

Supplementary:

Table S1. Environmental characteristics of sampling sites

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Main vegetation
					Clay	Sand	Powder				
CX01	102°21'52"	25°32'16"	2420	Purple sand shale residual deposit	34.08	19.60	46.32	Medium mountain	10	SW	<i>Pinus armandii</i> Franch
CX—02	102°23'27"	25°30'14"	1758	Argillaceous sandstone slope wash	64.81	28.07	7.13	Medium mountain	20	NE	<i>Quercus acutissima</i> Carruth
CX—03	102°17'27"	25°30'46"	2340	Limestone deluvium	16.70	30.27	53.03	Medium mountain	25	NE	<i>Alnus nepalensis</i> D. Don.
CX—04	101°46'21"	26°10'6"	2317	Sandstone deluvium	10.22	24.01	65.78	Medium mountain	12	W	<i>Pinus yunnanensis</i>
CX—05	101°13'59"	25°57'14"	2759	Purple sandstone residual deposit	21.48	30.68	47.84	Medium mountain	25	S	<i>Cupressus duclouxiana</i> Hickel
CX—06	101°6'4"	25°38'4"	2458	Purple sandstone deluvium	33.60	20.68	45.72	Medium mountain	20	NE	<i>Castanopsis delavayi</i> Franch
CX—07	102°4'47"	24°57'7"	1716	Purple sandstone residual deposit	40.48	27.86	31.66	Medium mountain	15	NE	<i>Dodonaea viscosa</i> (L.) Jacq.
KM—01	102°37'28"	24°58'21"	2060	Sandstone deluvium	26.88	36.02	37.10	Medium mountain	38	NE	<i>Cyclobalanopsis austroglauca</i> Y. T. Chang
KM—02	102°25'22"	24°58'24"	2140	Limestone deluvium and residual deposit	29.99	26.89	43.12	Medium mountain	20	N	<i>Keteleeria evelyniana</i> Mast.

Table S1 Environmental characteristics of sampling sites (continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Main vegetation
					Clay	Powder	Sand				
KM—03	102°37'11"	25°4'0.25"	2220	Sandstone deluvium and residual deposit	28.34	36.06	35.60	Medium mountain	27	NW	<i>Castanopsis orthacantha</i> Franch.
YX—01	102°58'1"	24°44'11"	2220	Schist deluvium	37.25	41.90	20.85	Medium mountain	30	E	<i>Phyllostachys sulphurea</i>
YX—02	102°57'8"	24°15'46"	1732	Sandstone deluvium	52.26	36.86	10.88	Medium mountain	15	S	<i>Quercus dentata</i> Thunb.
HH—01	102°17'41"	22°53'26"	1860	argillaceous shale deluvium	21.99	18.23	59.78	Medium mountain	42	SE	<i>Castanopsis remotidenticulata</i> Hu
HH—02	102°6'24"	22°55'28"	1625	Sandstone deluvium	28.32	18.02	53.66	Medium mountain	10	S	<i>Cunninghamia Lanceolata</i> Yunnan
HH—03	102°11'51"	22°51'34"	1077	Sandstone deluvium	25.21	26.24	48.55	Medium mountain	38	SW	<i>Dipterocarpus Gaertn. f.</i>
HH—04	103°14'4"	22°52'12"	2300	Limestone deluvium	33.52	5.95	60.54	Medium mountain	24	W	<i>Lithocarpus echinotholus</i>
BS—05	98°45'24"	25°51'6"	2164	Granodiorite and Argillaceous sandstone deluvium	20.23	44.40	35.37	Medium and higher mountain	40	WN	<i>Lithocarpus xylocarpus</i> (kurz) markg.

