Supplement of Biogeosciences, 14, 1285–1303, 2017
http://www.biogeosciences.net/14/1285/2017/
doi:10.5194/bg-14-1285-2017-supplement


Biogeosciences Open Access EGU

*Supplement of*

# Carbon stocks and dynamics at different successional stages in an Afromontane tropical forest

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**Supplementary information** (Nyirambangutse et al.)**:**

**Table S1.** Characteristics of all plots. SG, successional group including early (ES), mixed (MS) and late (LS); TG , topography including ridge (R), upper slope (US), slope (S) and valley (V); Slope, average slope of all subplot sides; Breast height diameter (*D*) are measured or calculated from diameter measurements above any stem irregularities (eq. 1). Height (*H*) was measured on 930 trees to obtain coefficients to calculate *H* (presented here) from *D* of all trees (eq. 2). No of stems, basal area (BA), mean *D*, mean height (*H*), stem biomass and production (prod) includes branches and were based on data from all trees > 5 cm *D*. Big trees are > 40 cm *D*. Stem biomass was calculated from eq. 3 based on four different combinations of species specific (Spec.) and generic (Gen.) *H* vs *D* relationships and wood densities ($\rho$). RGR, relative growth rate, mortality ($\mu$) and recruitment ($\lambda$) rate were calculated from eq. 6, 10 and 11 respectively. $SI_{BA}$ and $SI_{\#}$, successional index based on BA or no of stems (#) was calculated from eq. 9.

| | | | | | | *D* (cm) | | *H* (m) | | | | Stem biomass (Mg ha$^{-1}$) | | | | Stem prod. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Plot no | SG | TG | Slope (%) | No of stems (ha$^{-1}$) | BA (m$^2$ ha$^{-1}$) | Mean | Max | Mean | Max | *H* of 100 highest trees ha$^{-1}$ (m) | # big trees, *D* > 40 cm | Spec. *H*, $\rho$ | Gen. *H*, spec. $\rho$ | Spec. *H*, gen $\rho$ | Gen. *H*, $\rho$ | Biomass (Mg ha$^{-1}$ yr$^{-1}$) | RGR (% yr$^{-1}$) | $\rho_{BA}$ (g cm$^{-3}$) | $\mu$ (% yr$^{-1}$) | $\lambda$ (% yr$^{-1}$) | $SI_{BA}$ | $SI_{\#}$ |
| 1 | ES | US | 24 | 732 | 20.3 | 14.8 | 81.0 | 13.7 | 31.2 | 21.7 | 26 | 142 | 148 | 165 | 161 | 7.3 | 6.9 | 0.53 | 1.7 | 4.8 | 0.050 | 0.084 |
| 2 | ES | R | 16 | 850 | 28.4 | 17.5 | 81.3 | 15.7 | 29.8 | 22.2 | 28 | 182 | 190 | 226 | 233 | 9.3 | 5.0 | 0.47 | 1.0 | 4.3 | 0.012 | 0.009 |
| 3 | ES | S | 24 | 678 | 20.2 | 15.4 | 78.4 | 14.5 | 34.5 | 22.0 | 40 | 148 | 152 | 172 | 162 | 6.7 | 10.0 | 0.49 | 1.0 | 14.1 | 0.057 | 0.009 |
| 4 | MS | S | 10 | 1220 | 33.2 | 15.6 | 98.8 | 14.8 | 31.2 | 22.9 | 30 | 248 | 251 | 271 | 272 | 4.5 | 2.3 | 0.51 | 0.5 | 1.5 | 0.178 | 0.103 |
| 5 | ES | US | 32 | 530 | 22.3 | 19.1 | 78.7 | 16.1 | 31.7 | 22.4 | 40 | 153 | 159 | 190 | 198 | 4.0 | 6.1 | 0.46 | 0.7 | 3.1 | 0.021 | 0.019 |
| 6 | ES | US | 27 | 338 | 21.2 | 21.7 | 86.9 | 15.1 | 31.8 | 22.8 | 62 | 157 | 170 | 193 | 199 | 3.4 | 5.9 | 0.51 | 1.2 | 5.2 | 0.002 | 0.011 |
| 7 | MS | R | 25 | 466 | 30.4 | 18.9 | 131.4 | 13.5 | 30.8 | 24.3 | 58 | 300 | 322 | 301 | 316 | 4.2 | 7.0 | 0.51 | 2.7 | 5.6 | 0.549 | 0.071 |
| 8 | MS | S | 20 | 484 | 36.9 | 23.0 | 126.1 | 16.7 | 38.0 | 26.3 | 70 | 342 | 346 | 379 | 376 | 7.5 | 5.4 | 0.49 | 1.4 | 4.3 | 0.209 | 0.079 |
| 9 | MS | S | 23 | 336 | 27.1 | 22.0 | 105.9 | 15.6 | 33.3 | 23.6 | 46 | 279 | 298 | 273 | 287 | 4.3 | 6.1 | 0.52 | 1.7 | 5.3 | 0.349 | 0.092 |
| 10 | LS | S | 46 | 1798 | 45.1 | 14.2 | 69.0 | 13.4 | 33.6 | 25.9 | 68 | 392 | 393 | 370 | 371 | 7.9 | 2.1 | 0.62 | 0.8 | 0.4 | 0.598 | 0.518 |
| 11 | LS | R | 15 | 536 | 60.9 | 28.3 | 102.2 | 18.7 | 37.7 | 33.0 | 172 | 793 | 743 | 699 | 650 | 8.1 | 2.9 | 0.59 | 1.3 | 0.7 | 0.888 | 0.398 |
| 12 | LS | R | 21 | 446 | 17.5 | 16.3 | 79.6 | 13.0 | 29.0 | 21.7 | 28 | 159 | 170 | 156 | 165 | 3.3 | 5.9 | 0.56 | 1.7 | 2.6 | 0.575 | 0.217 |
| 13 | MS | V | 10 | 1080 | 26.4 | 13.9 | 65.3 | 14.2 | 29.6 | 26.1 | 32 | 229 | 217 | 231 | 213 | 7.0 | 4.3 | 0.58 | 1.6 | 1.7 | 0.383 | 0.234 |
| 14 | LS | R | 40 | 596 | 31.2 | 19.0 | 106.2 | 15.7 | 38.8 | 28.7 | 66 | 343 | 319 | 326 | 298 | 4.4 | 4.3 | 0.62 | 1.6 | 2.2 | 0.559 | 0.294 |
| 15 | LS | S | 20 | 812 | 26.0 | 15.3 | 85.5 | 13.7 | 35.5 | 25.0 | 46 | 245 | 245 | 232 | 225 | 4.2 | 3.8 | 0.62 | 1.6 | 1.3 | 0.617 | 0.246 |
| Mean | | | 24 | 727 | 29.8 | 18.3 | 91.8 | 15.0 | 33.1 | 24.6 | 54 | 274 | 275 | 279 | 275 | 5.7 | 5.2 | 0.54 | 1.4 | 3.8 | 0.336 | 0.159 |
| ES - mean | | | 25 | 626 | 22.5 | 17.7 | 81.3 | 15.0 | 31.8 | 22.2 a | 39 | 156 a | 164 a | 189 | 191 | 6.1 | 6.8 | 0.49 a | 1.1 | 6.3 a | 0.028 a | 0.027 a |
| MS - mean | | | 21 | 541 | 28.4 | 19.9 | 103.1 | 15.0 | 32.7 | 24.6 ab | 54 | 262 b | 271 b | 276 | 278 | 5.2 | 5.7 | 0.52 a | 1.7 | 4.4 ab | 0.298 b | 0.097 b |
| LS -mean | | | 29 | 838 | 36.2 | 18.6 | 88.5 | 14.9 | 34.9 | 26.9 b | 76 | 387 b | 374 b | 357 | 342 | 5.6 | 3.8 | 0.60 b | 1.4 | 1.4 b | 0.648 b | 0.335 c |
| *P*-value | | | 0.19 | 0.81 | 0.14 | 0.95 | 0.19 | 0.97 | 0.31 | 0.018 | 0.26 | 0.015 | 0.017 | 0.081 | 0.085 | 0.93 | 0.056 | <0.001 | 0.61 | 0.01 | 0.002 | <0.001 |

