Supplementary Information

Table S1. Annual, Decadal and long-term mean values of rainfall and temperature data of three sites.

Sites	Rainfall (mm)			Temperature (°C)		
	Annual	Decadal	Long term	Annual	Decadal	Long term
SWS	978.75	1210.66	1054.99	27.97	27.00	26.83
VNP	1107.91	1557.72	1370.95	27.05	26.52	26.28
MTR	1486.28	1731.88	1651.06	25.65	24.84	24.46

Table S2. Common tree species across three sites.

Sr. No.	Species
1	*Albizia odoratissima* (L.f.) Benth.
2	*Albizia saman* (Jacq.) Merr.
3	*Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guillem. & Perr.
4	Bamboo species
5	*Bauhinia racemosa* Lam.
6	*Bombax ceiba* L.
7	*Bridelia retusa* (L.) A.Juss.
8	*Butea monosperma* (Lam.) Taub.
9	*Cassia fistula* L.
10	*Casuarina equisetifolia* L.
11	*Dalbergia lanceolaria* L.f.
12	*Dalbergia latifolia* Roxb.
13	*Desmodium oojeinense* (Roxb.) H.Ohashi
14	*Ficus racemosa* L.
15	*Ficus religiosa* L.
16	*Ficus virens* Aiton
17	*Garuga pinnata* Roxb.
18	*Gmelina arborea* Roxb.
19	*Grewia tiliifolia* Vahl
20	*Lagerstroemia lanceolata* Wall.
21	*Lagerstroemia parviflora* Roxb.
22	*Lannea coromandelica* (Houtt.) Merr.
23	*Madhuca longifolia* var. *latifolia* (Roxb.) A.Chev.
24	*Mangifera indica* L.
25	*Mitragyna parvifolia* (Roxb.) Korth.
26	*Phyllanthus emblica* L.
27	*Pterocarpus marsupium* Roxb.
28	*Schleichera oleosa* (Lour.) Merr.
29	*Tectona grandis* L.f.
30	*Terminalia bellirica* (Gaertn.) Roxb.
31	*Terminalia tomentosa* Willd.

Table S3. Estimated values of species number present at each site obtained from different methods tested for species richness

Sites	Jackknife1	Jackknife2	Chao	Bootstrap
SWS	98	115	110	82
VNP	91	105	98	78
MTR	118	138	120	97

Table S4. Abundant tree species recorded at each site.

Sr. No.	SWS	VNP	MTR
1	Bamboo species (Bambsps)	*Albizia procera* (Albipro)	*Anogeissus latifolia* (Anoglat)
2	*Bridelia retusa* (Bridret)	Bamboo species	*Artocarpus heterophyllus* (Artohet)
3	*Butea monosperma* (Butemon)	*Butea monosperma*	Bamboo species
4	*Ficus racemosa* (Ficurac)	*Dalbergia lanceolaria* (Dalblan)	*Celtis tetraandra* (Celttet)
5	*Ficus religiosa* (Ficurel)	*Diospyros melanoxylon* (Diosmel)	*Dalbergia latifolia* (Dalblat)
6	*Ficus virens* (Ficuvir)	*Ficus racemosas*	*Eucalyptus globulus* (Eucaglo)
7	*Garuga pinnata* (Garupin)	*Ficus religiosa*	*Ficus racemosa*
8	*Haldina cordifolia* (Haldcor)	*Garuga pinnata*	*Ficus tsjahela* (Ficutsj)
9	*Lagerstroemia lanceolata* (Lagelan)	*Haldina cordifolia*	*Ficus virens*
10	*Lagerstroemia parviflora* (Lagepar)	*Lannea coromandelica* (Lanncor)	*Grevillea robusta* (Grevrob)
11	*Madhuca longifolia* (Madhlon)	*Madhuca longifolia*	*Lagerstroemia lanceolata*
12	*Mangifera indica* (Mangind)	*Mangifera indica*	*Pterocarpus marsupium*
13	*Miliusa tomentosa* (Militom)	*Miliusa tomentosa*	*Radermachera xylocarpa* (Radexyl)
14	*Mitragyna parvifolia* (Mitrpar)	*Mitragyna parvifolia*	*Schleichera oleosa* (Schlole)
15	*Pongamia pinnata* (Pongpin)	*Pterocarpus marsupium* (Ptermar)	*Stereospermum tetragonum* (Stertet)
16	*Syzygium cumini* (Syzycum)	*Tamarindus indica* (Tamaind)	*Syzygium cumini*
17	*Tectona grandis* (Tectgra)	*Tectona grandis*	*Tectona grandis*
18	*Terminalia bellirica* (Termbel)	*Terminalia bellirica*	*Terminalia bellirica*
19	*Terminalia tomentosa* (Termtom)	*Terminalia tomentosa*	*Terminalia tomentosa*
20	*Wrightia tinctoria* (Wrigtin)	*Wrightia tinctoria*	-

