

Species diversity and regeneration at Sessang peat swamp forest, Sarawak

(Kepelbagaian spesies dan pertumbuhan semula hutan tanah gambut di Sessang, Sarawak)

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Key words: peat swamp forest, species diversity, regeneration, felling-burning, felling-stacking, felling-chipping-stacking

Abstract

A survey of species diversity was made along a trail in a 65-ha plot of peat swamp forest at MARDI Station, Sessang, Sarawak before the trees were cleared for agricultural development. Plant species that regenerated 10 months later were studied in a plot (100 m x 100 m) each under the felling-burning, felling-stacking and felling-chipping-stacking clearing techniques. Before the felling of trees, the peat swamp forest was represented by *Macaranga triloba*-community as well as *M. gigantea*, *M. pruinosa* and *M. puncticulata* which formed the dominant species. A total of 148 species represented by 66 families and 91 genera were recorded. The most diverse families in species number were Annonaceae, Euphobiaceae, Lauraceae and Moraceae.

About 10 months after clearing of the forest, a total of 87 plant species regenerated, belonging to 71 genera and 47 families. About 31% of the species recorded before clearing of the forest were found to regenerate in the area. Out of the total 87 species recorded, about 37% of the species regenerated could be found in the areas of the three clearing techniques. Comparatively, the area cleared by the felling-burning technique had the least number of plant density and plant species diversity with 44 species belonging to 36 genera and 28 families while the area cleared by felling-stacking technique, registered more plant species and higher number of plant density than that of the felling-burning technique with a total of 66 species, belonging to 55 genera and 39 families. The plot cleared by the felling-stacking-chipping technique possessed the most abundant not only in plant density but also in species diversity, with 78 species, 61 genera and 43 families recorded.

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Introduction

Malaysia has a vast area of peat swamps estimated to be about 2.73 million ha. Sarawak has the largest area of peat soil in the country, covering about 1.66 million ha or 61%, followed by Peninsular Malaysia 980,000 ha and Sabah 90,000 ha (Tie and Lim 1991). MARDI Station at Sessang was gazetted as a Tropical Peat Research Station in the country. In 2001, 170 ha of peat land at the station was earmarked for improvement and agricultural development.

The conversion of peat land to agricultural land is a threat to its biodiversity. In Indonesia, peat swamp forest, which was converted to agricultural land, was reported to have created major land degradation and biodiversity loss (Simbolon and Mirmanto 2000). In Malaysia, flora composition, its species richness and diversity in the peat swamp forests had been studied by several workers (Wyatt-Smith 1959; Anderson 1963; Ibrahim and Chong 1992; Corner 1994). However, little information on the vegetation dynamics of peat swamps had been documented (Suzuki et al. 1991). The objective of this study was to assess species diversity of the peat swamp forest at MARDI Station, Sessang before the clearing of the forest and to determine the species regeneration about one year after land clearing.

Materials and methods

Site description

About 65 ha of peat swamp forest to the east of the station was earmarked for clearing to make way for agricultural development and experimentation (*Figure 1*). The forest area however, has been disturbed quite extensively due to selective logging for their valuable timber resources. The forest was cleared using four clearing techniques: a) felling-burning (9 ha); b) felling-stacking (35 ha); c) felling-chipping-stacking (17 ha); and d) selective felling (4 ha) (Jamaludin 2003).

Before land clearing

In 2001, several exploration trips were made along the existing trails established to connect the subsidence holes for monitoring the surface of subsidence during early stage of peat development (*Figure 1*). Plant species growing at about 5 m on each side of the trails were surveyed, identified and recorded to construct a checklist of the plant species. Herbarium specimens were collected and deposited at the MARDI herbarium.