**Table S2.** Properties of all species identified within the 15 plots at census I (2011/2012) and II (2014/2015). Wood density ($\rho$) was obtained from measurements of the most common species, indicated by # for number of sampled trees and standard deviation (SD) of the mean. Wood density from other species are from the global wood density databases (Chave et al 2009, Zanne et al 2009). Breast height diameter (*D*) were measured or calculated from diameter measurements above any stem irregularities. Height (*H*) was measured on 930 trees among the most common species (see Table S3) to obtain coefficients to calculate *H* (presented here) from *D* of all trees. No of living, new and dead represents the classification in census II (2015). Rank represents the most abundant species based on no of stems, basal area (BA) and relative growth rates (RGR). The BAs are based on all 15 plots (7.5 ha).

| | $\rho$ (g cm$^{-3}$) | | | *D* (cm) | | *H* (m) | | Stem biomass (kg) | | Number of trees | | | Rank | | | BA | No of big trees, *D* > | RGR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | # | Mean | SD | Mean | Max | Mean | Max | Mean | Max | Living | New | Dead | # stems | BA | RGR | (m$^2$ ha$^{-1}$) | 40 cm | (% yr$^{-1}$) |
| *Afrocrania volkensii* | 2 | 0.53 | ± 0.00 | 17.3 | 58.6 | 19.0 | 29.6 | 276 | 2812 | 119 | 1 | 3 | 11 | 13 | 33 | 0.504 | 3 | 4.6 |
| *Agauria salicifolia* | 2 | 0.53 | ± 0.02 | 20.8 | 62.0 | 14.3 | 24.3 | 347 | 2555 | 82 | | 2 | 13 | 11 | 81 | 0.559 | 10 | 0.3 |
| *Alangium chinense* | | 0.40 | | 8.7 | 12.5 | 10.7 | 13.6 | 27 | 49 | 2 | 1 | | 70 | 75 | 8 | 0.002 | | 9.5 |
| *Albizia gummifera* | | 0.53 | | 6.7 | 6.7 | 9.4 | 9.4 | 13 | 13 | 1 | | | 76 | 80 | 64 | 0.0005 | | 2.1 |
| *Alchornea hirtella* | | 0.53 | | 5.7 | 8.9 | 8.6 | 11.2 | 9 | 27 | 138 | 22 | 13 | 10 | 39 | 42 | 0.053 | | 4.2 |
| *Anthocleista grandiflora* | | 0.58 | | 22.7 | 57.4 | 17.0 | 27.9 | 607 | 2754 | 6 | | | 55 | 41 | 68 | 0.051 | 1 | 1.9 |
| *Antidesma venenosum* | | 0.65 | | 16.9 | 31.7 | 15.3 | 21.9 | 232 | 762 | 7 | | | 54 | 51 | 59 | 0.026 | | 2.6 |
| *Apodytes dimidiata* | | 0.61 | | 16.3 | 50.3 | 14.1 | 26.6 | 336 | 2137 | 16 | | 1 | 38 | 34 | 37 | 0.081 | 1 | 4.2 |
| *Balthasarea schliebenii* | | 0.59 | | 28.0 | 60.5 | 19.3 | 28.4 | 824 | 3169 | 6 | | | 56 | 36 | 54 | 0.067 | 1 | 2.9 |
| *Beilschmiedia rwandensis* | 5 | 0.68 | ± 0.01 | 31.5 | 78.0 | 14.4 | 26.8 | 1452 | 5627 | 16 | | | 39 | 19 | 70 | 0.287 | 5 | 1.9 |
| *Bersama abyssinica* | | 0.62 | | 30.9 | 81.3 | 11.8 | 19.9 | 1145 | 4173 | 4 | | | 63 | 35 | 38 | 0.078 | 1 | 4.2 |
| *Bridelia brideliifolia* | | 0.55 | | 14.6 | 38.9 | 14.1 | 23.9 | 163 | 1063 | 14 | | | 40 | 44 | 63 | 0.042 | | 2.5 |
| *Carapa grandiflora* | 8 | 0.57 | ± 0.08 | 12.8 | 73.9 | 13.5 | 27.6 | 196 | 4431 | 266 | 14 | 2 | 4 | 8 | 18 | 0.786 | 9 | 6.3 |
| *Casearia runssorica* | | 0.63 | | 14.1 | 39.6 | 12.7 | 26.7 | 222 | 1383 | 11 | 1 | | 45 | 47 | 65 | 0.035 | | 2.3 |
| *Cassipourea gummifera* | | 0.63 | | 9.7 | 9.7 | 11.7 | 11.7 | 40 | 40 | 1 | | | 77 | 77 | 60 | 0.001 | | 2.6 |
| *Cassipourea ndando* | | 0.63 | | 6.8 | 9.6 | 9.5 | 11.7 | 18 | 39 | 5 | | | 59 | 71 | 12 | 0.003 | | 7.7 |
| *Cassipourea ruwensoriensis* | | 0.63 | | 13.0 | 43.9 | 12.6 | 25.2 | 199 | 1608 | 21 | 5 | | 36 | 37 | 20 | 0.063 | 1 | 6.1 |
| *Cassipourea spp* | | 0.63 | | 13.1 | 39.6 | 13.1 | 24.1 | 175 | 1261 | 11 | | | 46 | 48 | 36 | 0.030 | | 4.3 |
| *Chassalia subochreata* | | 0.59 | | 5.8 | 8.6 | 8.7 | 10.9 | 11 | 28 | 37 | 1 | 3 | 26 | 57 | 44 | 0.015 | | 3.9 |
| *Chionanthus africanus* | 4 | 0.53 | ± 0.03 | 9.7 | 38.8 | 10.8 | 24.2 | 61 | 1033 | 80 | 4 | 2 | 14 | 28 | 25 | 0.111 | | 5.2 |
| *Chrysophyllum gorungosanum* | | 0.54 | | 21.1 | 36.0 | 17.0 | 23.2 | 341 | 861 | 10 | | | 52 | 38 | 57 | 0.059 | | 2.6 |
| *Chrysophyllum rwandense* | | 0.65 | | 37.7 | 55.0 | 25.6 | 31.8 | 1692 | 3251 | 10 | | | 53 | 25 | 67 | 0.176 | 6 | 2.1 |

