Supplementary materials

Table S1. The important value index (IVI) of total 21 species in 16 families, and tree size as tree height and diameter breast height (DBH) in the secondary dry dipterocarp forest.

Species	Family	Important value index	DBH (cm)	Height (m)
Dipterocarpus obtusifolius Teijsm. ex Miq.	Dipterocarpaceae	50.9	5.1±2.6	5.8±2.6
Shorea siamensis Miq.	Dipterocarpaceae	45.0	5.1±1.8	6.2±2.4
Shorea obtusa Wall.	Dipterocarpaceae	37.6	4.3±1.6	4.7±2.1
Shorea roxburghii G. Don.	Dipterocarpaceae	31.4	7.8±3.2	7.7±2.1
Croton oblongifolius Roxb.	Euphobiaceae	23.3	1.4±1.0	3.0±1.0
Sindora siamensis Teijsm. ex Miq.	Leguminosae	21.6	5.3±2.4	6.6±1.9
Ellipanthus tomentosus Kuze var. tomentosus	Connaraceae	19.1	5.5±2.8	5.8±2.1
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae	12.9	3.5±3.1	4.4±2.5
Xylia xylocarpa (Roxb.) Taub. var. *kerrii*	Fabaceae-Mimosoideae	10.3	7.0±3.5	8.7±3.2
Phyllanthus emblica	Phyllanthaceae	9.9	2.9±1.2	3.9±0.7
Litsea glutinosa (Lour.) C.B.Rob.	Lauraceae	8.2	3.0±1.5	3.9±2.1
Erythrophleum succirubrum Gagnep.	Leguminosae-Caesalpinioideae	6.3	3.6±2.5	5.4±3.3
Dipterocarpus tuberculatus Roxb.	Dipterocarpaceae	3.7	5.9±2.8	6.9±2.9
Grewia eriocarpa Juss.	Tiliaceae	2.9	4.7±1.2	5.7±2.0
Vitex peduncularis Wall. ex Schauer	Viticaceae	2.8	2.0±2.1	3.5±2.4
Stereospermum neuranthum Kurz.	Bignoniaceae	2.8	4.0±1.1	5.7±2.0
Terminalia mucronata Craib&Hutch.	Combretaceae	2.4	4.5	7.9
Bauhinia saccocalyx Pierre	Fabaceae-Caesalpinioideae	2.3	2.4	7.9
Pavetta tomentosa Roxb. Ex Sm. Var.	Rubiaceae	2.2	2.9	2.9
Ochna integerrima (Lour.) Merr.	Ochnaceae	2.2	0.9	2.1
Melientha suavis Pierre	Opiliaceae	2.2	0.5	2.0

Non-El Niño : Dry season 2016/2017 and dry season 2017/2018

December 2016

February 2017

April 2017

December 2017

February 2018

April 2018

El Niño : Dry season 2015/2016

December 2015

February 2016

April 2016

Figure S1. Seasonal change in secondary dry dipterocarp forest between dry season 2016/2017 and 2017/2018 during non- El Niño, and dry season 2015/2016 during El Niño, illustrating the shift of earlier end of season and late of start of season leading to greater degree of deciduousness during El Niño event.

