Supplementary Materials

Table S1. Mean values and the range of candidate variables used for modelling across the main beech forest types. With * variables included into the modeling procedure for parameters *b* and *c* are marked.

Variable		Submontane & colline	Montane	Subalpine & altimontane	Acidophi-lous	Thermophi-lous
D_{MIN} *	Mean	14.4	13.9	13.6	13.8	13.8
	Min-Max	(10–38)	(10–45)	(10–43)	(10–39)	(10–37)
QMD *	Mean	29.2	28.5	27.8	28.4	27.1
	Min-Max	(12.2–53.2)	(11.6–56.7)	(11.0–50.17)	(13.1–57.1)	(12.4–51.4)
D_{DOM} *	Mean	41.3	40.3	39.8	40.9	38.2
	Min-Max	(15.0–66.6)	(14.0–65.4)	(14.0–65.0)	(17.5–69.0)	(14.5–60.2)
D_{MAX} *	Mean	48.0	46.8	45.8	47.4	44.1
	Min-Max	(15–88)	(15–83)	(16–78)	(18–84)	(15–80)
BA *	Mean	33.4	33.62	36.6	33.2	32.8
	Min-Max	(5.9–74.8)	(3.5–89.3)	(7.0–78.6)	(9.3–75.7)	(9.6–67.5)
N	Mean	561	611	719	587	660
	Min-Max	(200–2050)	(200–2900)	(200–2400)	(200–1920)	(200–1900)
PBeech *	Mean	0.93	0.92	0.93	0.93	0.94
	Min-Max	(0.80–1.00)	(0.80–1.00)	(0.80–1.00)	(0.80–1.00)	(0.80–1.00)
ELE *	Mean	532	828	1145	428	763
	Min-Max	(139–1272)	(197–1646)	(300–1636)	(150–1288)	(226–1393)
SLP *	Mean	14.7	17.7	20.2	16.8	17.0
	Min-Max	(0.2–44.7)	(0.0–46.8)	(1.9–46.1)	(0.1–38.8)	(0.8–43.2)
Tspr *	Mean	7.9	6.2	7.0	8.5	7.6
	Min-Max	(2.3–9.7)	(1.0–9.7)	(2.3–9.7)	(2.3–12.0)	(2.3–12.0)
Tspr_sum	Mean	23.7	18.7	20.9	25.3	22.8
	Min-Max	(7–29)	(3–29)	(7–29)	(7–36)	(7–36)
SOLRAD	Mean	1931.5	1852.8	1860.5	1958.5	1909.3
	Min-Max	(1650–2030)	(1580–2030)	(1610–2030)	(1650–2335)	(1610–2395)
BIO1	Mean	8.5	6.9	7.1	8.7	7.8
	Min-Max	(3–11)	(3–11)	(3–9)	(3–13)	(3–13)
BIO2	Mean	9.2	8.6	10.9	8.9	9.0
	Min-Max	(0–12)	(0–14)	(4–14)	(0–14)	(2–14)
BIO10	Mean	16.9	15.1	16.0	17.5	16.5
	Min-Max	(12.3–18.3)	(10.3–18.3)	(11.0–18.3)	(12.3–21.8)	(11.0–21.8)
BIO11	Mean	-0.2	-1.4	-1.0	0.1	-0.4
	Min-Max	(-3.7–1.00)	(-4.3–1.00)	(-4.3–1.00)	(-3.7–5.00)	(-4.3–5.67)
PCP	Mean	1503.9	2011.2	2278.2	1407.3	1960.8
	Min-Max	(0–2900)	(1250–3600)	(1250–3600)	(850–2900)	(1250–2900)
PCP_D	Mean	24	19	21	25	23
	Min-Max	(7-29)	(3-29)	(7-29)	(7-36)	(7-36)
DSoil	Mean	62.8	50.2	55.5	67.7	54.1
	Min-Max	(0–175)	(10-208)	(10–128)	(8–300)	(10–150)
DSoil_A	Mean	14.4	13.4	11.6	13.4	12.3
	Min-Max	(0–52)	(2–33)	(3–22)	(3–50)	(2–33)
pH	Mean	5.49	5.50	4.52	4.42	4.83
	Min-Max	(0.0–7.5)	(0.0–7.4)	(0.0–7.2)	(0.0–7.4)	(0.0–7.4)
pH_A	Mean	5.52	5.55	4.78	4.47	4.96

