculture, Kyoto University. He was a Visiting Researcher (1984-1985) at Oregon State University, Forest Laboratory of North-West Forestry Experimental Station, U.S.A., Silviculture Expert of JICA (1986-1988) Forestry Research Project in Brunei Darussalam, Principal Scientist (1996-1999) at Center for International Forestry Research (CIFOR), CGIAR, and Principal Research Coordinator (International Forest and Global Environment Research, 2001-2003), Independent Administrative Institute, Forestry & Forest Products Research Institute. His major publications include PUSREHUT Special Publication (1990), "Initial phase of secondary succession at the burnt logged-over forest in Bukit Soeharto, East Kalimantan, Indonesia" Eds. Suhartoyo H. et al, CIFOR (2001) "Introduction: Rehabilitation of degraded tropical forest ecosystems" Eds. Kobayashi S. et al., Proceedings of the Seventh Round-Table Conference on Dipterocarps (2004), "Silviculture management of natural Dipterocarp forests- The rehabilitation of logged-over forests" Eds. H. Aminah, et al., Forest Ecology and Management (2004) "Landscape rehabilitation of degraded tropical forest ecosystems - Case study of CIFOR/Japan project in Indonesia and Peru" .

ksige@asafas.kyoto-u.ac.jp