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
HH-05	103°13'41"	22°58'35"	1255	Argillaceous sandstone deluvium	42.51	20.73	36.76	Medium mountain	30	E	<i>Indosasa crassiflora</i> <i>Mc Olure</i>
HH-07	103°44'10"	22°59'56"	1190	Argillaceous sandstone deluvium	52.34	45.73	1.93	Medium mountain	37	SW	<i>Altingia chinensis</i>
HH-08	103°36'28"	23°5'21"	1665	Sandstone deluvium	36.64	34.02	29.34	Medium mountain	36	E	<i>Phyllostachys sulphurea</i> (Carr.) <i>A. et C. Riv.</i>
HH-09	103°36'50"	22°56'3"	657	Sandstone deluvium	43.47	31.20	25.33	Medium mountain	39	NE	<i>Schizostachyum pseudolima</i> <i>McClure</i>
BS-01	98°28'42"	25°1'11"	1896	Sandstone deluvium	73.78	24.59	1.63	Low mountain valley	32	SE	<i>Quercus acutissima</i> <i>Carruth</i>
BS-02	98°36'12.6"	25°31'21"	1908	Sandstone deluvium	40.29	51.80	7.90	Medium mountain	45	NE	<i>Castanopsis wattii</i>
BS-03	98°37'19.2"	25°31'	1819	bertholite sandstone residual deposit	35.63	42.01	22.36	Low mountain valley	36	NE	<i>Taiwania flousiana</i> <i>Gausson</i>

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
BS—06	98°28'43"	25°0'40"	1763	Volcanics and bertholite sandstone deposit	24.73	35.24	40.04	Hill	23	SN	<i>Alnus nepalensis</i> D. Don
BS—07	98°28'32"	25°0'57"	1796	Volcanics and bertholite sandstone deluvium	64.24	32.94	2.82	Hill	10	NW	<i>Betula alnoide</i> forest
DH—02	97°37'49"	24°38'21"	1256	Quartz sandstone deluvium	30.52	27.84	41.64	Medium mountain	30	NE	<i>Castanopsis tonkinensis</i> Seem. , <i>castanopsis indica</i>
DH—04	97°35'27"	24°39'53"	713	Sandstone and gneiss deluvium	36.09	39.35	24.57	Low mountain valley	25	NE	<i>Terminalia myriocarpa</i> Vaniot <i>Huerck et Muell. — Arg.</i>
DH—05	97°34'19"	24°42'3"	364	Argillaceous sandstone	35.31	26.35	38.34	Low mountain valley	31	N	Yunnan <i>Dipterocarpus Gaertn. f.</i>
DQ—01	99°56'13.7"	27°54'11.8"	3620	Argillaceous shale deluvium	34.91	26.32	38.77	Higher mountains	20	NW	<i>Betulaplatyphylla</i> Suk
ZT—01	104°43'45"	27°53'54"	1285	Purple sandstone residual deposit	43.53	15.74	40.73	Mountains in central	15	N	<i>Bambusoideae</i>

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
DQ — 02	99°56'41.6"	27°54'6.8"	3685	Argillaceous shale deluvium	20.96	18.70	60.34	Higher mountains	25	NW	<i>Picea likiangensis</i> (Franch.) Pritz.
DQ — 03	100°0'0.03"	27°50'12.5"	3745	Granite deluvium	28.52	25.29	46.19	Higher mountains	5	N	<i>Larix potaninii</i> var. <i>australis</i> A. Henry ex Hand. —Mazz
DQ — 04	99°59'53"	27°49'32"	3528	Granite deluvium	20.23	16.40	63.37	Higher mountains	21	NW	<i>Quercus aquifolioides</i> Rehd. et Wils.
DQ—05	100°0'36"	27°2'43"	3960	Quartzite and shale deluvium	25.19	24.67	50.14	Higher mountains	30	E	<i>Tsuga forrestii</i> Downie
DQ—11	99°38'19"	27°54'3"	3330	Granodiorite and sandstone deluvium	18.73	39.07	42.20	Medium mountain	10	E	<i>Populus davidiana</i> Dode
DQ—13	99°00'65"	28°38'24"	4250	Granodiorite ice accretion deluvium	14.02	36.34	49.64	Higher mountains	8	SW	Shrubs meadow
DQ—14	98°59'59"	28°22'32"	4501	Granodiorite and argillaceous sandstone ice accretion deluvium	30.67	37.66	31.67	Higher mountains	8	W	Shrubs meadow