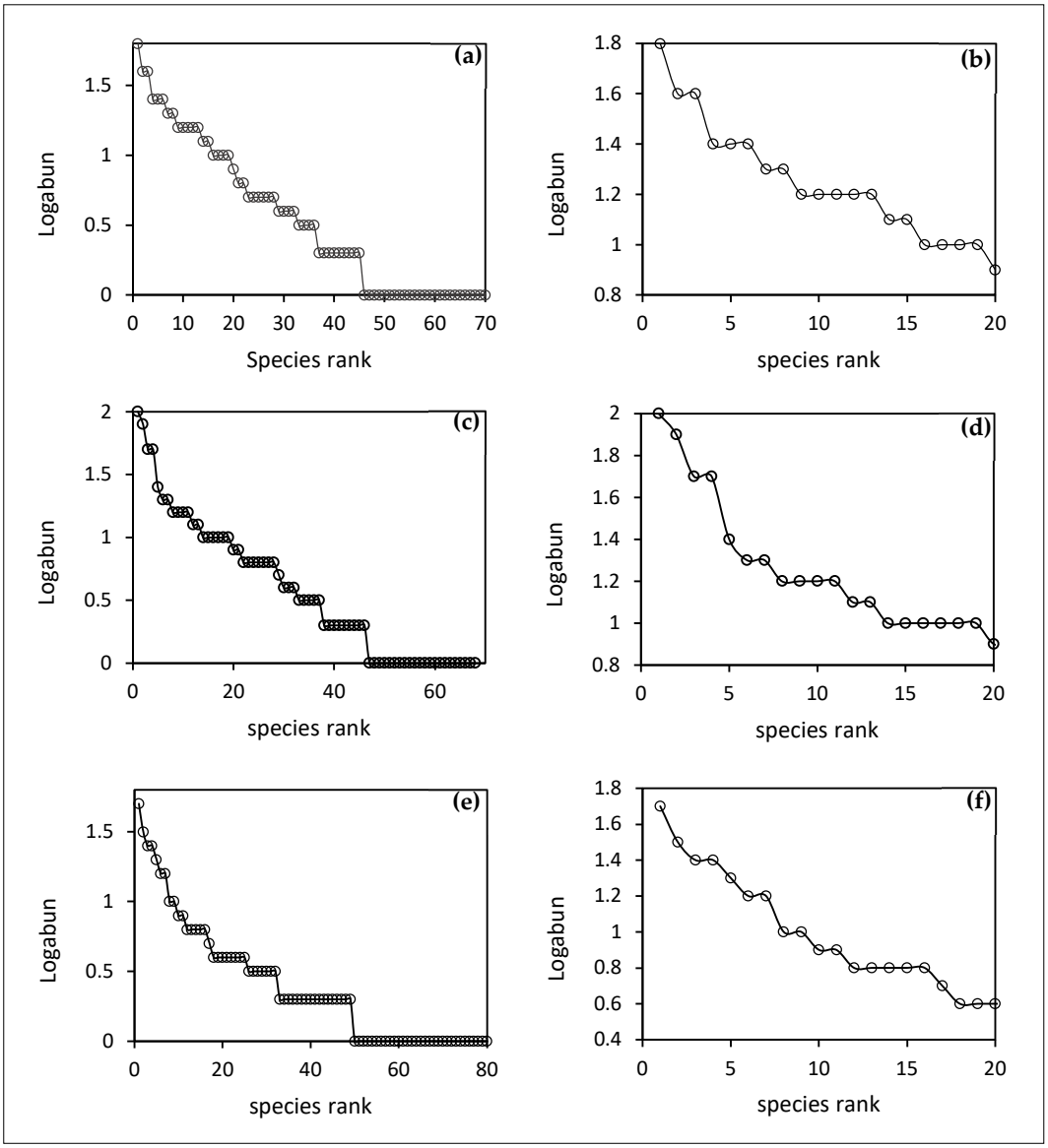

Figure S1. Rank abundance curves of all recorded (left) and abundant (right) tree species at each site. (a) and (b) SWS, (c) and (d) VNP, (e) and (f) MTR.

