Vegetation Structure and Composition of Primary Degraded Forest, Secondary Forest and Degraded Forest Land at Grand Forest Park Sultan Thaha Syaifuddin, Jambi

Technical Report No. 4

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Abstract

Rehabilitation of degraded forests is an urgent matter from the viewpoint of enrichment of ecosystems and sustainable use of degraded areas. In a logged-over forests, where former ecosystems are still remaining, accelerated natural regeneration is needed. On the other hand, in areas where there is less or none of the natural ecosystem remaining, plantation or agroforestry must be considered.

The purpose of this paper is to present the characteristics of the structure and species composition of the lowland forest at Grand Forest Park Sultan Thaha Syaifuddin, Jambi province. This study will mainly focus on the secondary forest description, especially at the project area for restoration, rehabilitation and agroforestry purposes.

The study area is located in Senami and Bungku villages, in the province of Jambi. To study the stand structure and species composition, several plots were established at each different land-use, as follows: 1) seven line plots were applied in area of restoration (Senami), 2) two plots were established in area of rehabilitation (Bungku), 3) four plots were located in area of agroforestry (semak belukar and old rubber plantation).

The results showed that Kedondong, Kabau, Sebasah, Semasam, Marlipayan, Petaling and Kempinis are considered as potential trees in the non Dipterocarp group. Additional information that can be concluded was that in general the Grand Forest Park (Tahura) area showed a stable condition.

Key words : agroforestry, degraded area, rehabilitation, restoration, sustainable

Introduction

Rehabilitation of degraded forests is an urgent matter from the point of view of ecosystems enrichment and sustainable use of degraded areas. In logged-over forests, where former ecosystems are still remaining, accelerating natural regeneration is needed. On the other hand, in areas where there is less or none of the remaining natural ecosystem, plantation or agroforestry must be considered.

A sound forest management cannot possibly be applied without an understanding on the forest basic ecology. The identification of the tree species is the fundamental step, on which other research components such as forest structure, growth and regeneration depend on. Several studies have indicated that floristic variations within tropical rainforest are linked to the complex interaction of both physical (climate, soil condition,

topography) and biological factors. A better understanding of the trees species ecology will lead to the improvement of forest management and silviculture. Therefore, studies of biological characteristics in such areas are necessary in order to make restoration or rehabilitation activities successful.

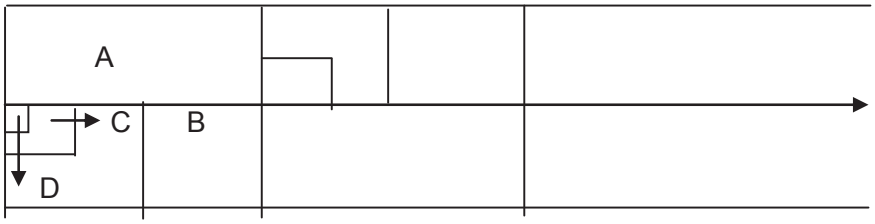
The purpose of this paper is to present the characteristics of the structure and species composition of the lowland forest in Grand Forest Park Sultan Thaha Syaifuddin, especially at Senami and Bungku villages, Jambi province. This study will mainly focus on the secondary forest description based on the survey conducted on areas for restoration, rehabilitation and agroforestry purposes.

Materials and Methods

The study area is located in Senami and Bungku villages, in the province of Jambi. To study the stand structure and species composition, several plots and transects were established at different land-use, as follows:

1. 7 plot lines were made in the area for restoration (Senami village). Each plot has a size of 20 m x 500 m (1 ha).
2. 2 plots were established in the area for rehabilitation (Bungku village). Each plot has a size of 20 m x 20 m (400 m^2).
3. 4 plots were located in the area for agroforestry (bushwood and old rubber plantation). Each plot has a size of 20 m x 20 m (400 m^2).