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition			Terrain	Slope angle	Slope aspect	Vegetation
					of soils						
					Clay	Powder	Sand				
NJ—05	99°17'11"	28°9'35"	1280	Granodiorite deluvium	27.94	9.50	62.56	Medium mountain	10	ES	<i>Pinus</i>
NJ—06	99°36'22"	27°45'5"	1685	Granite deluvium	14.38	6.16	79.46	Medium mountain	45	W	<i>Lithocarpus variolosus</i> (Fr.) Chun
QJ—08	104°7'50"	24°35'18"	1957	Limestone deluvium	56.69	19.26	24.06	Mountains in central	28	NW	<i>Cyclobalanopsis glaucoides</i> Schotky
QJ—01	103°55'7"	25°54'8"	2347	Sandstone deluvium and residual deposit	41.06	34.39	24.55	Mountains in central	8	N	Form. <i>Castanopsis orthacantha</i>
QJ—02	104°8'26"	24°36'56"	2107	Sandstone deluvium	22.35	20.20	57.45	Mountains in central	26	N	<i>Lithocarpus dealbatus</i> (Hook. f. et Thoms.) Rehd
QJ—03	104°10'40"	24°39'18"	2140	Sandstone deluvium	15.11	16.73	68.15	Mountains in central	20	NW	<i>Quercus aliena</i> Bl. var. <i>acuteserrata</i> Maxim. ex Wenz

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
QJ-04	103°24'23"	26°3'27"	2540	Limestone deluvium	33.32	15.07	51.61	Mountains in central	23	NE	<i>pinus armandii franch</i>
QJ-05	103°17'33"	26°24'33"	2223	Limestone deluvium	60.45	18.16	21.39	Mountains in central	28	E	<i>Keteleeria evelyniana Mast.</i>
QJ-06	103°30'39"	25°49'18"	2041	Limestone deluvium	18.14	32.99	48.87	Mountains in central	17	S	<i>Pinus yunnanensis</i>
QJ-07	103°7'53"	24°35'22"	1996	Limestone deluvium	58.93	18.31	22.76	Mountains in central	20	W	<i>Castanopsis delavayi Franch</i>
QJ-09	103°55'7"	25°54'8"	2347	Sandstone deluvium	26.34	13.98	59.68	Mountains in central	8	N	<i>Castanopsis orthacantha forest</i>
DQ-02	99°56'41.6"	27°54'6.8"	3685	Argillaceous shale deluvium	20.96	18.70	60.34	Higher mountains	25	NW	<i>Picea likiangensis (Franch.) Pritz.</i>
DQ-03	100°0'0.03"	27°50'12.5"	3745	Granite deluvium	28.52	25.29	46.19	Higher mountains	5	N	<i>Larix potaninii var. australis A. Henry ex Hand. —Mazz</i>
QJ-10	103°55'7"	25°54'8"	2347	Sandstone deluvium	26.34	13.98	59.68	Mountains in central	8	N	<i>Castanopsis orthacantha forest</i>

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Sand	Powder				
DQ—04	99°59'53"	27°49'32"	3528	Granite deluvium	20.23	16.40	63.37	Higher mountains	21	NW	<i>Quercus aquifolioides</i> Rehd. et Wils.
DQ—05	100°0'36"	27°2'43"	3960	Quartzite and shale deluvium	25.19	24.67	50.14	Higher mountains	30	E	<i>Tsuga forrestii</i> Downie
DQ—11	99°38'19"	27°54'3"	3330	Granodiorite and sandstone deluvium	18.73	39.07	42.20	Medium mountain	10	E	<i>Populus davidiana</i> Dode
DQ—13	99°00'65"	28°38'24"	4250	Granodiorite ice accretion deluvium	14.02	36.34	49.64	Higher mountains	8	SW	<i>Shrubs meadow</i>
DQ—14	98°59'59"	28°22'32"	4501	Granodiorite and argillaceous sandstone ice accretion deluvium	30.67	37.66	31.67	Higher mountains	8	W	<i>Shrubs meadow</i>
NJ—05	99°17'11"	28°9'35"	1280	Granodiorite deluvium	27.94	9.50	62.56	Medium mountain	10	ES	<i>Pinus</i>
NJ—06	99°36'22"	27°45'5"	1685	Granite deluvium	14.38	6.16	79.46	Medium mountain	44	W	<i>Lithocarpus variolosus</i> (Fr.) Chun
QJ—08	104°7'50"	24°35'18"	1957	Limestone deluvium	56.69	19.26	24.06	Mountains in central	28	NW	<i>Cyclobalanopsis glaucoides</i> Schotky