Table S5. Classification accuracies and Kappa value of the abundant species maps

Sr. No.	Accuracy	SWS	VNP	MTR
1	Overall accuracy (%)	80.15	76.32	78.54
2	Kappa coefficient	0.79	0.75	0.76
3	Producer's accuracy (%)	75.01	70.37	75.21
4	User's accuracy (%)	86.60	83.54	86.70

Table S6. Confusion matrix of SWS using SVM classification. Diagonal values represent the correctly classified individuals.

Class	Madhlon	Tectgra	Haldcor	Bambsps	Mitrpar	Termtom	Butemon	Termbel	Lagelan	Bridret	Syzycum	Ficurac	Militom	Pongpin	Ficuvir	Mangind	Ficurel	Wrigtin	Garupin	Lagepar	Total	User's accuracy (%)
Unclassified	0	0	0	11	2	0	1	0	0	0	0	0	8	0	0	0	0	7	5	0	34	
Madhlon	60	0	1	1	2	0	0	1	0	0	0	0	4	0	0	0	0	2	3	1	75	80.00
Tectgra	0	21	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	24	87.50
Haldcor	0	2	53	3	0	0	1	0	0	0	0	1	0	0	0	0	1	1	1	0	63	84.13
Bambsps	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	21	95.24
Mitrpar	0	0	0	0	21	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	23	91.30
Termtom	0	1	0	1	0	24	1	0	0	0	0	0	0	1	0	0	0	2	0	0	30	80.00
Butemon	0	1	0	1	0	1	22	0	1	0	0	1	1	0	0	0	0	1	2	2	33	66.67
Termbel	0	1	0	0	1	0	0	45	0	0	2	0	0	3	0	0	0	0	0	1	53	84.91
Lagelan	0	0	0	0	0	1	0	0	32	0	0	1	1	0	0	0	0	1	2	0	38	84.21
Bridret	0	1	0	0	0	0	3	0	0	33	0	0	1	1	0	0	0	1	0	0	40	82.50
Syzycum	0	0	0	0	1	0	0	0	0	0	22	0	0	0	0	0	0	1	2	0	26	84.62
Ficurac	0	0	0	2	1	1	0	0	0	0	0	23	0	0	0	0	0	0	1	0	28	82.14
Militom	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	1	0	11	90.91
Pongpin	0	0	0	0	1	0	0	1	0	1	0	1	1	32	0	0	0	0	2	0	39	82.05
Ficuvir	0	0	0	0	1	0	0	0	1	0	2	0	3	0	27	0	0	0	0	0	34	79.41
Mangind	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	44	0	0	0	0	45	97.78
Ficurel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	25	100
Wrigtin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	100
Garupin	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	11	0	14	78.57
Lagepar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	100
Total	60	27	55	39	30	28	29	47	34	34	27	27	31	37	27	44	26	21	30	7	660	
Producer's accuracy (%)	100	77.78	96.36	51.28	70	85.71	75.86	95.74	94.12	97.06	81.48	85.19	32.26	86.49	100	100	96.15	9.52	36.67	28.57		86.60

Table S7. Confusion matrix of VNP using SVM classification. Diagonal values represent the correctly classified individuals.