| Species | ρ (g cm$^{-3}$) | | | *D* (cm) | | *H* (m) | | Stem biomass (kg) | | Number of trees | | | Rank | | | BA (m$^2$ ha$^{-1}$) | No of big trees, *D* > 40 cm | RGR (% yr$^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | Mean | SD | Mean | Max | Mean | Max | Mean | Max | Living | New | Dead | # stems | BA | RGR | | | |
| *Cleistanthus polystachyus* | 8 | 0.63 | ± 0.09 | 27.4 | 75.2 | 20.9 | 38.8 | 1033 | 7025 | 71 | 3 | | 16 | 7 | 49 | 0.790 | 16 | 3.5 |
| *Cremaspora triflora* | | 0.59 | | 9.5 | 17.1 | 11.3 | 16.1 | 49 | 155 | 12 | 1 | 1 | 44 | 58 | 32 | 0.015 | | 4.8 |
| *Dasylepis racemosa* | | 0.64 | | 6.6 | 7.4 | 9.3 | 10.0 | 16 | 21 | 2 | | | 71 | 78 | 24 | 0.001 | | 5.2 |
| *Dichaetanthera corymbosa* | | 0.59 | | 16.0 | 37.0 | 14.9 | 23.4 | 186 | 1005 | 26 | | 2 | 30 | 31 | 47 | 0.092 | | 3.6 |
| *Drypetes gerrardii* | | 0.70 | | 20.3 | 29.0 | 17.0 | 21.0 | 368 | 667 | 2 | | | 72 | 60 | 77 | 0.010 | | 0.8 |
| *Drypetes occidentalis* | | 0.71 | | 6.8 | 9.6 | 9.4 | 11.7 | 21 | 44 | 4 | | | 64 | 74 | 11 | 0.002 | | 7.8 |
| *Ekebergia capensis* | | 0.47 | | 14.5 | 126.1 | 13.0 | 34.8 | 420 | 12955 | 35 | 2 | 2 | 27 | 21 | 66 | 0.229 | 1 | 2.2 |
| *Erica johnstonii* | | 0.59 | | 16.4 | 16.4 | 15.8 | 15.8 | 140 | 140 | 1 | | | 78 | 70 | 80 | 0.003 | | 0.5 |
| *Faurea saligna* | 3 | 0.76 | ± 0.03 | 54.8 | 102.2 | 29.0 | 37.7 | 4512 | 14936 | 49 | | | 20 | 3 | 79 | 1.804 | 38 | 0.5 |
| *Ficalhoa laurifolia* | 3 | 0.60 | ± 0.03 | 27.0 | 71.0 | 23.6 | 36.8 | 943 | 5689 | 66 | | 6 | 18 | 9 | 74 | 0.735 | 14 | 1.2 |
| *Ficus oreadum* | | 0.41 | | 6.7 | 10.5 | 9.3 | 12.3 | 12 | 32 | 5 | 2 | | 60 | 72 | 1 | 0.003 | | 19.8 |
| *Galiniera coffeoides* | | 0.59 | | 7.8 | 18.8 | 10.1 | 16.9 | 28 | 195 | 241 | 36 | 13 | 5 | 23 | 23 | 0.185 | | 5.7 |
| *Garcinia volkensii* | | 0.73 | | 13.1 | 30.5 | 13.4 | 21.5 | 140 | 785 | 39 | 1 | | 24 | 33 | 50 | 0.086 | | 3.0 |
| *Grewia mildbraedii* | | 0.56 | | 9.8 | 35.2 | 11.3 | 22.9 | 76 | 844 | 17 | | | 37 | 52 | 4 | 0.025 | | 11.5 |
| *Hagenia abyssinica* | | 0.57 | | 17.9 | 55.9 | 14.8 | 27.6 | 369 | 2535 | 11 | 6 | 5 | 47 | 32 | 17 | 0.089 | 2 | 6.9 |
| *Harungana montana* | 2 | 0.53 | ± 0.06 | 31.6 | 86.9 | 20.0 | 31.8 | 1080 | 6438 | 44 | 5 | 2 | 21 | 10 | 10 | 0.701 | 11 | 8.2 |
| *Ilex mitis* | 2 | 0.51 | ± 0.02 | 15.7 | 67.7 | 14.3 | 27.0 | 268 | 3277 | 77 | 4 | 1 | 15 | 17 | 75 | 0.360 | 7 | 1.2 |
| *Ixora burundiensis* | | 0.79 | | 10.9 | 21.6 | 12.2 | 18.2 | 95 | 367 | 28 | 1 | 1 | 28 | 43 | 56 | 0.044 | | 2.7 |
| *Lepidotrichilia volkensii* | | 0.59 | | 7.0 | 8.7 | 9.6 | 11.0 | 17 | 29 | 6 | | | 57 | 68 | 51 | 0.003 | | 3.0 |
| *Lindackeria kivuensis* | | 0.56 | | 7.0 | 8.3 | 9.6 | 10.7 | 16 | 24 | 4 | 1 | | 65 | 73 | 5 | 0.002 | | 11.3 |
| *Macaranga kilimandscharica* | 9 | 0.44 | ± 0.03 | 15.9 | 70.7 | 15.4 | 24.5 | 158 | 2762 | 1977 | 245 | 58 | 1 | 2 | 9 | 7.468 | 59 | 8.2 |
| *Maesa lanceolata* | | 0.68 | | 10.2 | 20.0 | 6.0 | 10.0 | 37 | 150 | 26 | 3 | 5 | 31 | 46 | 28 | 0.040 | | 5.1 |
| *Magnistipula butayei* | | 0.59 | | 9.7 | 12.1 | 11.6 | 13.3 | 41 | 65 | 4 | | | 66 | 67 | 22 | 0.004 | | 5.5 |
| *Maytenus acuminata* | 2 | 0.74 | ± 0.02 | 10.6 | 54.1 | 11.9 | 21.4 | 96 | 2401 | 236 | 10 | 5 | 6 | 14 | 61 | 0.374 | 1 | 2.6 |
| *Maytenus undata* | | 0.73 | | 14.0 | 54.1 | 13.4 | 27.3 | 287 | 3023 | 14 | | | 41 | 42 | 45 | 0.049 | 1 | 3.7 |
| *Memecylon walikalense* | | 0.77 | | 13.9 | 29.1 | 13.4 | 21.0 | 219 | 732 | 14 | 2 | | 42 | 45 | 31 | 0.041 | | 5.0 |
| *Myrianthus holstii* | | 0.47 | | 14.9 | 29.7 | 14.1 | 21.2 | 148 | 475 | 6 | | | 58 | 55 | 19 | 0.019 | | 6.1 |
| *Neoboutonia macrocalyx* | | 0.33 | | 7.6 | 13.6 | 9.9 | 14.2 | 17 | 50 | 4 | 1 | | 67 | 69 | 2 | 0.003 | | 17.6 |