After land clearing

About 10 months after clearing, plant species that regenerated in three clearing technique areas namely felling-burning; felling-stacking; felling-chipping-stacking

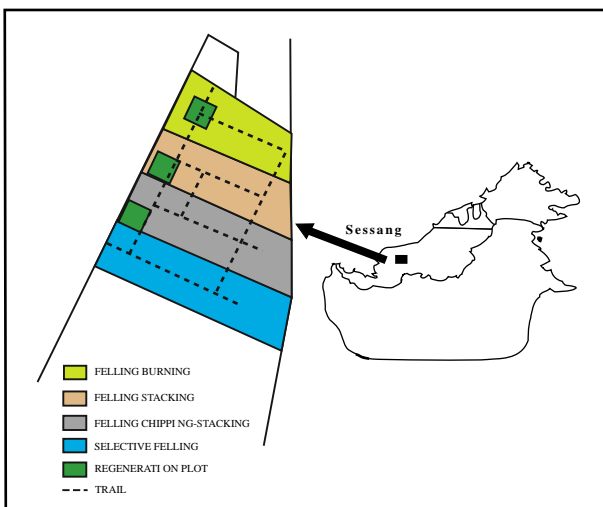


Figure 1. The trails in various clearing techniques and the regeneration plots

were surveyed and identified. A plot of 100 m by 100 m was constructed in each clearing technique. To facilitate observation of the plant species, each plot was further divided into 10 subplots, with 10 m by 100 m for each subplot. Using these subplots, the occurrence of all the species as well as their relative density was recorded.

Results and discussion

Diversity of plant species before land clearing

The area is a secondary peat swamp forest represented by *Macaranga triloba*-community of about 20–25 m in height which formed the dominant species. Three other species in the genus, *M. gigantea*, *M. pruinosa* and *M. puncticulata* were also observed forming the dominant species in the area. The subtree layer with heights of 10–20 m, consists of common species such as *Blumeodendron tokbrai* (Merbulan), *Eugenia* spp. (Kelat), *Diospyros* spp. (Kayu Arang), *Litsea* spp. (Medang), *Pometia pinnata* (Kasai) and *Xylopia coriifolia* (Jangkang Paya). The main species in the shrub and herb layer are *Aglaonema angustifolium*, *A. oblongifolium*, *Forrestia glabrata*, *Piper* spp., and the ferns *Nephrolepis biserrata* and *Asplenium pellucidum*. Homogeneity in species occurrence was observed in the area surveyed. *Nephrolepis biserrata* grew abundantly in opened areas where there was enough sunlight penetration. The woody climber such as *Uncaria* spp. was common throughout the area.

The plant diversity in the area studied was considered as low with a total number of 148 species from 91 genera and 46 families (Table 1). The number of species recorded was rather low compared to those obtained during other studies within the region. Ibrahim (1997) recorded 131 species in an area of 5.0 ha of peat swamp forest in Pahang, Peninsular Malaysia while Simbolon and Mirmanto (2000) recorded 310 species in 3.5 ha of peat swamp forest in Lahei, Tanjung Putting and Sungai

Sebangau, Kalimantan. The most diverse families in species number were Annonaceae (6 genera and 8 species), Euphobiaceae (3 genera and 8 species), Lauraceae (2 genera and 8 species), and Moraceae (2 genera and 8 species). Similarly, Ibrahim and Chong (1992) reported that in 3.8 ha plot of virgin jungle reserve (VJR) at Kuala Langat South Peat Swamp Forest, Selangor, Peninsular Malaysia, the most diverse species were also from the families of Euphobiaceae, Annonaceae and Myrtaceae.

Of the total number of plant species enumerated, only two forest species *Hopea* (Merawan) and *Shorea* (Meranti) belonging to Dipterocarp timber trees while 45 species of non-Dipterocarp timber trees *Litsea* sp., *Diospyros* sp., *Blumeodendron tokbrai*, *Alstonia* sp., and *Macaranga* sp. were observed (Table 2). Eight species of fruit trees *Dialium* sp. (KerANJI), *Scaphium macropodum* (Kembang Semangkuk), *Garcinia* sp. (Kandis), *Nephelium maingayi* (Serait), *Pometia pinnata* (Kasai), *Mangifera griffithii* (Rawa), *Dacryodes* sp. and *Xanthophyllum amoenum* were also recorded (Table 2). The most common terrestrial fern was *Nephrolepis biserrata* found abundant in the open areas. However, *Asplenium batuense*, a terrestrial fern more frequently occurred in more shady wet places of the forest. *Asplenium nidus*, commonly known as bird's nest fern was a common epiphytic fern observed. In addition, 22 plant species recorded have been reported to possess medicinal values.