SProd *	Min-Max	(0.0–7.5)	(0.0–7.5)	(2.9–7.3)	(1.9–7.5)	(0.0–7.3)
	Mean	2.10	1.96	1.83	1.99	1.82
BA_{REM} *	Min-Max	(1.47–2.95)	(1.20–2.95)	(1.47–2.67)	(1.33–2.67)	(1.20–2.55)
	Mean	3.5	3.1	2.9	3.4	2.8
	Min-Max	(0.0–41.9)	(0.0–38.8)	(0.0–27.0)	(0.0–37.4)	(0.0–20.8)

Table S2. Effect of stand and site variables on the modelling of the scale parameter *b* of the two-parameter Weibull distribution. Parameters were modelled using different sets of predictors to assess the impact of site and climate variables. Variables deliberately excluded from the modelling process are marked with an 'X' in the Coeff column. The Coeff column shows linear model coefficients along with the level of statistical significance (** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$). The T column shows transformations of the dependent and independent variables used to fulfil the linear model assumptions. In all models, logarithm transformations were applied for the dependent variable.

	b1		**b2**		**b3**	
	Coeff	**T**	**Coeff**	**T**	**Coeff**	**T**
Intercept	1.75e-01***		1.75e+00***		3.13e+00***	
D_{MIN}	3.11e-02 ***	ln	x		x	
QMD	9.39e-01 ***	ln	x		x	
D_{MAX}			excluded due to MC			
BA			3.19e-01 ***	ln	x	
PBeech	1.83e-02 ***		3.36e-01 ***		x	
ELE	2.184e-06**		-5.49e-05 ***		0**	
SLP					1.10e-03	
Tspr						
ASP warm			-1.52e-02 ***		-1.26e-02*	
SoilT D. Cam			1.74e-02**		2.37e-02*	
SoilT Leptosol			1.98e-02 *		2.32e-02*	
SoilT Other						
SProd			1.23e-01 ***		01.28e-01***	
BA_{REM}			3.80e-03 ***		x	

Table S3. Effect of stand and site variables on the modelling of the shape parameter *c* of the two-parameter Weibull distribution. Parameters were modelled using different sets of predictors to assess the impact of site and climate variables. Variables deliberately excluded from the modelling process are marked with an 'X' in the Coeff column. The Coeff column shows linear model coefficients along with the level of statistical significance (** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$). The T column shows transformations of the dependent and independent variables used to fulfil the linear model assumptions. In all models, logarithm transformations were applied for the dependent variable.

	c1		**c2**		**c3**	
	Coeff	**T**	**Coeff**	**T**	**Coeff**	**T**
Intercept	2.02e+00***		7.68e-01***		1.197e+00***	
D_{MIN}	7.55e-01***	ln	x		x	
QMD			excluded due to MC			
D_{MAX}	-9.18e-01***	ln	x		x	
BA	1.56e-01***		-6.38e-02***	ln	x	
PBeech	2.15e-01***		6.68e-01***		x	
ELE	3.42e-05***		3.56e-05**		3.53e-05**	
SLP	-5.53e-04*				-9.79e-04*	
Tspr	-3.72e-03***		-7.39e-03***		-7.29e-03***	
ASP warm	-8.14e-03*					

SoilT D. Cam		3.24e-02**	2.72e-02*
SoilT Leptosol		5.51e-02***	5.278e-02***
SoilT Other		6.38e-02***	5.35e-02***
SProd			
BA$_{REM}$	1.63e-03***	3.24e-03***	x