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition			Terrain	Slope angle	Slope aspect	Vegetation
					of soils						
					Clay	Powder	Sand				
QJ-01	103°55'7"	25°54'8"	2347	Sandstone deluvium and residual deposit	41.06	34.39	24.55	Mountains in central	8	N	<i>Form. Castanopsis orthacantha</i>
QJ-02	104°8'26"	24°36'56"	2107	Sandstone deluvium	22.35	20.20	57.45	Mountains in central	26	N	<i>Lithocarpus dealbatus</i> (Hook. f. et Thoms.) Rehd
QJ-03	104°10'40"	24°39'18"	2140	Sandstone deluvium	15.11	16.73	68.15	Mountains in central	20	NW	<i>Quercus aliena</i> Bl. var. <i>acuteserrata</i> Maxim. ex Wenz
QJ-04	103°24'23"	26°3'27"	2540	Limestone deluvium	33.32	15.07	51.61	Mountains in central	23	NE	<i>pinus armandii franch</i>
QJ-05	103°17'33"	26°24'33"	2223	Limestone deluvium	60.45	18.16	21.39	Mountains in central	28	E	<i>Keteleeria evelyniana</i> Mast.
QJ-06	103°30'39"	25°49'18"	2041	Limestone deluvium	18.14	32.99	48.87	Mountains in central	17	S	<i>Pinus yunnanensis</i>
QJ-07	103°7'53"	24°35'22"	1996	Limestone deluvium	58.93	18.31	22.76	Mountains in central	20	W	<i>Castanopsis delavayi</i> Franch

Table S1 Environmental characteristics of sampling sites (continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
ZT-05	103°54'27"	28°12'34"	2066	Basalt deluvium	28.92	29.19	41.89	Mountains in central	14	N	<i>Form. Castanopsis platycantha</i>
ZT-08	103°54'49"	28°12'21"	1982	Basalt deluvium	35.29	26.54	38.17	The bottom of the valley	7	NE	<i>Davidia involucrata</i> Baill.
BN - 01	101°37'8.4"	21°35'41"	686	Purple sandstone residual deposit	28.56	45.14	26.29	The top of the mountain	35	S	<i>Parashorea chinensis</i> Wang Hsie.
BN - 02	101°13'33.6"	21°35'38.4"	579	sandstone residual deposit	73.54	15.43	11.03	The top of the mountain	27	NW	<i>Schizostachyum</i>
BN - 03	101°23'20.4"	21°39'11"	859	Purple sandstone residual deposit	22.66	31.61	45.73	The top of the mountain	30	EW	<i>Form. Dendrocalamus strictus</i>
BN-04	101°44'32"	21°27'10"	1119	Purple sandstone residual deposit	41.57	52.35	6.08	Mountains in central	18	NW	<i>Castanopsis mekongensis</i> A. Camus
BN-05	101°40'19"	21°29'14"	849	Purple sandstone residual deposit	18.37	34.19	47.44	Mountains in central	25	NE	<i>Pometia tomentosa</i> (Bl.) Teysm. et Binn

Table S1 Environmental characteristics of sampling sites (continued)

Section number	Longitude(E)	Latitude(N)	Altitude (m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
BN—06	101°17'6"	21°54'13"	677	Purple sandstone residual deposit	55.04	32.39	12.56	Gentle slope hills	6	N	<i>Lithocarpus glaber</i> (Thunb.) Nakai
BN—08	101°20'54"	21°59'16"	1271	Alluviation deluvium	44.56	23.56	31.88	Gentle slope hills	10	SW	<i>Dendrocalamus giganteus</i> Munro.
BN—11	101°33'30"	21°36'34"	961	Alluviation deluvium	37.09	4.06	58.85	Gentle slope hills	5	S	<i>Vatica mangachapoi</i> Blanco
LC—01	99°12'37"	23°18'46"	2263	Purple sandstone deluvium and residual deposit	45.26	24.91	29.83	The top of the mountain	19	NE	<i>Lithocarpus glaber</i> (Thunb.) Nakai
LC—02	99°12'36"	23°18'29"	2173	Granite deluvium and residual deposit	45.12	31.48	23.40	Mountains in central	23	NE	<i>Lithocarpus glaber</i> (Thunb.) Nakai
PE—01	101°6'20"	22°36'58"	1620	Purple sandstone Sandstone deluvium and deluvium	40.52	31.17	28.31	Mountains in central	20	SW	<i>Betula alnoides</i> Hamilt.