Class	Garupin	Termbel	Tectgra	Ptermar	Termtom	Mitrpar	Ficurac	Mangind	Albipro	Ficurel	Haldcor	Bambsps	Dalblan	Madhlon	Butemon	Diosmel	Militom	Wrigtin	Lanncor	Tamaind	Total	User's accuracy (%)
Unclassified	8	0	2	0	19	2	0	0	0	0	0	0	2	0	5	0	3	0	3	0	44	
Garupin	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	16	93.75
Termbel	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	100.00
Tectgra	0	2	70	5	3	2	0	0	1	0	1	1	2	0	4	1	0	3	1	0	96	72.92
Ptermar	2	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	18	83.33
Termtom	0	0	0	0	33	0	0	0	0	0	0	0	1	1	4	0	0	0	0	0	39	84.62
Mitrpar	0	0	0	0	1	46	0	0	0	0	0	1	0	0	0	1	0	0	0	0	49	93.88
Ficurac	1	0	3	1	10	0	26	0	0	0	2	0	0	0	3	0	0	0	4	0	50	52.00
Mangind	0	4	0	0	1	1	0	62	0	0	1	1	0	0	3	0	0	0	0	0	73	84.93
Albipro	1	0	0	0	1	0	0	0	63	0	0	2	0	1	0	2	0	1	0	0	71	88.73
Ficurel	0	0	0	1	0	0	0	0	0	32	2	1	0	0	0	0	1	1	1	0	39	82.05
Haldcor	0	0	0	0	1	0	0	0	0	0	15	0	0	0	0	3	2	0	3	0	24	62.50
Bambsps	2	0	1	0	1	0	0	0	0	0	2	20	0	0	3	0	0	0	2	0	31	64.52
Dalblan	0	0	0	0	1	0	0	0	0	0	1	0	31	0	0	0	0	0	0	0	33	93.94
Madhlon	1	0	0	3	4	2	0	0	0	3	5	1	1	84	0	3	1	2	0	0	110	76.36
Butemon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	5	100.00
Diosmel	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	8	87.50
Militom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	20	0	0	0	21	95.24
Wrigtin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	8	1	0	10	80.00
Lanncor	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	8	0	10	80.00
Tamaind	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	34	36	94.44
Total	30	21	76	25	76	53	26	62	64	35	29	29	37	86	30	17	29	16	23	34	798	
Producer's accuracy (%)	50	71.43	92.11	60	43.42	86.79	100	100	98.44	91.43	51.72	68.97	83.78	97.67	16.67	41.18	68.97	50	34.78	100		83.54

Table S8. Confusion matrix of MTR using SVM classification. Diagonal values represent the correctly classified individuals.

Class	Syzycum	Dalblat	Tecgra	Bambsps	Termbel	Lagelan	ficuvir	Termtom	Anoglat	Schlole	Ptermar	Stertet	Radexyl	Ficutsj	Celttet	Artohet	Ficurac	Grevrob	Eucaglo	Total	User's accuracy (%)
Unclassified	4	3	2	12	0	3	0	4	4	2	4	1	0	6	9	15	10	12	0	91	
Syzycum	68	6	0	1	3	0	0	0	0	2	0	0	0	1	0	0	0	0	0	81	83.95
Dalblat	1	68	0	3	0	4	0	2	0	1	0	0	0	0	0	0	0	2	0	81	83.95
Tecgra	2	0	66	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	74	89.19
Bambsps	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	31	96.77
Termbel	2	6	3	0	62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73	84.93
Lagelan	0	2	0	2	3	44	0	0	1	0	0	2	0	0	0	2	0	0	0	56	78.57
ficuvir	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	1	0	0	14	92.86
Termtom	0	0	0	0	0	2	0	21	1	0	0	0	0	0	0	0	0	0	0	24	87.50
Anoglat	3	0	0	0	0	0	0	2	18	0	0	0	0	0	0	0	0	0	0	23	78.26
Schlole	0	2	0	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	0	30	93.33
Ptermar	0	0	0	0	0	0	0	2	0	0	14	0	0	0	0	0	0	0	0	16	87.50
Stertet	0	0	0	0	3	0	0	0	0	0	0	23	0	0	0	0	0	2	0	28	82.14
Radexyl	0	0	0	0	0	0	0	2	2	0	0	0	10	0	0	0	0	0	0	14	71.43
Ficutsj	0	0	0	0	0	0	0	0	0	0	0	0	1	22	0	0	1	2	0	26	84.62
Celttet	0	0	0	0	0	0	0	2	0	0	0	0	0	1	9	0	0	1	0	13	69.23
Artohet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	2	0	14	85.71
Ficurac	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	0	0	30	100.00
Grevrob	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	38	0	39	97.44
Eucaglo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	90	90	100.00
Total	80	87	71	48	74	53	13	35	29	33	18	26	11	30	18	30	42	60	90	848	
Producer's accuracy (%)	85.00	78.16	92.96	62.50	83.78	83.02	100.00	60.00	62.07	84.85	77.78	88.46	90.91	73.33	50.00	33.33	59.52	63.33	100.00		86.70

