Supplementary Material
Variation of the interspecific forest mass-density relationship along gradients of leaf area and global radiation.

Calculation procedure E_{sglob}

The values of E_{sglob} are determined mostly from the monthly means of daily irradiation and the length of the growing season (monthly mean daily minimum air temperature T_{min}≥0 °C, https://www.soda-pro.com/web-services/meteo-data/monthly-means-solar-irradiance-temperature-relative-humidity). In areas with a sea climate like in Belgium, the Netherlands and the United Kingdom the monthly mean daily mean air temperatures T_{mean} ≥5 °C are a better measure of the length of the growing season for forests, because the monthly means of daily minimum air temperature hardly fall below 0 °C, even when the monthly means of daily irradiation are very low.
In mountainous areas the temperature measurements are often not representative due to the spatial resolution of 2.5 km at sub-satellite. Therefore, additional data are used:

Cannell pp	Location	Additional data
111, 112 to 115, 116	Japan, Naeba Mountains	Wang, Q., Iio, A., Tenhunen, J. and Kakubari, Y.: Annual and seasonal variations in photosynthetic capacity of Fagus crenata along an elevation gradient in the Naeba Mountains, Japan. Tree Physiol., 28, 277–285, https://doi.org/10.1093/treephys/28.2.277, 2008.
121	Japan	Oshima, Y.: Ecological studies of Sasa Communities I. Productive structure of some of the Sasa communities in Japan. Bot. Mag., Tokyo 74, 199-210, 1961a. Oshima, Y.: Ecological studies of Sasa Communities II. Seasonal variations of productive structure and annual net production in Sasa communities. Bot. Mag., Tokyo 74, 199-210, 1961b.
129, 130 185	Japan, Mount Fuji Japan, Shigayama	Tadaki, Y., Hatiya, K. and Miyauchi, H.: Studies on the production structure of forest (XII); Primary productivity of *Abies veitchii* in the natural forests at Mount Fuji. J. Jpn. For. Soc., 49:421–428, 1967.
263, 278, 281, 286	USA, Great Smoky Mountains	Weather station Mount Leconte, Tennessee, https://www.climate-charts.com/USA-Stations/TN/USC00406328.html The lapse rate T_{min} = 0.43 °C per 100 m (also used for Arizona and Oregon), is calculated from Fridley, J.D.: Downscaling climate over complex terrain: high finescale (<1000m) spatial variation of near-ground temperatures in a montane forested landscape, Great Smoky Mountains. J. Appl. Meteorol. Climatol., 48, 1033-1049, https://doi.org/10.1175/2008jamc2084.1, 2009.
270, 292, 311, 334	USA, Arizona, Santa Catalina Mountains	Weather station Mount Lemmon, Arizona (025733) https://wrcc.dri.edu/summary/ Climsmaz. 2012. Available at www.wrcc.dri.edu/summary/ Climsmaz.html (accessed 24 June 2024).
336, 351	USA, Oregon	Weather stations Oregon: Santiam Pass (357559), Sisters (357857-7), Corvallis State University (352862-2) https://wrcc.dri.edu/summary/

This article assumes that the E_{sglob} calculation method is valid for both evergreen and deciduous species, which have different leaf phenology strategies to cope with E_{sglob}. An alternative calculation method has been applied to investigate the sensitivity of the results for the leaf phenology of deciduous species. E_{adj} instead of E_{sglob} is used for the broadleaved deciduous forests when leaf emergence and/or leaf senescence deviate approximately one month or more from the months used for E_{sglob} (see Supplementary Table 1). This results in minimal changes in the regression coefficients of Eq. 15 ($\varepsilon' = 0.17$, $g = 0.15$, $h = 2.97$), while the exponent value γ of N remains 0.47. The R^2 value of the model becomes 0.6743. Given the high similarity of the results and the accuracy of the available data, using only E_{sglob} is sufficient for the purpose of this article.

Supplementary Table 1. Stand data of 132 broadleaved forest communities selected from Cannell (1982). In this article Eq. 14 and 15 are calculated using values of E_{sglob}. In addition, values of E_{adj} are notated for deciduous forests when leaf unfolding and/or leaf senescence are expected to deviate approximately one month or more from the estimate of the begin and/or end of the growing season with E_{sglob} (see the previous text).

