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## Appendix 1

### Statistical summary for simulated self-thinning lines

Table A1. Self-thinning slopes ( $\beta$ ) and intercepts (K) estimated by robust least squares fitting for one-layer model simulations. LCL and UCL represent 95% lower- and upper confidence limits, respectively. The symbol  $s$  represents the level of abiotic stress. NF: in the absence of facilitation; F: in the presence of facilitation. C-Sym: completely symmetric competition; S-Sym: size-symmetric competition; C-Asym: completely asymmetric competition.

	$s = 0$		$s = 0.4$				$s = 0.8$			
			NF		F		NF		F	
	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL
C-Sym	0.966	9.662	0.990	9.277	0.976	9.687	0.994	8.163	0.977	9.673
	0.968, 0.965	9.655, 9.666	0.991, 0.988	9.270, 9.284	0.978, 0.974	9.678, 9.694	0.996, 0.992	8.153, 8.172	0.979, 0.975	9.664, 9.680
S-Sym	1.155	9.586	1.161	9.289	1.188	9.682	1.154	8.503	1.202	9.682
	1.160, 1.150	9.565, 9.606	1.166, 1.155	9.263, 9.314	1.195, 1.182	9.655, 9.712	1.159, 1.148	8.478, 8.526	1.208, 1.195	9.652, 9.712
C-Asym	1.383	9.560	1.379	9.388	1.399	9.602	1.309	8.660	1.410	9.634
	1.389, 1.377	9.535, 9.586	1.386, 1.372	9.360, 9.415	1.408, 1.389	9.563, 9.641	1.315, 1.304	8.637, 8.683	1.420, 1.400	9.593, 9.675

Table A2. Self-thinning slopes ( $\beta$ ) and intercepts (K) estimated by stochastic frontier analysis for one-layer model simulations. SE: standard error. The symbol  $s$  represents the abiotic stress level. NF: in the absence of facilitation; F: in the presence of facilitation. C-Sym: completely symmetric competition; S-Sym: size-symmetric competition; C-Asym: completely asymmetric competition.

	$s = 0$		$s = 0.4$				$s = 0.8$			
			NF		F		NF		F	
	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)
C-Sym	1.007 (0.0049)	9.979 (0.0313)	1.133 (0.0012)	10.219 (0.0085)	1.084 (0.0016)	10.387 (0.0099)	1.043 (0.0024)	8.510 (0.0127)	1.004 (0.0117)	9.959 (0.0753)
S-Sym	1.188 (0.0036)	9.945 (0.0216)	1.185 (0.0035)	9.609 (0.0182)	1.214 (0.0039)	9.998 (0.0203)	1.188 (0.0044)	8.904 (0.0228)	1.128 (0.0117)	10.311 (0.0702)
C-Asym	1.411 (0.0049)	9.860 (0.0237)	1.395 (0.0048)	9.616 (0.0207)	1.420 (0.0031)	9.850 (0.0136)	1.287 (0.0068)	8.748 (0.0272)	1.435 (0.0073)	9.933 (0.0398)

Table A3. Self-thinning slopes ( $\beta$ ) and intercepts (K) for shoot, root and total biomass estimated by robust least squares fitting for two-layer model simulations. LCL and UCL represent 95% lower- and upper confidence limits, respectively. The symbol  $s$  represents the level of abiotic stress. NF: in the absence of facilitation; F: in the presence of facilitation.

	$s = 0$		$s = 0.4$				$s = 0.8$			
			NF		F		NF		F	
	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL	$-\beta$ -LCL, -UCL	K LCL, UCL
Shoot	1.389	9.427	1.361	9.231	1.390	9.434	1.109	7.281	1.408	9.489
	1.394, 1.384	9.406, 9.448	1.367, 1.355	9.206, 9.256	1.397, 1.383	9.404, 9.464	1.113, 1.104	7.262, 7.299	1.416, 1.401	9.457, 9.521
Root	1.360	9.261	1.359	9.505	1.340	9.236	1.141	8.375	1.326	9.247
	1.365, 1.356	9.245, 9.279	1.366, 1.352	9.475, 9.535	1.346, 1.333	9.208, 9.261	1.148, 1.135	8.345, 8.402	1.333, 1.320	9.217, 9.275
Total	1.375	10.039	1.361	10.074	1.365	10.028	1.146	8.706	1.366	10.058
	1.380, 1.370	10.021, 10.060	1.367, 1.354	10.046, 10.101	1.371, 1.358	9.998, 10.055	1.152, 1.140	8.678, 8.734	1.373, 1.359	10.030, 10.088

Table A4. Self-thinning slopes ( $\beta$ ) and intercepts (K) for shoot, root and total biomass estimated by stochastic frontier analysis for two-layer model simulations. SE: standard error. The symbol  $s$  represents the abiotic stress level. NF: in the absence of facilitation; F: in the presence of facilitation.

	$s = 0$		$s = 0.4$				$s = 0.8$			
			NF		F		NF		F	
	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)	$-\beta$ (SE)	K (SE)
Shoot	1.399 (0.0032)	9.646 (0.0140)	1.379 (0.0045)	9.482 (0.0191)	1.387 (0.0053)	9.599 (0.0244)	1.129 (0.0034)	7.562 (0.0152)	1.406 (0.0050)	9.680 (0.0223)
Root	1.372 (0.0026)	9.464 (0.0113)	1.402 (0.0060)	9.871 (0.0274)	1.347 (0.0081)	9.420 (0.0362)	1.153 (0.0040)	8.662 (0.0200)	1.370 (0.0063)	9.636 (0.0332)
Total	1.386 (0.0028)	10.247 (0.0127)	1.406 (0.0057)	10.438 (0.0256)	1.375 (0.0075)	10.233 (0.0341)	1.175 (0.0069)	9.065 (0.0313)	1.399 (0.0177)	10.419 (0.0910)