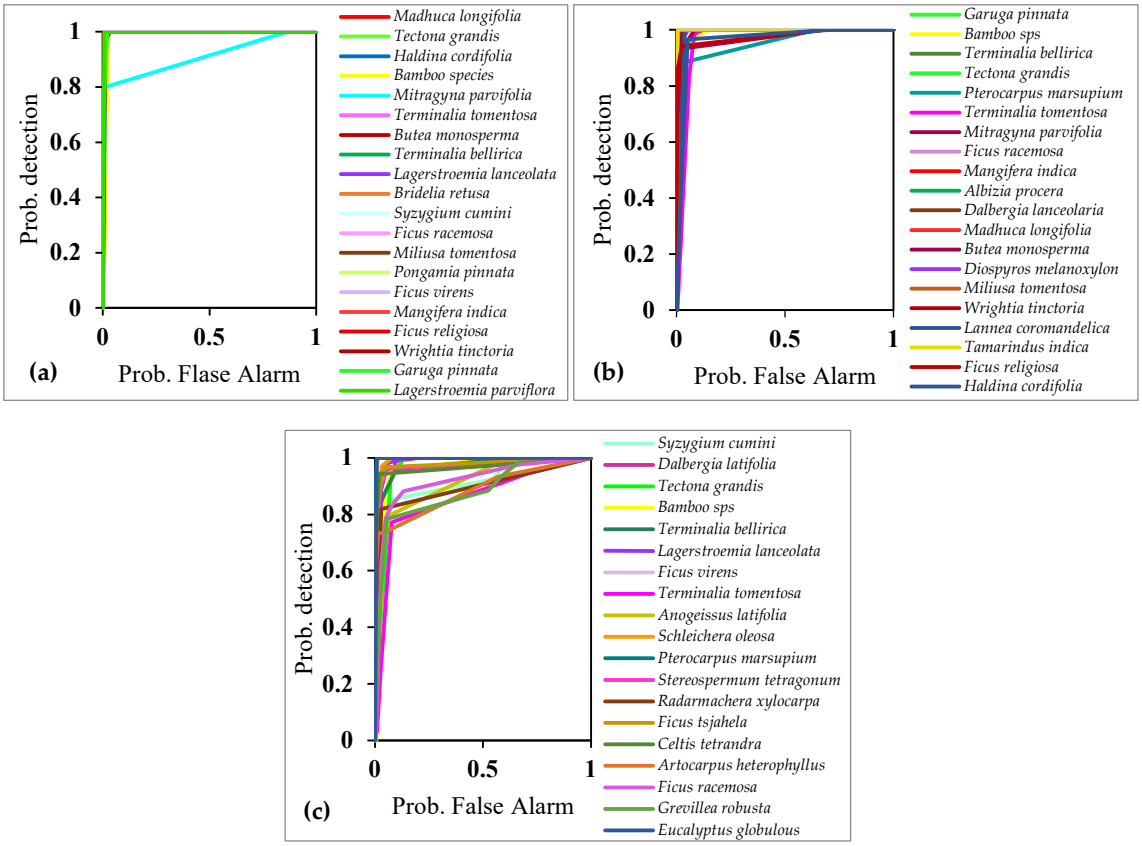

Figure S2. Receiver operating characteristics (ROC) curves for the detection from SVM for each species of (a) SWS, (b) VNP, and (c) MTR.

Table S9. Area under the curve (AUC) values of each species of three sites.

SWS	
Species	**AUC**
Madhuca longifolia	0.998
Tectona grandis	0.995
Haldina cordifolia	0.997
Bamboo species	0.986
Mitragyna parvifolia	0.907
Terminalia tomentosa	0.997
Butea monosperma	0.996
Terminalia bellirica	0.998
Lagerstroemia lanceolata	0.999
Bridelia retusa	0.998
Syzygium cumini	0.999
Ficus racemosa	0.998
Miliusa tomentosa	0.994
Pongamia pinnata	0.998
Ficus virens	0.999
Mangifera indica	0.999
Ficus religiosa	0.999
Wrightia tinctoria	0.997
Garuga pinnata	0.995
Lagerstroemia parviflora	0.996
Mean	**0.992**

VNP	
Species	**AUC**
Garuga pinnata	0.978
Terminalia bellirica	0.997
Tectona grandis	0.981
Pterocarpus marsupium	0.956
Terminalia tomentosa	0.963
Mitragtna parvifolia	0.986
Ficus racemosa	0.999
Mangifera indica	0.996
Albizia procera	0.994
Dalbergia lanceolaria	0.994
Madhuca longifolia	0.993
Butea monosperma	0.964
Diospyros melanoxylon	0.993
Miliusa tomentosa	0.995
Wrightia tinctoria	0.994
Lannea coromandelica	0.982
Tamarindus indica	0.999
Ficus religiosa	0.977
Haldina cordifolia	0.964
Bamboo species	0.974
Mean	**0.984**