Diversity of regenerated plant species after clearing

About 10 months after felling of the forest, the total number of plant species regenerated was found to be 87 belonging to 71 genera and 47 families (Table 3). About 31% of the species recorded before felling of the forest were found to regenerate in the area (Tables 4–5). Out of the total 92 species recorded, about 37% of the species regenerated can be found in the three areas

Table 1. Plant taxa in Sessang peat swamp forest before forest clearing

Family	Genus	No. of species
Acanthaceae	<i>Pseuderanthemum</i>	1
Anacardiaceae	<i>Camposperma</i>	1
	<i>Mangifera</i>	1
	<i>Parishia</i>	1
	<i>Swintonia</i>	1
Annonaceae	<i>Artabotrys</i>	1
	<i>Fissistigma</i>	2
	<i>Goniothalamus</i>	2
	<i>Polyalthia</i>	1
	<i>Uvaria</i>	1
	<i>Xylopia</i>	1
Apocynaceae	<i>Alstonia</i>	2
	<i>Dyera</i>	1
	<i>Melodinus</i>	1
	<i>Willughbeia</i>	1
Araceae	<i>Aglaonema</i>	2
	<i>Alocasia</i>	1
	<i>Raphidophora</i>	1
	<i>Scindapsus</i>	2
Arecaceae/Palmae	<i>Calamus</i>	1
	<i>Korthalsia</i>	1
Aspleniaceae	<i>Asplenium</i>	3
Blechnaceae	<i>Stenochlaena</i>	1
Burseraceae	<i>Dacryodes</i>	1
	<i>Santiria</i>	1
Clusiaceae/Guttiferae	<i>Calophyllum</i>	1
	<i>Garcinia</i>	1
Commelinaceae	<i>Forrestia</i>	1
Costaceae	<i>Costus</i>	1
Cyperaceae	<i>Cyperus</i>	1
	<i>Rhynchospora</i>	1
	<i>Scleria</i>	1
	<i>Thoracostachyum</i>	1
Dioscoreaceae	<i>Dioscorea</i>	2
Dipterocarpaceae	<i>Hopea</i>	1
	<i>Shorea</i>	4
Ebenaceae	<i>Diospyros</i>	4
Elaeocarpaceae	<i>Elaeocarpus</i>	4
Euphorbiaceae	<i>Antidesma</i>	2
	<i>Blumeodendron</i>	1
	<i>Macaranga</i>	5
Fabaceae/Leguminosae	<i>Dialium</i>	1
	<i>Koompassia</i>	1
	<i>Pithecellobium</i>	1
	<i>Sindora</i>	1
Fagaceae	<i>Lithocarpus</i>	4
Flacourtiaceae	<i>Hydnocarpus</i>	1
Lauraceae	<i>Cryptocarya</i>	1
	<i>Litsea</i>	7
Leeaceae	<i>Leea</i>	1

(cont.)

Table 1. (cont.)

Family	Genus	No. of species
Lindsaeaceae	<i>Lindsaea</i>	1
Melastomaceae	<i>Melastoma</i>	1
	<i>Sonerila</i>	1
Meliaceae	<i>Aglaia</i>	1
Moraceae	<i>Ficus</i>	7
	<i>Paraartocarpus</i>	1
Myristicaceae	<i>Gynacranthera</i>	1
	<i>Horsfieldia</i>	1
	<i>Knema</i>	1
Myrtaceae	<i>Eugenia</i>	4
Nepenthaceae	<i>Nepenthes</i>	1
Nephrolepidaceae	<i>Nephrolepis</i>	1
Pandanaceae	<i>Freycinetia</i>	1
	<i>Pandanus</i>	1
Piperaceae	<i>Piper</i>	4
Rosaceae	<i>Rubus</i>	1
Rubiaceae	<i>Argostemma</i>	1
	<i>Jackiopsis</i>	1
	<i>Mussaenda</i>	1
	<i>Psychotria</i>	3
	<i>Uncaria</i>	4
Rutaceae	<i>Melicope</i>	1
Sapindaceae	<i>Nephelium</i>	1
	<i>Pometia</i>	2
Sapotaceae	<i>Palaquium</i>	2
	<i>Payena</i>	1
Smilacaceae	<i>Smilax</i>	2
Sterculiaceae	<i>Scaphium</i>	1
	<i>Sterculia</i>	1
Thymelaeaceae	<i>Gonystylus</i>	1
Urticaceae	<i>Boehmeria</i>	1
	<i>Poikilospermum</i>	1
Verbenaceae	<i>Clerodendrum</i>	2
Vitaceae	<i>Ampelocissus</i>	1
	<i>Cayratia</i>	4
	<i>Tetrastigma</i>	1
Xanthophyllaceae	<i>Xanthophyllum</i>	3
Zingiberaceae	<i>Alpinia</i>	1
	<i>Boesenbergia</i>	1
	<i>Globba</i>	1
	<i>Hornstedtia</i>	1
Total	46	91
		148