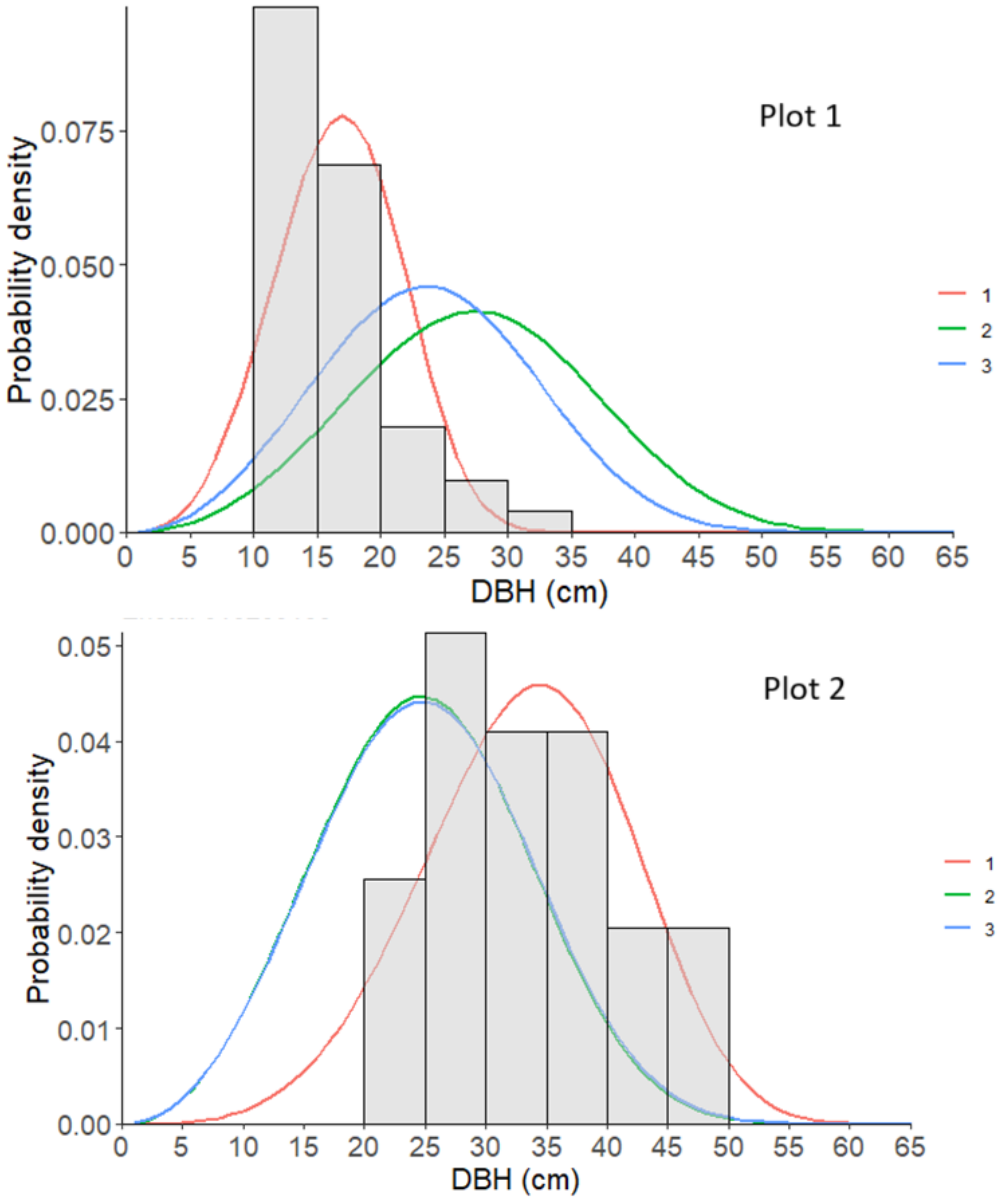


Figure S1. Weibull diameter distributions described using (1) general models containing all variables (b1 and c1; red), (2) models without the main stand parameters D_{MIN}, D_{MAX} and QMD (b2, c2; green) and (3) models including only geo-climatic variables (b3, c3; blue) for selected plots with empirical distribution.

Table S4. Characteristics of selected plots.