MTR	
Species	**AUC**
Syzygium cumini	0.913
Dalbergia latifolia	0.981
Tectona grandis	0.962
Bamboo species	0.959
Terminalia bellirica	0.970
Lagerstroemia lanceolata	0.985
Ficus virens	0.994
Terminalia tomentosa	0.853
Anogeissus latifolia	0.915
Schleichera oleosa	0.989
Pterocarpus marsupium	0.997
Stereospermum tetragonum	0.973
Radarmachera xylocarpa	0.895
Ficus tsjahela	0.978
Celtis tetrandra	0.966
Artocarpus heterophyllus	0.884
Ficus racemosa	0.918
Greviliea robutsa	0.884
Eucalyptus globulus	0.995
Mean	**0.948**

Table S10. CHV values of seed propagated and vegetative propagated tree species coming from 150 spectra.

SWS

Sr. No.	Seed propagated	CHV
1	*Bridelia retusa*	2.86
2	*Butea monosperma*	2.48
3	*Ficus racemosa*	2.72
4	*Ficus religiosa*	6.70
5	*Ficus virens*	6.78
6	*Lagerstroemia lanceolata*	3.89
7	*Lagerstroemia parviflora*	2.85
8	*Madhuca longifolia*	4.69
9	*Mangifera indica*	10.91
10	*Mitragyna parvifolia*	2.39
11	*Terminalia bellirica*	4.32
12	*Terminalia tomentosa*	3.79
13	*Wrightia tinctoria*	2.59
	Vegetative propagated	
14	Bamboo species	1.81
15	*Garuga pinnata*	2.40
16	*Haldina cordifolia*	5.79
17	*Miliusa tomentosa*	2.68
18	*Pongamia pinnata*	3.81
19	*Syzygium cumini*	4.23
20	*Tectona grandis*	1.32

VNP

Sr. No.	Seed propagated	CHV
1	*Albizia procera*	3.62
2	*Butea monosperma*	3.74
3	*Dalbergia lanceolaria*	4.21
4	*Diospyros melanoxylon*	3.88
5	*Ficus racemosa*	8.66
6	*Ficus religiosa*	2.70
7	*Madhuca longifolia*	3.39
8	*Mangifera indica*	5.56
9	*Mitragyna parvifolia*	3.53
10	*Pterocarpus marsupium*	3.48
11	*Tamarindus indica*	5.85
12	*Terminalia bellirica*	5.93
13	*Terminalia tomentosa*	6.45
14	*Wrightia tinctoria*	4.99
	Vegetative propagated	
15	Bamboo species	5.32
16	*Garuga pinnata*	3.43
17	*Haldina cordifolia*	4.00
18	*Lannea coromandelica*	6.05
19	*Miliusa tomentosa*	4.10
20	*Tectona grandis*	4.52

MTR

Sr. No.	Seed propagated	CHV
1	*Anogeissus latifolia*	4.66
2	*Artocarpus heterophyllus*	11.75
3	*Celtis tetraandra*	12.02
4	*Dalbergia latifolia*	6.15
5	*Ficus racemosa*	11.84
6	*Ficus tsjahela*	7.79
7	*Ficus virens*	14.49
8	*Lagerstroemia lanceolata*	4.63
9	*Pterocarpus marsupium*	4.32
10	*Radermachera xylocarpa*	7.32
11	*Schleichera oleosa*	7.44
12	*Stereospermum tetragonum*	3.67
13	*Terminalia bellirica*	5.38
14	*Terminalia tomentosa*	7.00
	Vegetative propagated	
15	Bamboo species	4.75
16	*Eucalyptus globulus*	9.11
17	*Grevillea robusta*	8.55
18	*Syzygium cumini*	9.94
19	*Tectona grandis*	3.53

Table S11. Range, Variance, Kurtosis and CHV across 175 forest plots for the first three principal components (a) SWS, (b) VNP, (c) MTR.