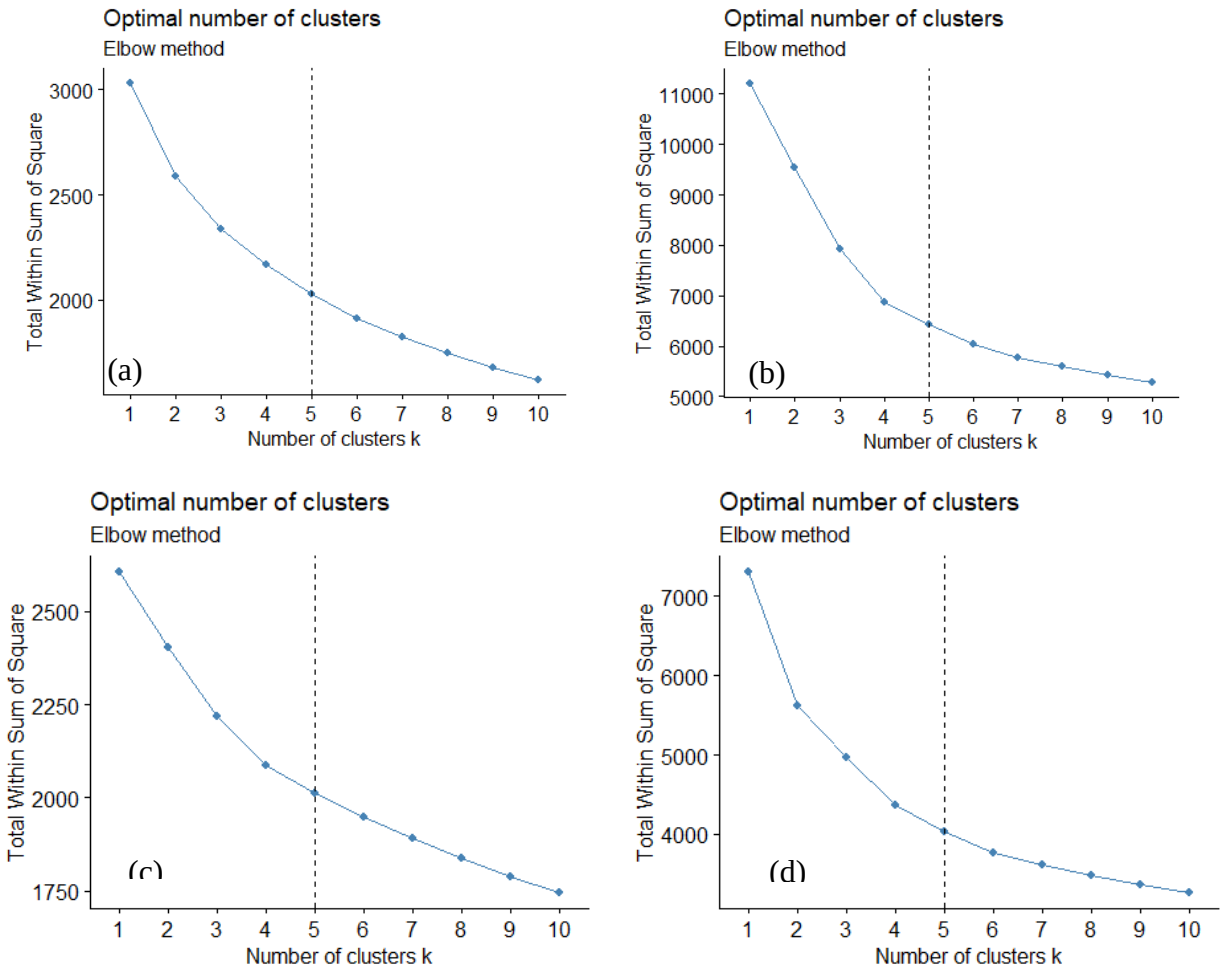

Figure S2. Optimal number of clusters for four phenological stages including (a) young leaf, (b) mature leaf, (c) scenescense leaf, and (d) leafless indicating that five clusters are suitable for all phenophases.