Plots location were determined by systematic sampling. The plot line for vegetation analysis is shown in **Figure 1.**



Remarks:

A: compartment for trees (20 m x 20 m)
B: compartment for poles (10 m x 10 m)
C: compartment for saplings (5 m x 5 m)
D: compartment for seedlings (2 m x 2 m)

Figure 1. Plot for vegetation analysis

The following data were recorded in each sample plot:

1. Botanical or local name of tree species
2. Number of seedlings, saplings, poles and trees
3. Diameter at breast height (dbh) of poles and trees
4. Total and clear bole height of poles and trees

Criteria for seedlings, saplings, poles and trees, are as follows:

1. Seedlings are juvenile with height of 30 cm to 150 cm
2. Saplings are juvenile with height > 150 cm and diameter at dbh < 10 cm
3. Poles are trees with a dbh ranging from 10 cm to 19.9 cm
4. Trees are individual with dbh of 20 cm above

Results and Discussion

Degraded Primary Forest

Density and species composition of seedlings, saplings, poles and trees

The number of individual seedlings, saplings and poles at the site, which is used for restoration activity is a good criterion to evaluate the degree of recovery after a disturbance in Tahura Senami. Recruitment of seedlings, saplings, poles and trees are shown in **Table 1.**

Table 1. Density of seedlings, saplings and poles in the area of restoration (Tahura Senami)

No	Stages	Number of species	Density (Ind/ha)	Most abundant species	Density of most abundant species (Ind/ha)
1	Seedlings	89	10 895	Kedondong	1,105
2	s	126	3 234	Kedondong	371
3	Saplings Poles	74	216	Kabau, Kedondong and Semasam	14
4	Trees	120	166	Kedondong, Marlipayan, Petaling, Kempinis	8

Table 1 shows that seedlings and saplings population in the Tahura Senami secondary forest was dominated by Kedondong (*Trioma malaccensis),* with the density of each stage is 1,105 and 371 individuals per ha, respectively. At pole stage the population was dominated by Kabau (*Pithecellobium bubalinum*), Kedondong (*Trioma malaccensis*) and Semasam. The average number was 14 individuals per ha.

Community of seedling stage is formed by 89 species with the average density of 10 895 individuals per ha. The dynamic of dominant trees canopy opening and tree density affected the density of seedlings most. The space and opening created by extraction of trees will provide growing space and sufficient sun light for many small trees, which might have been present before logging (Weidelt 1993). With regard to the distribution of the species, three species were distributed evenly, such as Kedondong, Sebekal and Kabau which have Frequency of Relative (FR) > 7.00%.

With regard to the recruitment of saplings, there are 126 species that contributed to the sapling stage. From more than 10 000 seedlings per ha to become saplings with total number of 3234 individuals per ha, it was apparent that only limited number of seedlings were successfully grown into saplings, which might be caused by the increasing competition of seedlings to reach saplings stage. This phenomenon was probably due to condition of that area, which did not give enough stimulants for saplings growth. From the recent study, it was noted that only Kedondong was distributed evenly (FR>7.0%).

The recent study found out that poles stages consisted of 74 species with total density of 216 individuals per ha. The development of poles shows that the vertical opening by logging has improved the poles acquiring ability to sun light, however, the number of poles in this area is still low compared to the study of Riyanto (1995) at PT. Asialog. He recorded 455 individuals per ha, within an area of 20 years after logging and 370 individual per ha in primary forest.

Species ranking according to the Importance Value Index (IVI) is shown in **Table 2.**

Table 2. Ranking of the 5 most abundant tree species according to the IVI

Local name	Importance Value Index (IVI)			
	Seedlings	Saplings	Poles	Trees
Kedondong	17.58 (1)	19.02 (1)	17.68 (3)	13.87 (3)
Sebekal	16.22 (2)	11.70 (2)	-	-
Kabau	14.77 (3)	8.36 (4)	18.10 (1)	-
Temeras	9.62 (4)	9.79 (3)	-	-
Babi kurus	8.99 (5)	-	-	-
Sebasah	-	5.89 (5)	-	-
Kempinis	-	-	11.85 (5)	11.82 (5)
Petaling	-	-	14.22 (4)	13.56 (4)
Semasam	-	-	17.72 (2)	-
Marlipayan	-	-	-	14.14 (2)
Udang	-	-	-	14.80 (1)

Remarks: ( ) sequence number

The most frequent species at seedlings and saplings stages belong to Kedondong, followed by Sebekal. It is remarkable that pioneer species like mahang (*Macaranga sp*) does not become a dominant. The dominant species found at poles and trees stages is totally different compared to seedlings and saplings stages, as shown in Table 2.

The total number of residual trees (dbh 20 cm above) is 166 individuals per ha. This value is lower compared to finding by Riyanto (1995) of 210 individuals per ha at logged over stands, 5 years after logging. The basal area as an important stand density parameter gives some valuable hints about the degree of recovery in this area. The total tree basal area in this site is 15.6 m^2/ha. The basal area is influenced by logging intensities and the recovery period (years after logging). The value of basal area indicated that the condition of the crown closure was very low. This value is still far from the value of the virgin forest, which is 30 m2/ha, and considered as a pan- tropical average for the basal area of tropical rainforest (Weidelt 1993).