Cannell pp	*LAI*	log*N* (m^{-2})	log*M* ($g\ m^{-2}$)	E_{sglob}/E_{adj} ($GJ\ m^{-2}\ yr^{-1}$)	Cannell pp	*LAI*	log*N* (m^{-2})	log*M* ($g\ m^{-2}$)	E_{sglob}/E_{adj} ($GJ\ m^{-2}\ yr^{-1}$)
24	6.5	-1.72125	4.5307118	2.5980/2.2524	103	5.5	1.176091	3.64836	5.8663
24	6.4	-1.79588	4.5724069	2.5980/2.2524	105	6	-0.53805	4.2862319	5.6246
37	1.5	-0.42022	3.587711	2.8159	106	4.3	-0.90309	4.2924776	5.9289
37	1.8	-0.42022	3.7737864	2.8159	110	8.3	-0.10696	4.5354207	5.8444
37	3.1	-1	4.2447718	2.8159	110	8.1	-0.17822	4.577032	5.8444
38	2.4	0.460898	3.382017	3.2702	110	6.9	-0.13686	4.5483894	5.8444
38	2.9	-0.02687	3.7307823	3.2702	111	7.7	-0.28108	4.3100557	4.1459
38	1.6	-1.30627	3.9698816	3.2702	111	7.6	-0.66035	4.331832	4.1459
56	5.2	-1.1349	4.2111205	2.6426/2.2970	111	7.8	-0.54837	4.3919931	4.1459
57	4.6	-1.06854	4.4974825	2.5982/2.2526	112	4.5	-1.42597	4.4402792	4.2470
59	5	-1.4318	4.3338501	2.4878	112	4.4	-1.48545	4.4874212	3.6134
67	4.4	-0.85387	4.4313638	4.6718	112	4.9	-1.62893	4.5370631	3.6134
72	6.5	-0.44129	4.1906118	2.2526/1.9286	112	5.4	-1.16749	4.5410798	3.6134
72	6.7	-0.92445	4.2013971	2.2526/1.9286	113	5.2	-0.97881	4.4824448	3.6134
72	5.9	-1.61439	4.4383841	2.2526/1.9286	113	3.3	-1.05799	4.3130231	2.9141
90	3.2	-1.07779	4.3847117	6.1104	113	3.2	-1.22915	4.1798389	2.9141
92	4.8	-0.20761	4.3541084	6.5410	113	3.3	-1.44733	4.2345173	2.9141
92	5.4	-0.19382	4.5228353	6.5410	114	5.8	-1.43533	4.5240064	3.6134
97	4.1	-1.30103	4.0681859	3.2227	114	5.5	-1.5391	4.5430742	3.6134
97	5.2	-1.22185	4.155336	3.2227	114	5.6	-1.49349	4.5582284	3.6134
97	3.7	-1.56864	3.9571282	3.2227	114	4.6	-1.3279	4.4966529	3.6134
98	2.9	0.277701	3.2648178	3.2225	114	6.2	-1.44855	4.5625308	3.6134
99	6.2	-0.35655	4.2659964	5.7514	114	5.3	-1.39794	4.4935974	3.6134
99	5.6	-0.33724	4.1792645	5.7514	115	4.8	-0.99311	4.408918	3.6134
99	3.7	-0.04576	4.0580462	5.7514	115	4.2	-1.01818	4.3905819	2.9141
99	6.8	-0.36653	4.2469907	5.7514	115	4	-1.1945	4.31618	2.9141
101	6.6	0.146128	4.3956758	5.7514	115	3.2	-1.37469	4.184407	2.9141
101	6.4	-0.36653	4.2662317	5.7514	115	4.3	-1.08619	4.331832	2.9141
101	5.4	-0.33724	4.1766699	5.7514	116	4.5	-1.10513	4.465977	3.6281
101	4.1	-0.04576	4.0569049	5.7514	118	2.4	-0.90518	4.122544	3.2227
101	5.7	-0.36653	4.2526103	5.7514	119	7.5	0.133539	4.358125	5.7514
101	5.5	-0.25181	4.3562171	5.7514	119	7	-0.25964	4.326131	5.7514
102	10.7	0.09691	4.3092042	5.8663	119	6.8	0.193125	4.297323	5.7514
102	10.1	0.004321	4.3193143	5.8663	120	6.9	0.269513	4.338058	5.6561
102	9.8	-0.13077	4.3782161	5.8663	120	9.4	0.232996	4.423246	5.6561
102	8.5	-0.11351	4.2966652	5.8663	120	7.7	0.176091	4.421439	5.6561
103	7.4	-0.5376	4.3316297	5.8663	121	5.2	2.414973	3.276462	4.6003
103	4.4	-0.50864	4.0496056	5.8663	121	4.7	2.58995	2.913814	3.6355
103	4.4	-0.50169	4.0576661	5.8663	121	4.7	2.334454	3.217484	4.5568
103	5.2	0.139879	3.6757783	5.8663	121	5.3	1.439333	3.08636	3.2576
103	7.2	0.320146	3.8221681	5.8663	197	4.5	-1.12784	4.65782	5.6225