(a) Principal Components	Range	Variance	Kurtosis	Convex Hull Volume
PC 1	8.08	1.52	0.07	NA
PC 2	3.86	0.17	0.64	NA
PC 3	1.59	0.04	0.11	NA
Three PCs combined	13.53	1.73	NA	20.17

(b) Principal Components	Range	Variance	Kurtosis	Convex Hull Volume
PC 1	8.23	1.55	-0.02	NA
PC 2	3.00	0.18	0.07	NA
PC 3	1.76	0.05	0.08	NA
Three PCs combined	12.99	1.78	NA	17.66

(c) Principal Components	Range	Variance	Kurtosis	Convex Hull Volume
PC 1	9.63	1.97	0.06	NA
PC 2	4.40	0.41	- 0.16	NA
PC 3	2.70	0.09	0.70	NA
Three PCs combined	16.73	2.47	NA	39.83

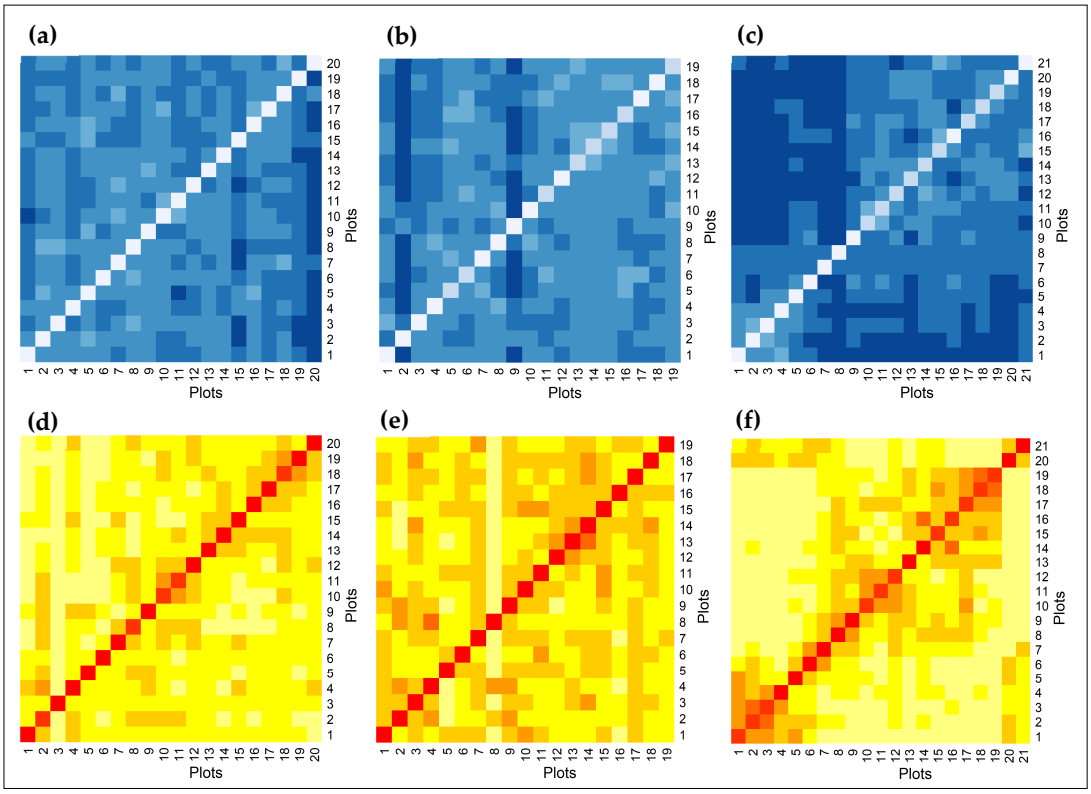

Figure S3. Heatmap of Bray-Curtis dissimilarity graphs of all recorded species. Mean dissimilarity value of species abundance data (blue) and that of spectral diversity as CHVs (yellow) are (a) 0.70 and (d) 0.81 of SWS, (b) 0.63 and (e) 0.70 of VNP and (c) 0.85 and (f) 0.82 of MTR.