Based on the number of species and its composition, the site planned for restoration at Tahura Senami have been deforested, and the second succession is still occuring. The Tahura Senami have less or poor on Dipterocarps species, while availability of non-Dipterocarps species is more dominant.

In forest ecosystem, species diversity is one of the parameter for ecosystem stability. Based on the species diversity index, the value of both seedlings, saplings, poles and trees stage is of 3.93, 4.00, 3.93 and 4.00 respectively. The index indicated that the ecosystem of Tahura Senami is still stable ecologically.

Degraded Forest Land

The target area for land rehabilitation is differentiated into 2 types of land-use, namely bushy grassland (Bungku village) and bare land (Sridadi village). The vegetation of bushy grassland mentioned in this study is dominated by grass, and bushes that sporadically grow until seedling, sapling and pole stages. This vegetation is formed as a result of forest degradation, followed by abandoned land cultivation. The result of vegetation analysis on this bushes area is presented in **Table 3.**

There are 8 surviving species at seedling stage, where Mangkirai species is dominant. For saplings and poles stages, each is dominated by Medang (*Litsea sp.*) and Tulang (*Microdesmis casaerifolia*).

Table 3. Composition of bush vegetation in Bungku village

No	Stages	Number of species	Species dominance
1	Bushes	4	Grass
2	Seedlings	8	Mangkirai
3	Saplings	4	Medang
4	Poles	1	Tulang

The most degraded area is the bare land in Sridadi village, which becomes burned area after it's experience of fire 6 months ago. This area, nowadays, has rubber trees planted by people from outside Sridadi village.

Secondary Forest

The land which is designed for agro forestry area covers bushy grassland, bare land and old rubber plantation. This area is located surrounding the settlement of Senami and Bungku villages.

The result of site monitoring in Tahura Senami area shows:

1. Bushy grassland area is dominated by Balam (*Palaquium sp*.), Sebekal and Sigam for seedling stage. Mahang (*Macaranga maingayi*), Simpur, Kubung (*Macaranga gigantea*) dominating saplings stage. Kubung and Simpur (*Dillenia eximia*) dominating poles stage.

2. In old rubber plantation, the species found at plant and pole stages and mixed with rubber trees are Mahang (*Macaranga maingayi*), Kelat (*Eugenia sp*), Lebau (*Symplocos fasciculata*), Terentang (*Campnosperma masubsidiary crophylla*), and Jengkol.
3. In bare land, formerly rubber plantation, some species is found such as; Tempinis (*Osmelia grandistipulata*), Sungkai (*Peronema canescens*), Medang (*Litsea firma*), Terap (*Artocarpus elasticus*) and Bulian (*Eusyderoxylon zwageri*).

In Bungku village, as target area for agroforestry program (an old rubber plantation) several species on plant stage such as; Mahang and Jengkol is found, on pole stage Trembingil, Buluh, Semantung, and Mahang is found. Some species of saplings stages is also found here, such as; Jengkol, Rubber, Lisau, Srengkubung (*Macaranga* sp), Sigam, Semantung and Buluh. As for seedlings stages, only Rambutan and Tempinis can be found.

Conclusions

The Kedondong belonging to the non Dipterocarp group is the most important species in the Tahura Senami area, while Meranti (Shorea spp) were not found. Kedondong, Kabau, Sebasah, Semasam, Marlipayan, Petaling and Kempinis are also considered as potential trees in the non Dipterocarp group. Additional information that can be concluded in general is the state of Tahura Senami show a condition that remains stable ecologically.

ACKNOWLEDGMENTS

This Technical Report No. 4 on Vegetation Structure and Composition of Primer Degraded Forest, Secondary Forest and Degraded Forest Land in Grand Foreast Park Sultan Thaha Syaifuddin , Jambi has been prepared to fulfill **Objective 2 Point 2.4.** of the Workplan of ITTO Project PD 210/03. Rev 3 (F): Participatory Establishment of Collaborative Sustainable Forest Management in Dusun Aro, Jambi.

The author would like to thank ITTO, The Ministry of Forestry (GOI), Batang Hari Forest District Service, for their support. Appreciation also goes to the Project Steering Committee members for their suggestions.

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