Supplementary Table 1 (continued)

Cannell pp	*LAI*	log*N* (m^{-2})	log*M* ($g\ m^{-2}$)	E_{sglob}/E_{adj} ($GJ\ m^{-2}\ yr^{-1}$)	Cannell pp	*LAI*	log*N* (m^{-2})	log*M* ($g\ m^{-2}$)	E_{sglob}/E_{adj} ($GJ\ m^{-2}\ yr^{-1}$)
197	6.3	-1.22185	4.678609	5.6225	260	4.4	-0.66354	4.11727	4.2366/3.6661
201	5.2	-1.52288	4.429914	2.4878/2.1350	263	7.4	-0.73993	4.343802	5.2018/4.3090
213	4.7	-1.52724	4.353916	2.4151/2.0911	269	6.6	-0.79588	4.31492	3.0070
219	2.5	-0.56384	3.775974	3.9410/3.4658	270	6.4	-0.51428	4.097257	5.9021/4.0546
219	3.4	-0.70553	3.716838	3.9410/3.4658	274	5	-0.54638	3.969882	3.4289/3.1313
222	3.1	-1.34486	3.890421	2.3909/1.8254	274	4.9	-0.68194	3.980003	3.4289/3.1313
224	3.4	-1.61979	4.515211	2.4139	274	5.5	-0.72862	4.07664	3.4289/3.1313
224	4.3	-1.74473	4.49693	2.4139	276	4.4	-1.37469	4.421604	3.6641
224	3.2	-1.49485	4.352183	2.4139	278	3.5	-0.58503	3.934498	4.6510/3.6661
229	6.6	-0.95546	4.246499	2.8682/2.4434	281	6.3	-0.67162	4.623249	5.2028/4.3090
234	12.1	0.209515	4.842297	5.7838	286	6.1	0.630428	4.032619	4.3421/3.6661
238	6.2	-0.3019	3.79379	2.4720/2.4288	370	4.4	-0.25181	4.469527	5.2109
238	3.5	-0.60555	3.893762	2.4720/2.4288	370	9.5	-0.20761	4.784403	5.2109
238	4.1	-0.37572	3.804821	2.4720/2.4288	370	5.8	-0.02687	4.270213	5.2109
238	1.7	-0.82391	3.848189	2.4720/2.4288	370	5.4	-0.01323	4.384891	5.2109
238	2.8	-0.8729	3.836957	2.4720/2.4288	370	3.1	0.155336	4.03543	5.2109
238	4.1	-1.13077	4.082067	2.4720/2.4288	370	5.7	0.127105	4.419956	5.2109
238	5.9	-0.9914	4.237292	2.4720/2.4288	371	3	0.243038	3.977724	5.2109
238	6.5	-1.05552	4.201397	2.4720/2.4288	371	2.8	0.198657	4.266232	5.2109
240	4.5	-1.28483	3.986772	2.6136/2.3695	371	9.8	0.068186	4.727297	5.2109
240	4.5	-1.27003	4.053846	2.6136/2.3695	371	3.9	0.012837	4.265525	5.2109
250	6.2	-0.83863	4.699143	4.6510/3.6661	371	4.7	0.029384	4.447933	5.2109
259	5.7	-0.88941	4.167022	3.3696	371	4.6	0.025306	4.65273	5.2109
259	6.2	-0.88941	4.200303	3.3696	371	3.2	0.123852	4.2266	5.2109
259	5.5	-0.61618	3.98945	3.3696	372	5.2	0.049877	4.510143	5.2109