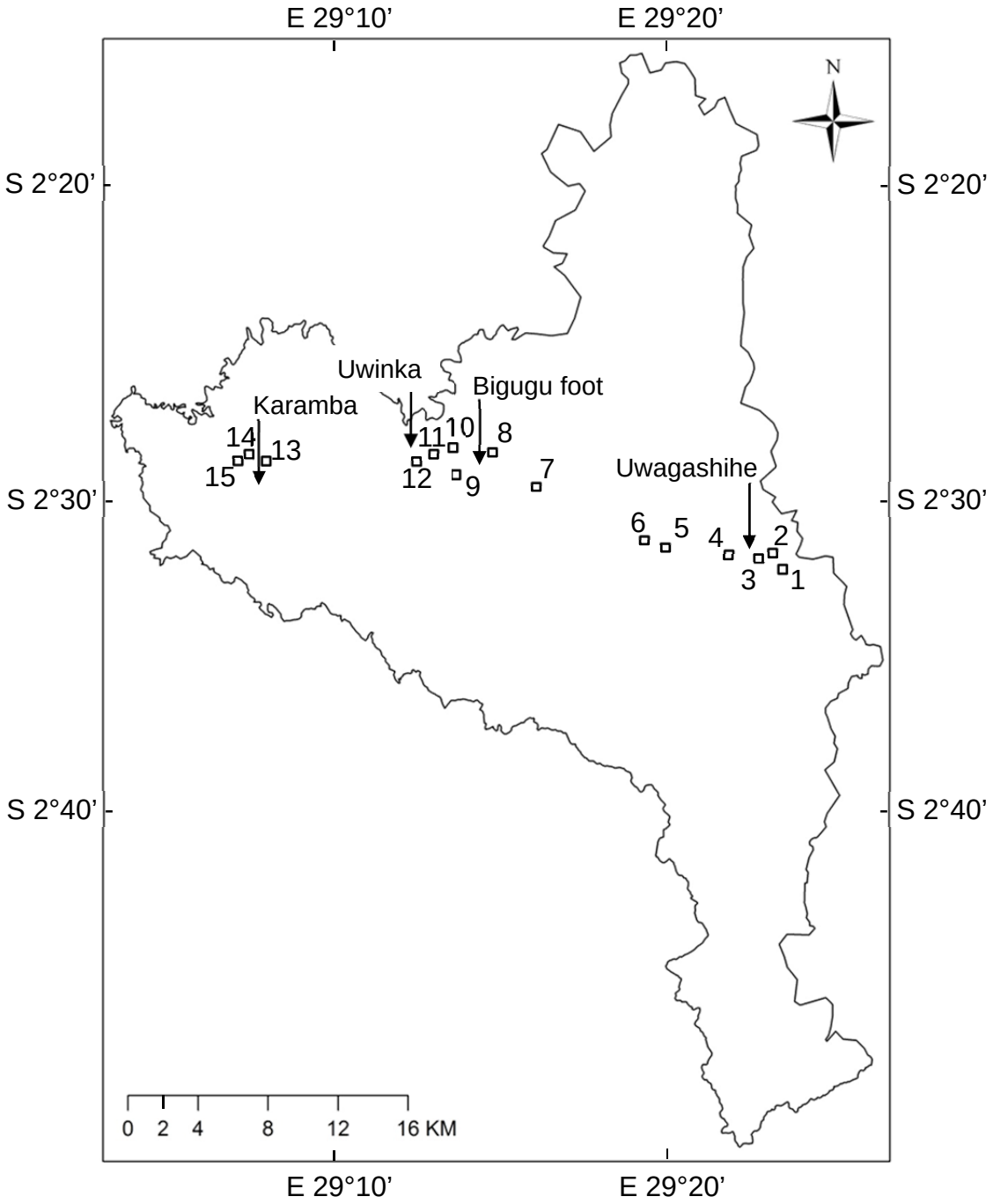
| Species | ρ (g cm$^{-3}$) | | | *D* (cm) | | *H* (m) | | Stem biomass (kg) | | Number of trees | | | Rank | | | BA (m$^2$ ha$^{-1}$) | No of big trees, *D* > 40 cm | RGR (% yr$^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | Mean | SD | Mean | Max | Mean | Max | Mean | Max | Living | New | Dead | # stems | BA | RGR | | | |
| *Newtonia buchananii* | | 0.50 | | 6.2 | 6.2 | 9.0 | 9.0 | 10 | 10 | 1 | | | 79 | 81 | 39 | 0.000 | | 4.1 |
| *Nuxia congesta* | | 0.68 | | 17.4 | 29.1 | 15.9 | 21.0 | 221 | 647 | 25 | | 2 | 32 | 30 | 71 | 0.095 | | 1.7 |
| *Ochna afzelii* | | 0.75 | | 11.9 | 19.5 | 12.8 | 17.3 | 110 | 269 | 3 | | | 69 | 66 | 34 | 0.005 | | 4.6 |
| *Ocotea kenyensis* | 4 | 0.52 | ± 0.11 | 26.5 | 99.1 | 17.8 | 38.0 | 1042 | 9822 | 67 | 4 | 1 | 17 | 6 | 15 | 0.902 | 14 | 6.5 |
| *Ocotea usambarensis* | 4 | 0.49 | ± 0.05 | 15.2 | 106.2 | 13.3 | 34.6 | 313 | 9677 | 195 | 10 | 2 | 8 | 5 | 27 | 0.971 | 13 | 5.1 |
| *Olea capensis* | | 0.77 | | 27.4 | 71.3 | 17.4 | 30.0 | 1491 | 6006 | 11 | | 2 | 48 | 24 | 76 | 0.184 | 4 | 0.8 |
| *Olinia rochetiana* | 1 | 0.71 | | 19.6 | 103.6 | 15.0 | 33.3 | 785 | 12741 | 62 | 7 | 3 | 19 | 12 | 41 | 0.538 | 6 | 4.2 |
| *Oricia renieri* | | 0.59 | | 7.2 | 12.6 | 9.8 | 13.6 | 20 | 72 | 11 | 1 | 1 | 49 | 64 | 21 | 0.007 | | 5.8 |
| *Oxyanthus speciosus* | | 0.53 | | 5.0 | 5.0 | 7.9 | 7.9 | 6 | 6 | 1 | 1 | | 80 | 83 | 30 | 0.000 | | 6.5 |
| *Oxyanthus spp* | | 0.53 | | 16.8 | 28.0 | 14.6 | 20.7 | 234 | 461 | 1 | | 1 | 81 | 63 | 29 | 0.009 | | 4.8 |
| *Parinari excelsa* | | 0.70 | | 21.5 | 69.0 | 16.0 | 29.7 | 786 | 5067 | 11 | 1 | 1 | 50 | 29 | 48 | 0.104 | 2 | 3.7 |
| *Peddea spp* | | 0.59 | | 7.1 | 8.0 | 9.7 | 10.5 | 18 | 23 | 2 | | | 73 | 76 | 78 | 0.001 | | 0.6 |
| *Pentadesma reyndersii* | | 0.77 | | 15.8 | 21.7 | 15.0 | 18.2 | 205 | 360 | 2 | | | 74 | 65 | 40 | 0.006 | | 4.1 |