of clearing techniques. *Melicope accendens* (Jampang) and *Macaranga triloba* (Mahang) appeared to be the most dominant tree species while *Stenochlaena palustris* and *Nephrolepis biserrata* were the most significant ferns that grew in abundance in

the three different plots of clearing techniques.

Comparatively, the area cleared by felling-burning technique was found to have the least number of plant density and plant species diversity, i.e. 44 species belonging to 36 genera and 28 families (Table 6). In this

Table 2. Species before clearing of forest with their potential uses

Dipterocarp timber trees	Fruit trees
1. <i>Hopea</i> sp.	1. <i>Dacryodes</i> sp.
2. <i>Shorea</i> sp.	2. <i>Dialium</i> sp.
3. <i>Shorea scabrida</i>	3. <i>Garcinia</i> sp.
	4. <i>Mangifera griffithii</i>
Non-dipterocarp timber trees	5. <i>Nephelium maingayi</i>
1. <i>Aglaiia</i> sp.	6. <i>Pometia pinnata</i>
2. <i>Alstonia angustiloba</i>	7. <i>Scaphium macropodum</i>
3. <i>Alstonia pneumatophora</i>	8. <i>Xanthophyllum amoenum</i>
4. <i>Blumeodendron tokbrai</i>	
5. <i>Calophyllum sclerophyllum</i>	Medicinal plants
6. <i>Camposperma coriaceum</i>	1. <i>Alocasia denudata</i>
7. <i>Cryptocarya</i> sp.	2. <i>Alstonia pneumatophora</i>
8. <i>Dacryodes</i> sp.	3. <i>Antidesma</i> sp.
9. <i>Dialium</i> sp.	4. <i>Artabotrys suaveolens</i>
10. <i>Diospyros</i> sp.	5. <i>Asplenium nidus</i>
11. <i>Diospyros maingayi</i>	6. <i>Costus speciosus</i>
12. <i>Dyera polyphylla</i>	7. <i>Cyperus rotundus</i>
13. <i>Elaeocarpus</i> sp.	8. <i>Diospyros</i> sp.
14. <i>Eugenia</i> sp.	9. <i>Diospyros maingayi</i>
15. <i>Ficus</i> sp.	10. <i>Ficus hispida</i>
16. <i>Garcinia</i> sp.	11. <i>Goniothalamus</i> sp.
17. <i>Goniothalamus</i> sp.	12. <i>Koompassia malaccensis</i>
18. <i>Gonystylus bancanus</i>	13. <i>Leea indica</i>
19. <i>Gymnacranthera</i> sp.	14. <i>Macaranga</i> sp.
20. <i>Horsfieldia</i> sp.	15. <i>Melastoma malabathricum</i>
21. <i>Hydnocarpus</i> sp.	16. <i>Pometia pinnata</i>
22. <i>Knema</i> sp.	17. <i>Pseuderanthemum</i> sp.
23. <i>Koompassia malaccensis</i>	18. <i>Stenochlaena palustris</i>
24. <i>Lithocarpus</i> sp.	19. <i>Uncaria</i> sp.
25. <i>Litsea</i> sp.	20. <i>Uvaria</i> sp.
26. <i>Litsea castanea</i>	21. <i>Willughbeia</i> sp.
27. <i>Macaranga</i> sp.	22. <i>Xanthophyllum</i> sp.
28. <i>Macaranga gigantea</i>	
29. <i>Macaranga triloba</i>	
30. <i>Mangifera griffithii</i>	
31. <i>Nephelium maingayi</i>	
32. <i>Palaquium</i> sp.	
33. <i>Palaquium maingayi</i>	
34. <i>Parartocarpus</i> sp.	
35. <i>Parishia maingayi</i>	
36. <i>Payena</i> sp.	
37. <i>Pometia pinnata</i>	
38. <i>Santiria apiculata</i>	
39. <i>Scaphium macropodum</i>	
40. <i>Sindora leiocarpa</i>	
41. <i>Sterculia macrocarpa</i>	
42. <i>Swintonia</i> sp.	
43. <i>Xanthophyllum amoenum</i>	
44. <i>Xanthophyllum</i> sp.	
45. <i>Xylopiia coriifolia</i>	