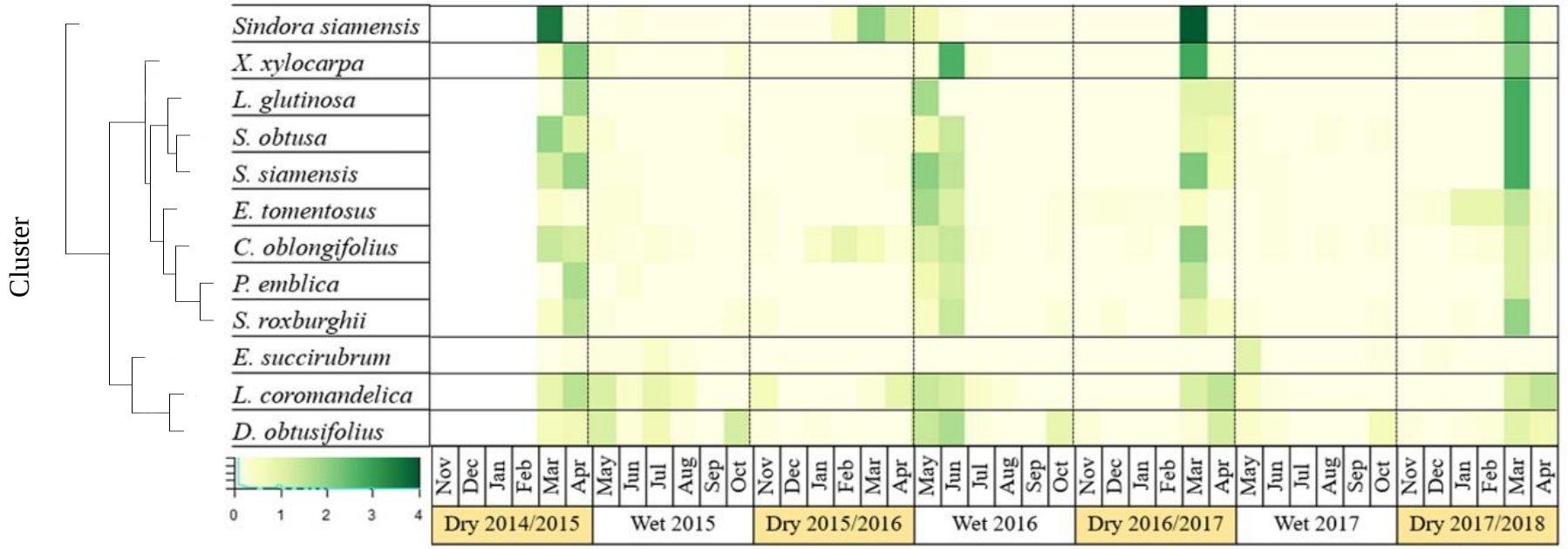

Figure S3. Dendrogram and phenological pattern of young leaves of 12 species that are grouped into five clusters (C1-C5) between March 2015 and April 2018 (the black lines mark the separation between the different clusters of species based on their phenological patterns), the gradient color in legend defines the score of young leaf stage (0-4) in the canopy, dark green means the new flushed leaves in the canopy, while the yellow means the young leaves turn to mature leaves or no young leave production, respectively.

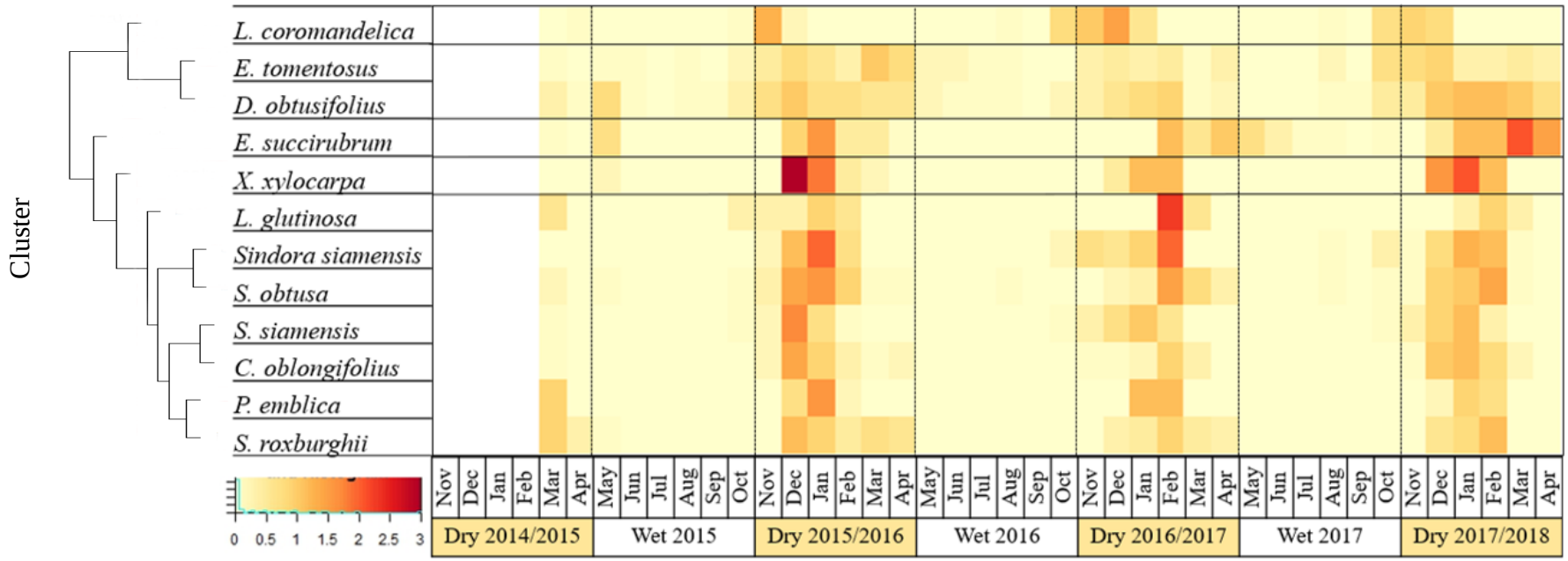

Figure S4. Dendrogram and phenological pattern of scenescense leaves of 12 species that are grouped into five clusters (C1-C5) between March 2015 and April 2018 (the black lines mark the separation between the different clusters of species based on their phenological patterns), the gradient color in legend defines the score of senescence leaf stage (0-4) in the canopy, dark brown means lots of senescence leaves or leaf coloration in the canopy.