| *Pleiocarpa pycnantha* | | 0.59 | | 17.8 | 26.3 | 15.9 | 20.0 | 221 | 443 | 5 | | | 61 | 54 | 46 | 0.020 | | 3.6 |
| *Podocarpus falcatus* | | 0.60 | | 11.7 | 25.0 | 12.4 | 19.6 | 104 | 399 | 5 | | | 62 | 61 | 82 | 0.010 | | 0.2 |
| *Podocarpus latifolius* | 4 | 0.49 | ± 0.02 | 21.7 | 56.6 | 16.6 | 25.8 | 347 | 2108 | 42 | 1 | | 23 | 20 | 72 | 0.271 | 4 | 1.7 |
| *Polyscias fulva* | 3 | 0.50 | ± 0.11 | 23.6 | 77.9 | 15.2 | 26.6 | 597 | 4166 | 103 | 20 | | 12 | 4 | 3 | 1.008 | 26 | 13.2 |
| *Prunus africana* | 2 | 0.61 | ± 0.07 | 20.8 | 57.7 | 12.3 | 19.3 | 362 | 2042 | 25 | 3 | 1 | 33 | 26 | 35 | 0.171 | 3 | 4.8 |
| *Psychotria mahonii* | 3 | 0.56 | ± 0.04 | 9.6 | 34.8 | 6.5 | 14.3 | 37 | 523 | 268 | 34 | 22 | 3 | 15 | 16 | 0.367 | | 6.6 |
| *Psydrax subcordata* | | 0.76 | | 11.3 | 36.8 | 12.3 | 23.4 | 117 | 1276 | 23 | 1 | 7 | 34 | 40 | 26 | 0.053 | | 5.2 |
| *Rapanea melanophloeos* | 4 | 0.67 | ± 0.03 | 12.1 | 33.0 | 13.3 | 24.4 | 122 | 952 | 146 | 2 | 1 | 9 | 18 | 55 | 0.288 | | 2.8 |
| *Rytigynia bridsoniae* | | 0.59 | | 5.6 | 5.6 | 8.4 | 8.4 | 9 | 9 | | | 1 | 83 | 82 | 73 | 0.0003 | | 1.5 |
| *Rytigynia bugoyensis* | | 0.59 | | 7.3 | 7.3 | 9.9 | 9.9 | 18 | 18 | 1 | | | 82 | 79 | 83 | 0.001 | | -1.2 |
| *Rytigynia kigeziensis* | | 0.59 | | 8.1 | 24.9 | 10.2 | 19.5 | 41 | 388 | 23 | 1 | 3 | 35 | 53 | 62 | 0.024 | | 2.6 |
| *Rytigynia kiwuensis* | | 0.59 | | 8.8 | 23.2 | 10.8 | 18.9 | 43 | 327 | 206 | 25 | 4 | 7 | 22 | 43 | 0.209 | | 4.1 |
| *Sapium ellipticum* | | 0.55 | | 22.7 | 27.8 | 18.5 | 20.6 | 315 | 474 | 2 | | | 75 | 59 | 69 | 0.011 | | 1.9 |
| *Sericanthe leonardii* | | 0.59 | | 8.6 | 16.2 | 10.8 | 15.7 | 35 | 135 | 11 | | | 51 | 62 | 58 | 0.010 | | 2.6 |
| *Strombosia scheffleri* | 8 | 0.73 | ± 0.06 | 25.0 | 84.1 | 19.9 | 32.4 | 927 | 8400 | 38 | | | 25 | 16 | 53 | 0.360 | 5 | 2.9 |