	Plot 1	**Plot 2**
D_{MIN} (cm)	10	20
QMD (cm)	16.8	34.0
D_{MAX} (cm)	34	47

BA (m^2/ha)	45.1		35.4	
PBeech (%)	1.00		0.96	
ELE (m)	613		1417	
SLP (°)	26.966257		37.88397	
Tspr	2.3		2.3	
ASP	cold		cold	
SoilT	leptosol		leptosol	
SProd	1.62		1.885	
BA_{REM}	0.00001		0.00001	
Modelled b1, c1	18.48	3.76	4.44	36.53
Modelled b2, c2	30.72	3.27	3.19	27.79
Modelled b3, c3	26.68	3.15	3.17	27.92

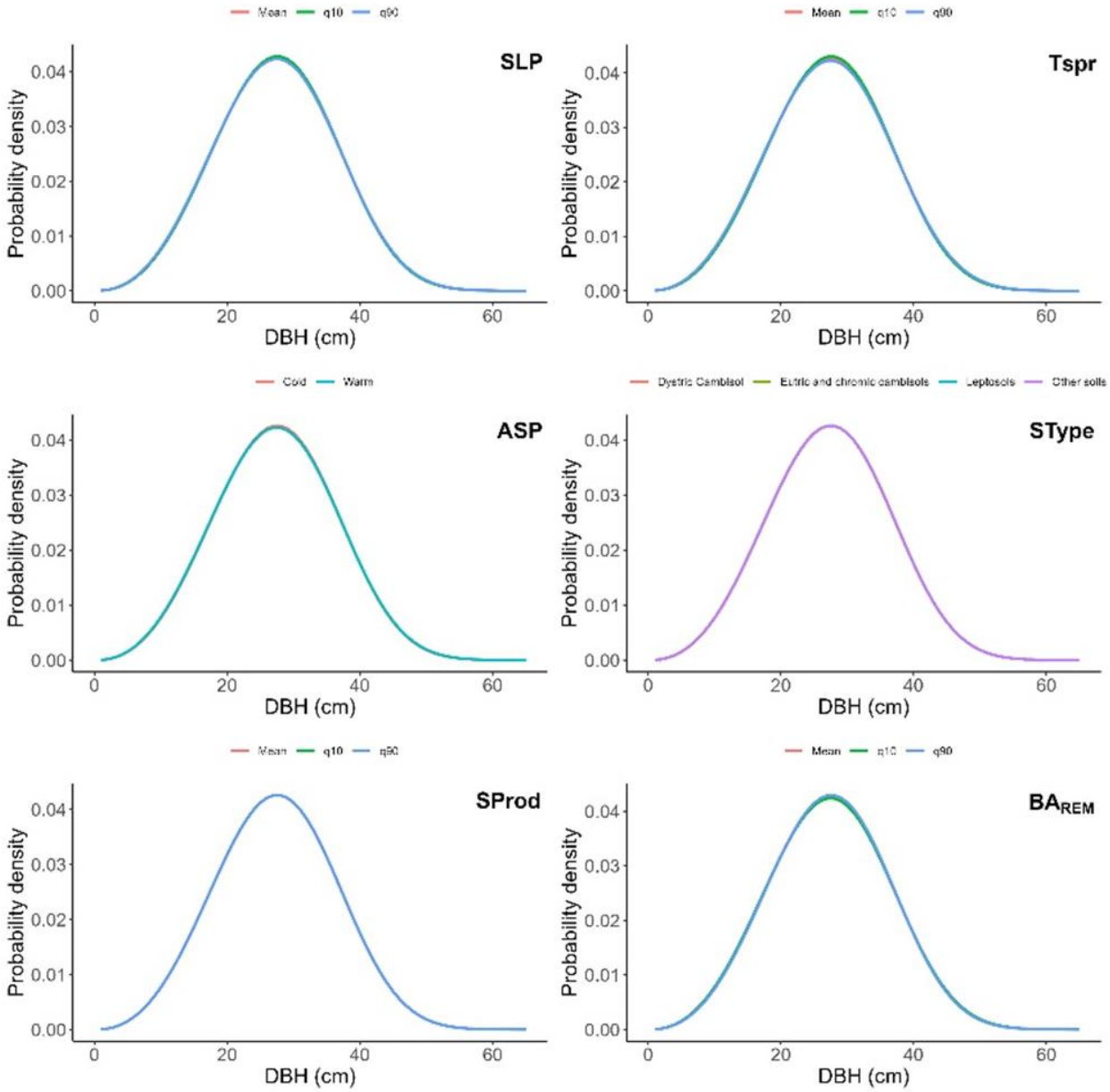


Figure S2. Weibull diameter distributions under varying stand predictors (slope (SLP), mean spring temperature (Tspr), aspect (ASP), soil type (SoilT), site productivity (Sprod) and past removals (BAREM)) when all other predictors were held constant at their mean values (see Table 1). ASP was fixed at the reference level "cold" and SoilT at the reference level "eutric & chromic cambisols". For