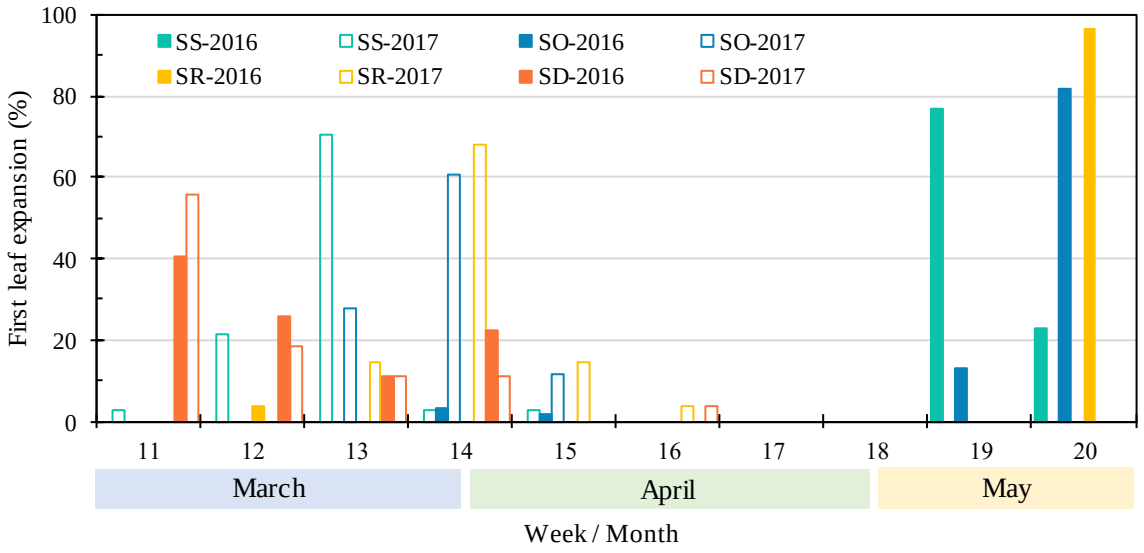

Figure S5. Timing of first leaf expansion of four dominant species including *S. siamensis* Miq. (SS), *S. obtuse* Wall. (SO), *S. roxburghii* G. Don (SR) and *Sindora siamensis* Teijsm. ex Miq. (SD) between March and May 2016 (dry season 2015/2016) and 2017 (dry season 2016/2017).

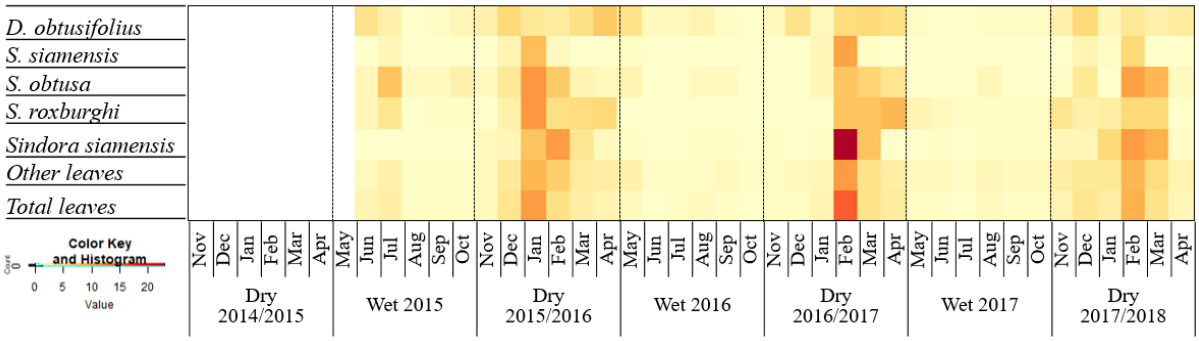

Figure S6. Percentage of leaflitter production for five dominant species, other leaves excepting five dominant species and total leaf fall in secondary dry dipterocarp forest.

Table S2. Dieback (DB) and mortality (MT) rate of 6 dominant species (at least represented by 20 individual trees each) for each wet and dry seasons from 2014 to 2018.

Species	No.	Dry 2014/2015		Wet 2015		Dry 2015/2016		Wet 2016		Dry 2016/2017		Wet 2017		Dry 2017/2018		Total			% from total trees of each species		
		DB	MT	DB	MT	DB	MT	DB	MT	DB	MT	DB	MT	DB	MT	DB	MT	sum	DB	MT	sum
Dipterocarpus obtusifolius	89	0	0	3	0	5	1	2	3	1	1	4	1	0	2	15	8	23	17	9	26
Shorea siamensis	77	0	1	1	0	1	2	2	1	0	2	3	0	1	1	8	7	15	10	9	19
Shorea obtusa	72	0	1	2	1	2	5	1	4	0	5	0	0	1	1	6	17	23	8	24	32
Shorea roxburghii	28	0	0	0	0	3	1	0	0	0	0	0	0	0	0	3	1	4	11	4	14
Sindora siamensis	28	0	1	2	0	0	0	0	0	0	0	0	0	0	1	2	2	4	7	7	14
Lannea coromandelica	26	0	0	0	1	0	1	0	2	0	1	1	0	0	0	1	5	6	4	19	23
Total	320	0	3	8	2	11	10	5	10	1	9	8	1	2	5	35	40	75			
% dieback or mortality per season		0	8	23	5	31	25	14	25	3	23	23	3	6	13	100	100				