| Species | ρ (g cm$^{-3}$) | | | *D* (cm) | | *H* (m) | | Stem biomass (kg) | | Number of trees | | | Rank | | | BA (m$^2$ ha$^{-1}$) | No of big trees, *D* > 40 cm | RGR (% yr$^{-1}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | Mean | SD | Mean | Max | Mean | Max | Mean | Max | Living | New | Dead | # stems | BA | RGR | | | |
| *Symphonia globulifera* | | 0.60 | | 20.7 | 62.7 | 15.4 | 28.8 | 640 | 3498 | 14 | 1 | | 43 | 27 | 6 | 0.116 | 2 | 10.4 |
| *Syzygium guineense* | 11 | 0.63 | ± 0.08 | 24.3 | 131.4 | 16.0 | 30.8 | 880 | 16583 | 708 | 20 | 11 | 2 | 1 | 52 | 7.941 | 139 | 3.0 |
| *Tabernaemontana stapfiana* | | 0.52 | | 18.6 | 25.7 | 16.4 | 19.8 | 212 | 374 | 4 | | | 68 | 56 | 13 | 0.017 | | 7.4 |
| *Tarenna rwandensis* | | 0.69 | | 8.7 | 21.8 | 10.7 | 18.3 | 49 | 326 | 27 | 1 | | 29 | 49 | 7 | 0.026 | | 8.8 |
| *Xymalos monospora* | | 0.59 | | 7.1 | 17.0 | 9.6 | 16.1 | 21 | 152 | 43 | 14 | 1 | 22 | 50 | 14 | 0.026 | | 7.6 |
| *All speces:* | | | | | | | | | | | | | | | | | | |
| Mean | | 0.60 | | 15.4 | 40.9 | 13.5 | 21.4 | 356 | 2333 | | | | | | | | | 4.62 |
| Sum | 94 | | | | | | | | | 5970 | 519 | 191 | | | | | 406 | |

