Supplementary Materials

Estimation of the spatiotemporal patterns of vegetation and associated ecosystem services in a Bornean montane zone using three shifting-cultivation scenarios

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Table S1. Description of stand age, altitude and AGB and dominant species in each of the 27 vegetation stands in the upland area between the Kinabalu Park and the Crocker Range Park in Sabah, northern Borneo (cited from Fujiki et al. [22]). In a main plot, AGB is measured for trees ≥ 5 cm dbh (age < 50 years), and for trees ≥ 20 cm dbh (age > 50 years). In a subplot, AGB is measured for trees 5 cm > and ≥ 1 cm dbh (age < 50 years), and for trees 20 cm > and ≥ 5 cm dbh (age > 50 years). In a small plot, AGB is measured for grasses or trees < 1 cm dbh (age < 50 years), and for trees 5 cm > and ≥ 1 cm dbh (age > 50 years). The two oldest stands (which are presumably older than 100 years) were not included in the vegetation analyses with TWINSPAN and DCA due to their unknown ages.

Stand Age (y)	Altitude (m)	Main plot size (m^2) (subplot) [small plot]	Total AGB (kg m^{-2})	AGB in main plot (kg m^{-2})	AGB in subplot (kg m^{-2})	AGB in small plot (kg m^{-2})	Dominant species (relative dominance > 10 % on each stand)
2	1153	[4×4]	0.41	-	-	0.41	*Erigeron* sp., *Eupatorium odoratum*
2	1053	[4×4]	0.6	-	-	0.6	*Eupatorium odoratum, Ficus condensa, Melastoma malabathricum, Pteridium aquilinum*
2	1234	[4×4]	0.39	-	-	0.39	*Erigeron* sp., *Melastoma malabathricum, Pluchea odorata*
2	1076	(5×5)[4×4]	0.82	-	0.17	0.66	*Melastoma malabathricum,*

							Poaceae sp.
3	1170	[4×4]	0.3	-	-	0.3	*Eupatorium odoratum, Imperata cylindrica, Paspalum conjugatum*
3	1125	(5×5)[4×4]	0.94	-	0.54	0.4	*Clethra canescens, Macaranga costulata, Tectaria* sp.
3	1244	(5×5)[4×4]	1.65	-	1.17	0.48	*Clethra canescens, Macaranga costulata*
3	1191	(5×5)[4×4]	0.82	-	0.33	0.49	*Clethra canescens, Melastoma malabathricum, Pteridium aquilinum*
3	1091	(5×5)[4×4]	2.5	-	1.71	0.79	*Alphitonia excelsa, Clethra canescens, Macaranga costulata*
4	1115	(5×5)[4×4]	1.51	-	1.12	0.39	*Clethra canescens, Macaranga costulata*
5	1282	20×20(5×5)[4×4]	2.41	0.48	1.81	0.13	*Macaranga costulata*
6	1051	20×20(5×5)[4×4]	2.16	0.33	1.34	0.49	*Alphitonia excelsa, Eupatorium odoratum, Ficus* sp., *Lygodium japonicum, Melastoma malabathricum, Miscanthus sinensis, Pteridium aquilinum, Scleria terrestris, Schima wallichii*
6	1236	20×20(5×5)[4×4]	3.06	1.28	1.49	0.29	*Carex* sp., *Clethra canescens, Macaranga costulata, Pteridium aquilinum*
6	1063	20×20(5×5)[4×4]	2.22	0.61	1.11	0.51	*Clethra canescens, Macaranga costulata*
9	1054	20×20(5×5)[4×4]	2.82	1.54	1.03	0.24	*Alphitonia excelsa, Decaspermum fruticosum Forst., Miscanthus sinensis, Pittosporum ferrugineum*

10	1044	20×20(5×5)[4×4]	3.85	2.62	0.93	0.29	*Alphitonia excelsa, Clethra canescens*
12	1218	20×20(5×5)[4×4]	6.85	5.18	1.53	0.14	*Adinandra dumosa, Clethra canescens*
15	1357	20×20(5×5)[4×4]	6.77	6.45	0.23	0.09	*Adinandra dumosa, Ilex cissoidea , Tectaria* sp.
15	984	20×20(5×5)[4×4]	5.48	4.27	1.11	0.1	*Clethra canescens*
20	1098	20×20(5×5)[4×4]	7.69	6.35	1.28	0.06	*Albizia falcataria, Clethra canescens, Itea macrophylla*
30	1237	20×20(5×5)[4×4]	7.45	6.26	1.04	0.15	*Astronia macrophylla, Tectaria* sp.
30	1147	20×20(5×5)[4×4]	9.3	8.48	0.74	0.09	*Itea macrophylla, Macaranga costulata*
33	1030	20×20(5×5)[4×4]	5.21	4.07	1.1	0.05	*Ilex cymosa*
55	1383	30×30(20×20)[5×5]	16.64	15.96	0.64	0.04	*Adinandra dumosa, Astronia macrophylla, Wendlandia paniculata*
55	1218	30×30(20×20)[5×5]	13.24	11.49	1.23	0.53	*Adinandra dumosa, Astronia macrophylla, Clethra canescens, Tectaria* sp., *Weinmannia fraxinea*
>100	1221	30×30(20×20)[5×5]	23.96	22.63	0.49	0.84	*Castanopsis acuminatissima*
>100	1151	30×30(20×20)[5×5]	19.66	18.14	0.44	1.08	Aracaceae sp.