each numeric stand predictor, the distribution is shown at the 0.10 quantile (q10), mean and 0.90 quantile (q90) of its value; for categorical predictors, all categories are shown.

Table S5. Effect of stand and geo-climatic predictors on the modelling of the scale parameter *b* of the two-parameter Weibull distribution for beech forest types. The relative decrease in R^2 (%) when a predictor is omitted form the model is shown together with the direction of its effect (↑ positive; ↓ negative).

	Submontane & colline	**Montane**	**Subalpine & altimontane**	**Acidophilous**	**Thermophilus**
D_{MIN} (cm)	2.6×10^{-1} ↑	1.5×10^{-1} ↑	9.2×10^{-2} ↑	1.6×10^{-1} ↑	1.0×10^{-1} ↑
QMD (cm)	99.7↑	99.8↑	99.9↑	99.8↑	99.9↑
BA (m^2/ha)	4.3×10^{-3} ↑		7.8×10^{-3} ↓		
PBeech (%)	3.3×10^{-3} ↑	3.7×10^{-3} ↑		4.3×10^{-3} ↑	2.3×10^{-2} ↑
ELE (m)					
SLP (°)					
Tspr					
ASP warm					
SoilT D Cam					
SoilT Leptosol					
SoilT Other					
SProd			6.0×10^{-3} ↓		
BA_{REM}					

Table S6. Effect of stand and site variables on the modelling of the scale parameter *b* of the two-parameter Weibull distribution for the main beech forest types. Parameters were modelled with sets of predictors for model b1. Linear model coefficients, level of statistical significance (** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$) and intercept are shown. Logarithmic transformation was applied to the dependent variable for all models.

	Submontane & colline	**Montane**	**Subalpine & altimontane**	**Acidophilous**	**Thermophilus**
Intercept	0.1658***	0.1789***	0.2431***	0.1671***	0.1667***
ln (D_{MIN})	0.0344***	0.0317 ***	0.0240 ***	0.0302***	0.0249***
ln (QMD)	0.9367***	0.9379***	0.9393 ***	0.9421***	0.9406***
ln (BA)	0.0038***		-0.0056 *		
PBeech	0.0135*	0.01761**		0.0175*	0.04106***
ELE					
SLP					
Tspr					
ASP warm					
SoilT D. Cam					
SoilT Leptosol					
SoilT Other					
SProd			-0.0060*		
BA_{REM}					

Table S7. Effect of stand and site variables on the modelling of the shape parameter *c* of the two-parameter Weibull distribution for the main for beech forest types. Parameters were modelled using predictor set c1. Linear model coefficients, level of statistical significance (** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$) and intercept are shown. Logarithmic transformation was applied to the dependent variable in all models.

	Submontane & colline	Montane	Subalpine & altimontane	Acidophilous	Thermophi-lus
Intercept	2.0887***	1.9813***	2.2163***	2.087***	1.754***
ln (D_{MIN})	0.7373***	0.7626 ***	0.7730 ***	0.7385 ***	0.8023***
ln (D_{MAX})	-0.9350 ***	-0.9280 ***	-0.8952 ***	-0.8862 ***	-0.9118 ***
ln (BA)	0.1614***	0.1635***	0.1170***	0.1608 ***	0.1359 ***
PBeech	0.2144 **	0.2804 ***			0.3723 ***
ELE					5.64×10^{-5} *
SLP					
Tspr		-0.0057 ***			
ASP warm		-0.0141*			
SoilT D. Cam					
SoilT Leptosol					
SoilT Other					
SProd					
BA_{REM}	0.0016*	0.0027 ***	0.0043 **		