**Table S3.** Species specific relationship of height (*H*) vs diameter at breast height (*D*) were established for the most abundant species based on basal area (BA) of all plots. For the *H* – *D* relationship the fitting parameters a, b and c in eq. 2, the modelling efficiency (ME) and the simulated height at a *D* of 10, 40 and 80 cm are given. Only simulated *H* within the range of *H* of sampled trees is given. The number of stems (#), measured *D* (mean, min, max) and *H* (mean, min, max) of the sampled trees are given.

| | Species abundance | | *H* - *D* relationship and properties of sample trees | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BA | | Fitting parameters of eq. 2 | | | | Simulated *H* (m) at *D* of: | | | | *D* (cm) | | | *H* (m) | | |
| Species | ($m^2$ $ha^{-1}$) | % | *a* | *b* | *c* | ME | 10 | 40 | 80 | # | Mean | Min | Max | Mean | Min | Max |
| *Afrocrania volkensii* | 0.50 | 1.7 | 30 | -0.059 | 1.1 | 0.83 | 14.5 | 28.3 | | 15 | 22.8 | 6.7 | 59.3 | 20.2 | 9.5 | 30.5 |
| *Agauria salicifolia* | 0.56 | 1.9 | 141 | -0.028 | 0.5 | 0.81 | 10.9 | 20.1 | | 12 | 27.2 | 7.0 | 55.5 | 16.0 | 7.0 | 24.9 |
| *Beilschmiedia rwandensis* | 0.29 | 1.0 | 39 | -0.034 | 0.8 | 0.86 | 7.7 | 19.2 | 27.0 | 14 | 31.0 | 5.3 | 78.7 | 14.3 | 2.0 | 32.8 |
| *Bersama abyssinica* | 0.08 | 0.3 | 20 | -0.052 | 1.0 | 0.91 | 7.9 | 17.3 | 19.9 | 4 | 31.3 | 6.3 | 81.5 | 11.9 | 3.0 | 20.1 |
| *Carapa grandiflora* | 0.78 | 2.6 | 28 | -0.039 | 1.2 | 0.71 | 12.9 | 26.7 | 27.6 | 56 | 21.5 | 6.4 | 74.0 | 18.5 | 6.9 | 32.8 |
| *Chionanthus africanus* | 0.11 | 0.4 | 31 | -0.066 | 0.9 | 0.88 | 11.7 | 24.5 | | 14 | 15.6 | 5.1 | 39.2 | 14.2 | 6.0 | 24.8 |
| *Chrysophyllum rwandense* | 0.18 | 0.6 | 80 | -0.049 | 0.6 | 0.83 | 13.6 | 27.5 | | 10 | 38.1 | 7.3 | 54.8 | 25.8 | 12.3 | 36.0 |
| *Cleistanthus polystachyus* | 0.79 | 2.6 | 208 | -0.016 | 0.6 | 0.82 | 13.6 | 27.5 | 37.4 | 37 | 31.0 | 6.0 | 75.8 | 22.4 | 6.1 | 42.8 |
| *Faurea saligna* | 1.80 | 6.1 | 41 | -0.033 | 0.9 | 0.77 | 10.1 | 26.3 | 35.3 | 40 | 57.1 | 5.2 | 102.3 | 29.5 | 6.7 | 43.8 |
| *Ficalhoa laurifolia* | 0.73 | 2.5 | 40 | -0.045 | 1.0 | 0.84 | 13.6 | 27.5 | 37.4 | 32 | 36.5 | 8.8 | 72.2 | 27.3 | 7.5 | 38.0 |
| *Harungana montana* | 0.70 | 2.3 | 58 | -0.156 | 0.3 | 0.75 | 16.5 | 23.9 | 28.3 | 18 | 44.4 | 9.0 | 88.8 | 23.5 | 15.5 | 30.7 |
| *Ilex mitis* | 0.36 | 1.2 | 32 | -0.107 | 0.7 | 0.89 | 12.8 | 23.3 | | 14 | 30.9 | 5.1 | 60.5 | 19.4 | 8.2 | 29.2 |
| *Macaranga kilimandscharica* | 7.40 | 24.8 | 29 | -0.183 | 0.6 | 0.53 | 13.7 | 21.6 | 25.0 | 195 | 25.7 | 5.1 | 71.0 | 18.0 | 5.5 | 31.1 |
| *Maesa lanceolata* | 0.04 | 0.1 | 43 | -0.025 | 0.8 | 0.52 | 6.1 | | | 15 | 12.7 | 6.0 | 20.7 | 7.1 | 3.0 | 12.6 |
| *Maytenus acuminata* | 0.37 | 1.2 | 21 | -0.067 | 1.1 | 0.77 | 12.3 | | | 16 | 13.7 | 6.0 | 29.6 | 13.7 | 7.1 | 22.4 |
| *Ocotea kenyensis* | 0.90 | 3.0 | 58 | -0.044 | 0.7 | 0.88 | 11.3 | 25.1 | 34.8 | 42 | 29.8 | 6.8 | 84.5 | 19.7 | 7.0 | 37.7 |
| *Ocotea usambarensis* | 0.97 | 3.2 | 42 | -0.064 | 0.7 | 0.76 | 11.7 | 24.4 | 31.8 | 38 | 27.4 | 6.3 | 107.7 | 17.6 | 1.6 | 36.9 |
| *Olinia rochetiana* | 0.54 | 1.8 | 45 | -0.007 | 1.2 | 0.98 | 5.1 | 22.0 | | 3 | 27.8 | 31.0 | 40.7 | 15.4 | 21.6 | 24.0 |
| *Podocarpus latifolius* | 0.27 | 0.9 | 27 | -0.038 | 1.1 | 0.74 | 10.2 | 23.9 | | 24 | 24.9 | 6.3 | 56.7 | 17.8 | 6.4 | 31.1 |
| *Polyscias fulva* | 1.00 | 3.4 | 26 | -0.026 | 1.3 | 0.78 | 10.0 | 24.4 | 25.8 | 63 | 30.6 | 6.7 | 78.0 | 18.3 | 5.2 | 32.1 |
| *Prunus africana* | 0.17 | 0.6 | 19 | -0.009 | 1.7 | 0.82 | 7.2 | 19.2 | | 20 | 22.8 | 7.3 | 47.8 | 13.9 | 5.4 | 22.8 |
| *Psychotria mahonii* | 0.36 | 1.2 | 15 | -0.039 | 1.2 | 0.74 | 7.3 | 14.6 | | 14 | 16.9 | 5.7 | 36.3 | 9.7 | 5.1 | 15.4 |
| *Rapanea melanophloeos* | 0.29 | 1.0 | 37 | -0.060 | 0.8 | 0.75 | 12.3 | | | 34 | 16.9 | 5.3 | 32.8 | 16.4 | 6.0 | 25.4 |
| *Strombosia scheffleri* | 0.36 | 1.2 | 34 | -0.062 | 0.9 | 0.89 | 12.8 | 27.1 | 32.2 | 22 | 25.4 | 6.1 | 86.2 | 19.7 | 8.3 | 32.7 |
| *Syzygium guineense* | 7.94 | 26.6 | 31 | -0.057 | 0.9 | 0.69 | 10.8 | 23.8 | 29.1 | 175 | 41.3 | 5.1 | 106.6 | 21.1 | 2.1 | 45.2 |
| All species | | | | | | | | | | | | | | | | |
| Mean | | | 47 | -0.055 | 0.9 | 0.79 | 11.1 | 23.5 | 30.1 | | 28.1 | 7.3 | 65.6 | 18.1 | 7.0 | 30.2 |
| Sum | 27.49 | 92.2 | | | | | | | | 930 | | | | | | |