Table 3. Taxa regenerated after felling of peat swamp forest

Family	Genus	Species
Acanthaceae	<i>Asystasia</i>	1
	<i>Hyptis</i>	1
Anacardiaceae	<i>Parishia</i>	1
Annonaceae	<i>Artabotrys</i>	1
Apocynaceae	<i>Alstonia</i>	2
	<i>Dyera</i>	1
Araceae	<i>Aglaonema</i>	1
	<i>Alocasia</i>	1
	<i>Scindapsus</i>	1
Palmae	<i>Elaeis</i>	1
Compositae	<i>Erechthites</i>	1
	<i>Erigeron</i>	1
	<i>Mikania</i>	1
Barringtoniaceae	<i>Barringtonia</i>	1
Blechnaceae	<i>Stenochlaena</i>	1
Commelinaceae	<i>Forrestia</i>	1
Convolvulaceae	<i>Ipomoea</i>	1
Costaceae	<i>Costus</i>	1
Cucurbitaceae	<i>Melothria</i>	1
Cyperaceae	<i>Cyperus</i>	2
	<i>Scleria</i>	1
Dilleniaceae	<i>Dillenia</i>	2
	<i>Tetracera</i>	1
Dioscoreaceae	<i>Dioscorea</i>	1
Elaeocarpaceae	<i>Elaeocarpus</i>	2
Euphorbiaceae	<i>Antidesma</i>	1
	<i>Breynia</i>	1
	<i>Croton</i>	1
	<i>Glochidion</i>	1
	<i>Macaranga</i>	3
	<i>Mallotus</i>	1
	<i>Bauhinia</i>	1
Leguminosae	<i>Koompassia</i>	1
	<i>Flagellaria</i>	1
Flagellariaceae	<i>Flagellaria</i>	1
Hemionitidaceae	<i>Pityrogramma</i>	1
Lauraceae	<i>Litsea</i>	1
Leeaceae	<i>Leea</i>	1
Liliaceae	<i>Dianella</i>	1
Melastomaceae	<i>Melastoma</i>	1
Moraceae	<i>Artocarpus</i>	1
	<i>Ficus</i>	4
Myrtaceae	<i>Eugenia</i>	2
Nephrolepidaceae	<i>Nephrolepis</i>	1
Oxalidaceae	<i>Sarcotheca</i>	1
Pandanaceae	<i>Pandanus</i>	1
Passifloraceae	<i>Adenia</i>	2
	<i>Passiflora</i>	1
Piperaceae	<i>Peperomia</i>	1
Pteridaceae	<i>Pteridium</i>	1
Rosaceae	<i>Rubus</i>	1

(cont.)

Table 3. (cont.)

Family	Genus	Species
Rubiaceae	<i>Jackiopsis</i>	1
	<i>Mussaenda</i>	1
	<i>Uncaria</i>	4
Rutaceae	<i>Melicope</i>	2
Sapindaceae	<i>Nephelium</i>	1
	<i>Pometia</i>	1
Schizaeaceae	<i>Lygodium</i>	1
Silacaceae	<i>Smilax</i>	1
Solanaceae	<i>Solanum</i>	1
Sterculiaceae	<i>Sterculia</i>	1
Ulmaceae	<i>Trema</i>	2
Urticaceae	<i>Boehmeria</i>	1
Verbenaceae	<i>Callicarpa</i>	1
	<i>Premna</i>	1
	<i>Vitex</i>	1
Vitaceae	<i>Ampelocissus</i>	1
	<i>Cayratia</i>	1
	<i>Cissus</i>	1
Xanthophyllaceae	<i>Xanthophyllum</i>	1
Zingiberaceae	<i>Alpinia</i>	1
	<i>Hornstedtia</i>	1
Total	47	71
		87

area, plant species grow in patches resulting in empty areas not occupied by plant species. This situation is probably due to the exposure of the land area to the heat caused from burning affecting the viability and the survival of the seeds or seedlings of the forest species. Ten most dominant species observed are listed in Table 7. The tall tree species were represented by *Melicope accendens* (Jampang) and *Macaranga triloba* (Mahang). While *Mallotus paniculata* (Balik Angin) and *Trema tomentosa* (Mengkirai Besar) were the smaller trees. The herbs and the shrubs consisted of *Melastoma malabathricum* (Senduduk), *Eraechthites valerianifolia*, *Dioscorea* sp. and *Uncaria* sp. The ferns, *Stenochlaena palustris* and *Nephrolepis biserrata* were also abundant.