Table S2. Description of stand age, altitude and AGB in each of the 12 validation plots in the upland area between the Kinabalu Park and the Crocker Range Park in Sabah, northern Borneo. In a main plot, AGB is measured for trees ≥ 5 cm dbh. In a subplot, AGB is measured for trees 5 cm > and ≥ 1 cm dbh.

Stand Age (y)	Altitude (m)	Main plot size (m^2) (subplot)	Total AGB (kg m^{-2})	AGB in main plot (kg m^{-2})	AGB in subplot (kg m-2)
4	1089	(25)	0.89	-	0.89
5	1501	400 (25)	4.57	3.6	0.98
8	1113	400 (25)	3.49	2.77	0.73
10	1198	400 (25)	11.02	9.94	1.08
12	1168	400 (25)	6.5	6.25	0.24
12	1368	400 (25)	10.83	10.2	0.63
17	1216	400 (25)	6.18	5.84	0.32
18	1045	400 (25)	4.13	3.8	0.33
21	1416	400 (25)	10.24	9.34	0.9
23	1067	400 (25)	7.13	6.23	0.89
23	1274	400 (25)	13.29	12.86	0.43
26	1132	400 (25)	9.21	9.12	0.09

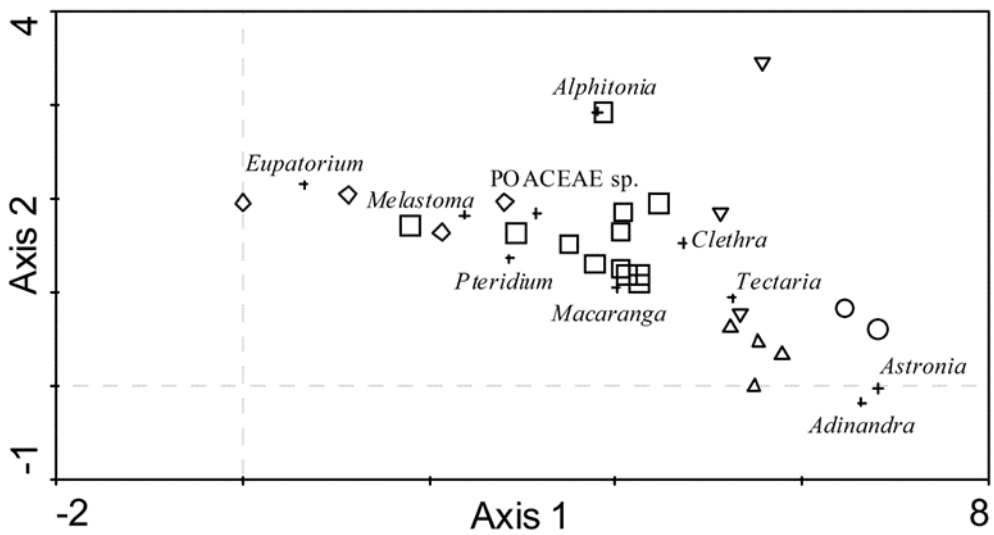

Figure S1. The results of a DCA analysis on 25 vegetation stands in the upland area between the Kinabalu Park and the Crocker Range Park in Sabah, northern Borneo (cited from Fujiki *et al*., 2017). Circles, diamonds, triangles and squares indicate stands, while crosses indicate dominant species. Different symbols of stands indicate the five plant communities (diamonds, herbaceous community; squares, shrub community; triangles, upper montane short forest community; inverted triangles, lower montane short-forest community; and circles, forest community) classified by TWINSPAN (Fujiki et al. [22]). Eigenvalue is 0.786 for the axis 1, and 0.465 for the axis 2. Dominant species are represented by generic names.

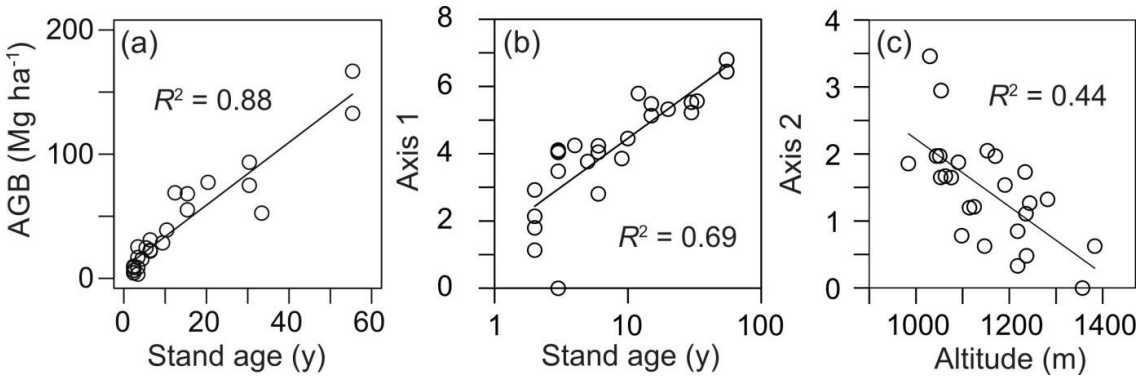

Figure S2. The relationships between stand ages (years) and AGB (a), and stand ages (years) and axis-1 values (b), altitudes (m asl) and axis-2 values (c) for 25 vegetation stands in the upland area between the Kinabalu Park and the Crocker Range Park in Sabah, northern Borneo (modified from Fujiki et al. [22]).