**Figure S1.** Location of plots (1-15) and climate stations (↓ name) in Nuyungwe national park, in south-western Rwanda.



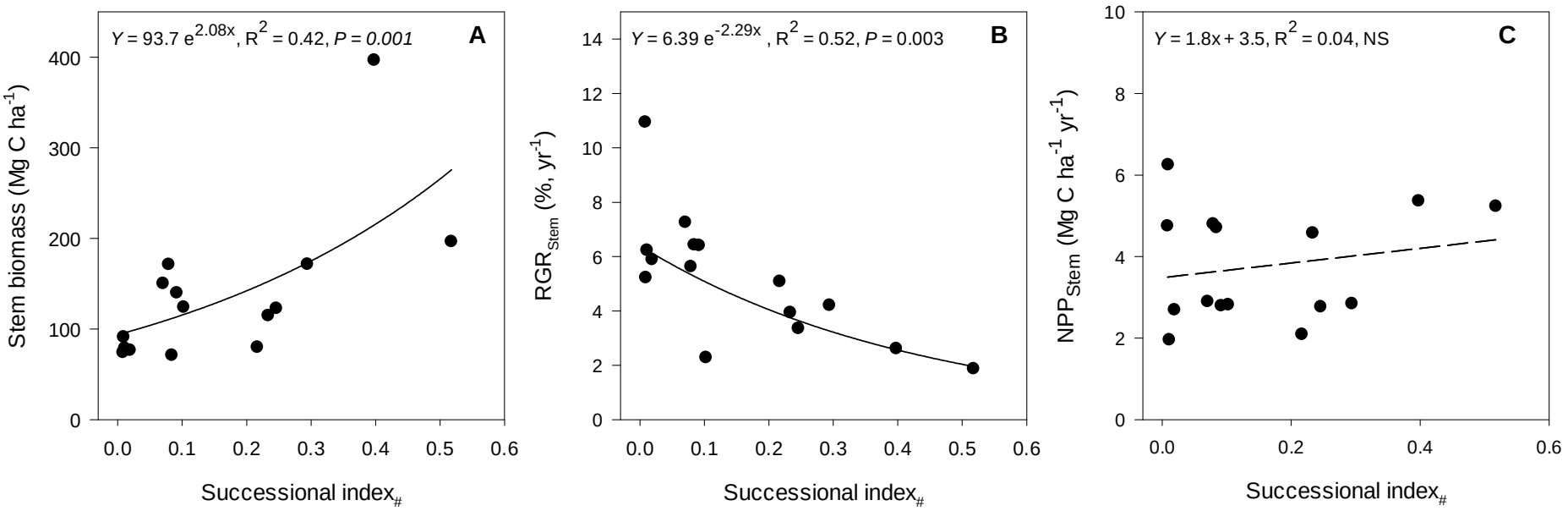



**Figure S2.** Biomass (a), relative growth rates (RGR, b) and net primary production (NPP, c) of stems including branches of each plot in relation to its successional index, based on number of stems (#) of the most abundant early and late successional species (eq. 9). Biomass, RGR, and NPP is calculated from eq. 3, 6, 5, respectively based on measurements of $D_{BH}$, $H$ and $\rho$. The adjusted $R^2$-values are 0.37 and 0.48 in a and b, respectively.