However, the area cleared by felling-stacking technique, possessed more plant species and higher number of plant density than the felling-burning area. The environment in this area is probably more suitable for the growth of more plant species

compared to the burning area. A total of 66 species, belonging to 55 genera and 39 families were observed. With the exception of *Dianella ensifolia*, the six dominant tree species occurring in this area were similar to those found in the felling-burning area (Table 7). The tree species in this area were more abundant compared to the area covered by the ferns.

The plot cleared by felling-stacking-chipping possessed the most abundant not only in plant density but also in species diversity represented by 78 species, 61 genera and 43 families. This clearing technique provides suitable environment for the survival and growth of more species. The plot was densely covered with plant species, and it was very difficult to pass through to take the records. Only six dominant species were similar to those of the plot felling-burning and felling-stacking, except for *Alstonia pneumatophora*, *Eugenia* sp. and *Pometia pinnata*.

Table 4. List of species recorded before land clearing regenerated after 10 months of land clearing

Species	Types	Common names
<i>Aglaonema angustifolium</i>	Herb	Keladi
<i>Alocasia denudata</i>	Herb	Keladi candik
<i>Alpinia</i> sp.	Herb	Halia besar/puar hutan
<i>Alstonia angustiloba</i>	Tree	Pulai
<i>Alstonia pneumatophora</i>	Tree	Pulai paya/pulai basong
<i>Ampelocissus</i> sp.	Climber	Akar gamat
<i>Antidesma coriaceum</i>	Shrub	Kenidai
<i>Artabotrys suaveolens</i>	Climber	Akar mempisang
<i>Boehmeria</i> sp.	Shrub	Rami hutan
<i>Cayratia japonica</i>	Climber	Akar chulan
<i>Costus speciosus</i>	Herb	Setawar hutan
<i>Cyperus rotundus</i>	Herb	Rumput halia hitam
<i>Dioscorea</i> sp. 1	Climber	Akar ubi nasi
<i>Dyera polyphylla</i>	Tree	Jelutong paya
<i>Elaeocarpus</i> sp. 2	Tree	Mendong
<i>Ficus</i> sp. 1	Climber	Ara akar
<i>Ficus grossularioides</i>	Shrub	Ara
<i>Forrestia glabrata</i>	Herb	Tebu gagak
<i>Hornstedtia scyphifera</i>	Herb	Halia bulu
<i>Jackiopsis ornatus</i>	Tree	Selumar
<i>Koompassia malaccensis</i>	Tree	Kempas/menggrisi
<i>Leea indica</i>	Shrub	Mali-mali
<i>Litsea</i> sp.	Tree	Medang daun besar
<i>Macaranga gigantea</i>	Tree	Mahang gajah/mahang daun besar
<i>Macaranga pruinosa</i>	Tree	Mahang pucuk merah
<i>Macaranga triloba</i>	Tree	Mahang/benuah
<i>Melastoma malabathricum</i>	Shrub	senduduk
<i>Melicope accendens</i>	Tree	Jampang/pepauh
<i>Mussaenda villosa</i>	Climber	Balik adap bulu
<i>Nephelium maingayi</i>	Tree	Redan
<i>Nephrolepis biserrata</i>	Fern	Paku pedang
<i>Pandanus</i> sp.	Herb	Pandan
<i>Parishia maingayi</i>	Tree	Upi paya/sepul
<i>Pometia pinnata</i>	Tree	Kasai
<i>Rubus moluccanus</i>	Climber	Tumpu rengat
<i>Scindapsus</i> sp.	Climber	Keladi menjalar
<i>Scleria sumatrensis</i>	Herb	Sendayan
<i>Smilax barbata</i>	Climber	Akar kelonak
<i>Stenochlaena palustris</i>	Fern	Paku lemiding
<i>Sterculia macrophylla</i>	Tree	Kelumpang
<i>Uncaria</i> sp. 1	Climber	Kait-kait tegak
<i>Uncaria</i> sp. 2	Climber	Kait-kait menjalar
<i>Uncaria</i> sp. 3	Climber	Kait-kait daun lebar
<i>Uncaria</i> sp. 4	Climber	Kait-kait pucuk merah
<i>Xanthophyllum amoenum</i>	Tree	Langir