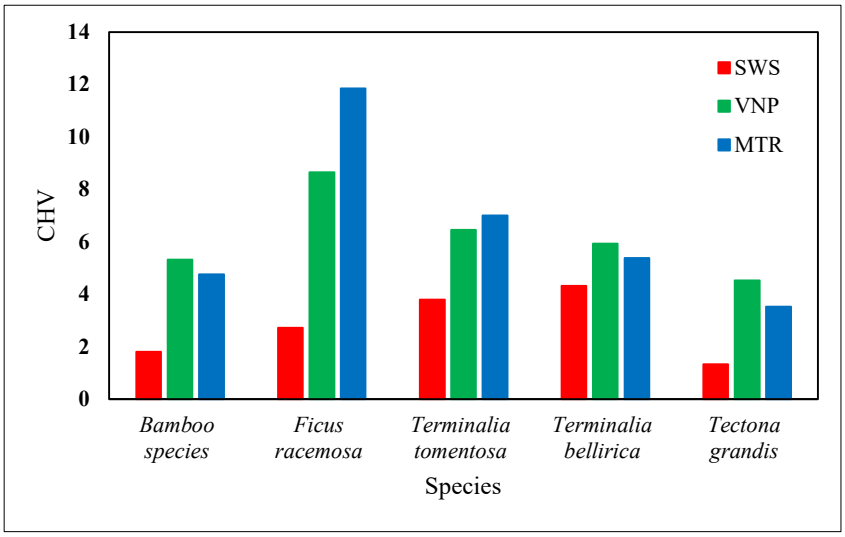

Figure S4. Intra- and inter-species spectral variability (as seen in CHVs) at three sites.

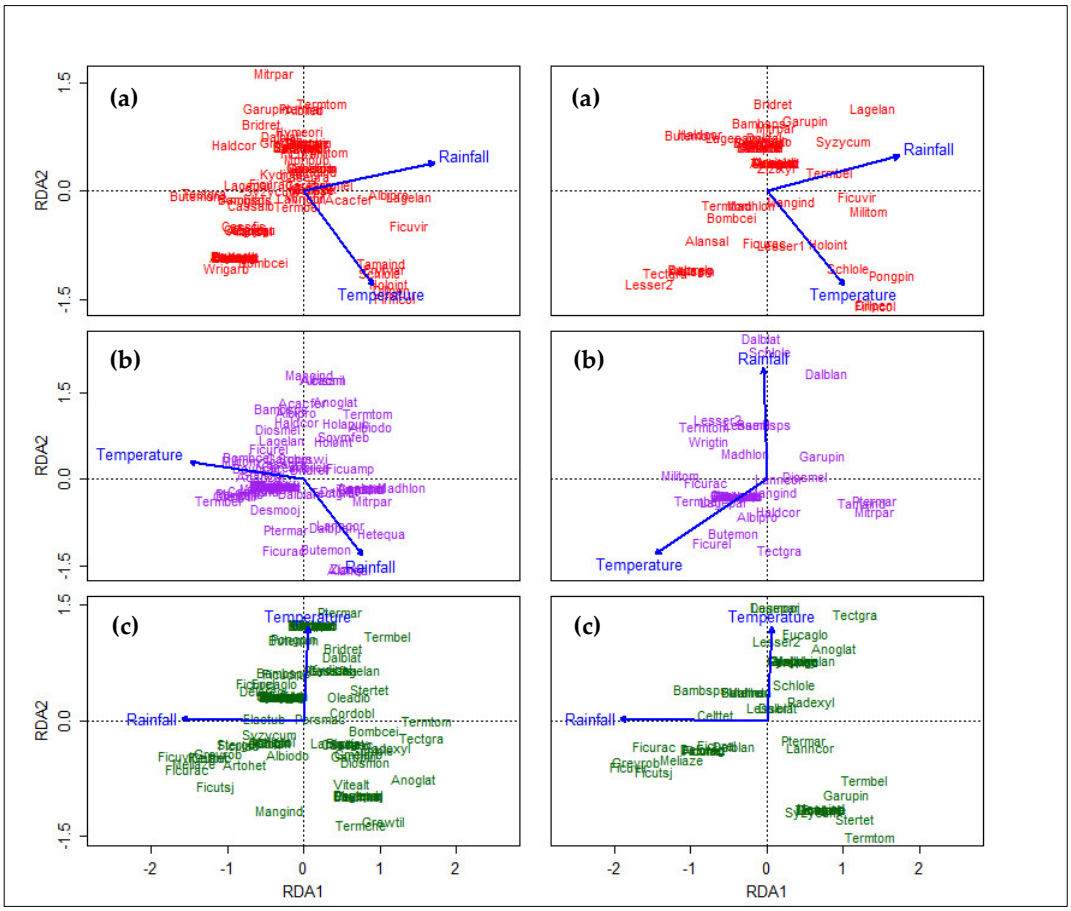

Figure S5. Redundancy analysis output of all recorded species distribution values (left) and spectral diversity as CHVs (right) (considered as response variables) with climatic gradient (explanatory variables). Variance explained for species distribution range between 13 – 14% and for spectral diversity as CHVs vary between 12 – 17%. (a) SWS, (b) VNP and (c) MTR.