Table S1 Environmental characteristics of sampling sites (continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
PE—02	100°43'37"	22°37'31"	1265	Limestone deluvium	26.01	29.46	44.53	Mountains in central	30	SE	<i>Bauhinia acuminata</i>
PE—03	100°32'4"	23°14'36"	1520	Purple sand shale residual deposit	37.78	20.67	41.55	Mountains in central	10	SE	<i>Pinus kesiya</i> var. <i>langbianensis</i>
PE—04	100°32'3"	23°14'38"	1554	Purple sand shale residual deposit	35.19	18.87	45.94	Mountains in central	10	SE	<i>Pinus kesiya</i> var. <i>langbianensis</i>
PE—06	101°15'48"	24°16'44"	2176	Crystalline rock slope deposits	32.15	24.77	43.07	The top of the mountain	25	SE	<i>Lithocarpus xylocarpus</i> (kurz) markg.
PE—07	101°15'48"	24°16'44"	2188	Crystalline rock slope deposits	24.27	16.88	58.85	The top of the mountain	20	NW	<i>L.truncatus</i>
PE—08	101°1'39"	24°32'35"	2467	Crystalline rock and Argillaceous shale deluvium	24.40	16.97	58.63	The top of the mountain	7	SW	<i>L.truncatus</i>)
PE—09	101°0'26"	24°30'16"	2338	paracrystalline rock deluvium	24.49	19.70	55.81	Mountains in central	25	NW	Form. <i>Castanopsis</i> , <i>orthacantha</i>

Table S1 Environmental characteristics of sampling sites (continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils(%)			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder					
						Sand					
LJ—07	100°15'3"	27°7'11"	3090	Tertiary paleolaterite, argillaceous sandstone	24.39	33.40	42.21	Lower subalpine	12	ES	<i>Pinus densata Mast.</i>
LJ—10	100°53'43"	27°7'4"	3389	Sandstone deluvium	19.15	4.52	76.33	Upper subalpine	20	SW	<i>Quercus aquifolioides Rehd. et Wils.</i>
LJ—11	100°64'44"	27°55'29"	3403	Argillaceous sandstone deluvium	23.36	17.93	58.71	Middle subalpine	20	S	<i>Quercus guyavifolia</i>
LJ—12	100°69'14"	27°55'49"	3341	Sandstone deluvium	21.87	6.01	72.11	Lower subalpine	30	N	<i>BetulaplatyphyllaSuk</i>
WS—01	103°59'06"	22°50'56'	1930	Sandstone deluvium	32.74	43.13	24.13	Medium mountain	34	N	<i>Cyclobalanopsis kerrii(Craib) Hu</i>
WS—02	103°59'25"	22°51.734'	1830	Sandstone deluvium	44.12	55.02	0.87	Medium mountain	20	SW	<i>Castanopsiscerebrina(Hick. et A. Camus) Barn. + Castanopsis faberi Hance</i>
WS—03	105°36'3"	23°28'38"	1370	Argillaceous sandstone deluvium	41.78	36.56	21.66	Medium mountain	36	W	<i>Phoebe zhennan S.Lee et F.N.Wei</i>

Table S1 Environmental characteristics of sampling sites(continued)

Section number	Longitude(E)	Latitude(N)	Altitude(m)	Parent material	The granular composition of soils			Terrain	Slope angle	Slope aspect	Vegetation
					Clay	Powder	Sand				
PE—10	100°47'48"	24°25'0"	1801	Purple sandstone deluvium and residual deposit	19.98	22.54	57.48	Mountains in central	20	W	<i>Castanopsis fargesii</i> Franch.
LJ—02	99°42'41"	27°4'30"	2808.1	Argillaceous shale deluvium	17.52	18.58	63.91	Lower subalpine	35	N	<i>Picea asperata</i> Mast + <i>Pinus armandii</i> Franch.
LJ—04	100°2'10"	26°53'34"	2817	Argillaceous shale deluvium	18.55	30.91	50.54	Mountains in central	7	NW	<i>Pinus yunnanensis</i>

CX: Chuxiong; KM: Kunming; YX: Yuxi; HH: Honghe; BS: Baoshan; DH: Dehong; DQ: Diqing; QJ: Qujing; NJ: Nujiang; ZT: Zhaotong; BN: Xishuangbanna;

LC: Lingcang; PE: Puer; LJ: Lijiang; WS: Wenshan; N: North; S: South; E: East; W: West.