Table 5. Comparison of taxa before and after the clearing of the forest

	Family	Genus	Species
Before forest clearing	66	91	148
After forest clearing (Regeneration)	47	72	92
Similar taxa regenerated	29	37	45 (31%)

Table 6. Comparison of taxa in different clearing techniques

	Felling-burning	Felling-stacking	Felling-burning- stacking	Common to all clearing techniques
Family	28	39	43	24
Genus	36	55	61	29
Species	44	66	78	34 (37%)

Table 7. Dominant tree species in the different clearing techniques

Species	Felling-Burning	Felling-stacking	Felling-Chipping- Stacking
<i>Melicope accendens</i>	*	*	*
<i>Mallotus paniculata</i>	*	*	*
<i>Macaranga triloba</i>	*	*	*
<i>Trema tomentosa</i>	*	*	*
<i>Trema cannabina</i>	*	*	*
<i>Ficus grossularioides</i>	*	*	*
<i>Boehmeria</i> sp.	+		
<i>Ficus fistulosa</i>	**	**	
<i>Melicope lunu-ankenda</i>	+		
<i>Macaranga pruinosa</i>	**	**	
<i>Parishia maingayi</i>		***	***
<i>Alstonia angustiloba</i>			+
<i>Alstonia pneumatophora</i>			+
<i>Eugenia</i> sp.			+
<i>Pometia pinnata</i>			+

* = Species available in the three clearing techniques

** = Species available in felling-burning and felling-stacking clearing techniques

*** = Species available in felling-burning and felling-chipping-stacking clearing techniques

+ = Species available in any one of the three clearing techniques

Conclusion

Low species diversity at Sessang peat swamp forest is partly due to the past activity of extensive logging of the area. After clearing of the forest, only 37% of the species regenerated due to habitat loss or to the change in the ecosystem. The felling-chipping-stacking technique provided better environment for the regeneration of the plant species after one year of forest felling.

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Abstrak

Satu survei kepelbagaian spesies telah dijalankan melalui trek dalam plot hutan paya gambut seluas 65 ha di Stesen MARDI, Sessang, Sarawak, sebelum pokok-pokok ditebang untuk pembangunan pertanian. Spesies tumbuhan yang tumbuh selepas 10 bulan telah dikaji dalam plot (100 m x 100 m) yang menjalankan teknik pembersihan tebang-bakar, tebang-susun dan tebang-potong-susun. Sebelum pokok ditebang, hutan paya gambut ini dipenuhi dengan komuniti *Macaranga triloba* dan juga *M. gigantea*, *M. pruinosa* and *M. puncticulata* yang merupakan spesies dominan. Famili yang mempunyai kepelbagaian spesies ialah Annonaceae, Euphobiaceae, Lauraceae dan Moraceae.

Selepas 10 bulan hutan dibersihkan, jumlah spesies tumbuhan yang tumbuh semula terdiri daripada 87 spesies, 71 genus dan 47 famili. Anggaran 31% spesies yang didapati sebelum hutan dibersihkan telah tumbuh semula dalam kawasan yang telah dibersihkan. Daripada 87 spesies yang tumbuh semula, 37% boleh didapati dalam ketiga-tiga teknik pembersihan. Sebagai perbandingan, tumbuhan hidup semula dalam kawasan yang dibersihkan secara tebang-bakar adalah sedikit, cuma 44 spesies daripada 36 genus dan 28 famili, sementara lebih banyak pokok yang tumbuh dalam kawasan tebang-susun, iaitu 66 spesies, 55 genus dan 39 famili. Manakala dalam plot yang dibersihkan melalui kaedah tebang-potong-susun, kepelbagaian spesies yang tumbuh didapati yang paling tinggi, terdiri daripada 78 spesies, 61 genus dan 43 famili.