Supplementary Table 2. Stand data of 67 coniferous forest communities selected from Cannell (1982)

Cannell pp	*LAI*	log*N* (m^{-2})	log*M* (g m^{-2})	E_{sglob} (GJ m^{-2} yr^{-1})	Cannell pp	*LAI*	log*N* (m^{-2})	log*M* (g m^{-2})	E_{sglob} (GJ m^{-2} yr^{-1})
57	3.4	-0.77806	4.111599	2.5982	244	3.3	-0.24872	3.539076	2.7271
73	9.4	-1.09691	4.508126	2.2814	244	3.9	-0.26761	3.695482	2.7271
125	5.4	-1.54061	4.574957	6.0435	244	1.9	-0.4389	3.800717	2.7271
129	8.1	0.290035	3.838849	4.2145	244	3.1	-0.62525	3.997386	2.7271
129	9.7	-0.01323	4.150756	4.2145	244	3.6	-0.72354	4.072617	2.7271
129	8.2	-0.49771	4.349083	4.2145	244	2.7	-1.11919	4.065206	2.7271
130	7.8	-0.41862	4.202488	4.2145	246	5	-0.67572	4.148294	2.4305
135	5.8	-0.45593	4.149219	5.4134	246	2.8	-0.67572	4.056524	2.4305
135	6.3	-0.88606	4.420286	5.4134	246	3.8	-0.67572	4.089905	2.4305
137	5.1	-0.46852	4.405517	5.1547	246	4.1	-0.67572	4.114277	2.4305
143	5.6	-0.87354	4.34733	4.4461	246	4.8	-0.67572	4.120245	2.4305
143	5.4	-0.8617	4.324077	4.4461	292	6.4	-1.12494	4.552474	5.4702
143	5.8	-0.83476	4.349472	4.4461	292	6.7	-0.82102	4.557146	5.4702
143	6	-0.8274	4.372912	4.4461	311	2.7	-0.56864	4.207634	5.4702
143	5.9	-0.79237	4.369772	4.4461	311	2.1	-0.95861	4.397592	5.4702
144	4.7	-0.87778	4.372728	6.0180	311	1.7	-0.89279	4.210586	5.4702
144	5.9	-0.84345	4.327972	6.0180	314	3.4	-0.3019	3.889862	3.3695
144	5.4	-0.79588	4.393048	6.0180	314	3.1	-0.15366	3.913284	3.3695
144	6.6	-0.54455	4.191171	6.0180	314	3.8	-0.81531	4.061452	3.3695
144	5.7	-0.6073	4.239049	6.0180	314	4.2	-0.19246	4	3.3695
144	6.2	-0.49594	4.312177	6.0180	314	4.3	-0.24185	4.01368	3.3695
146	5.1	-0.19382	4.039811	5.9125	315	1.9	-0.18575	3.673942	3.3695
146	5.1	-0.20066	4.031408	5.9125	315	2.6	-0.18575	3.744293	3.3695
146	5.9	-0.4437	4.106871	5.9125	315	2.5	-0.18575	3.739572	3.3695
147	4.1	-0.87517	4.149835	5.7806	315	3	-0.75449	3.864511	3.3695
147	5.3	-0.70952	4.164353	5.7806	315	2.9	-0.4168	3.888179	3.3695
147	5.7	-0.61618	4.185825	5.7806	315	2.3	-0.17522	3.757396	3.3695
149	7.4	0.469822	3.897627	5.9333	315	2.8	0.030195	3.741152	3.3695
167	4.2	-0.93742	4.216166	4.3470	334	6.7	-1.14267	4.640978	5.4702
185	6.8	-0.92118	4.303412	3.6348	335	6.5	-1.31158	4.652246	4.4092
186	4.3	-1.32331	4.650016	6.0708	335	7.8	-1.50585	4.937016	4.4092
232	2.8	-1.22185	4.299071	3.0687	336	9.6	-0.99783	4.722634	4.4330
232	3.1	-1.21896	4.477844	3.0687	351	4.3	-1.09474	4.444045	3.7456
242	9.1	-0.41828	4.033021	2.6152					