Supporting Information to accompany:

Structural, physiognomic and aboveground biomass variation in savanna-forest transition zones on three continents. How different are co-occurring savanna and forest formations?

by Elmar Veenendaal *et al.*

Contents:

Appendix A: Site Descriptions:

Plot	Latitude	Long.	*V*	E_V (m)	T_A (ºC)	P_A (m)	WRB Soil Classification
AFRICA: Cameroon							
MDJ-01	6.168N	12.825E	Tall forest	773	23.8	1.61	Haplic Lixisol (Humic, Chromic)
MDJ-02	6.163N	12.824E	Long-grass savanna	867	23.4	1.62	Pisolithic Plinthosol (Humic)
MDJ-03	5.984N	12.869E	Stunted shrub-rich forest	761	23.9	1.59	Pisolithic Plinthosol (Dystric)
MDJ-04	5.999N	12.868E	Long-grass savanna	755	23.9	1.59	Haplic Ferralsol (Dystric)
MDJ-05	5.980N	12.868E	Stunted shrub-rich forest	768	23.9	1.59	Pisolithic Plinthosol (Dystric)
MDJ-06	6.003N	12.891E	Long-grass savanna	755	23.9	1.59	Pisolithic Plinthosol (Humic, Clayic)
MDJ-07	6.007N	12.886E	Tall forest	755	23.9	1.59	Pisolithic Plinthosol (Ferric, Dystric)
MDJ-08	6.213N	12.749E	Long-grass savanna	772	23.8	1.62	Haplic Lixisol (Humic, Endoskeletic)
MDJ-09	6.009N	12.889E	Long-grass savanna	778	23.8	1.59	Hyperskeletic Leptosol (Dystric)
MDJ-10	5.997N	12.894E	Tall closed woodland	766	23.8	1.59	Pisolithic Plinthosol (Humic, Dystric)
AFRICA: Ghana							
ASU-01	7.136N	2.447W	Tall forest	263	26.0	1.21	Endofluvic Cambisol (Dystric)
BFI-01	7.714N	1.694W	Tall closed woodland	358	25.4	1.29	Haplic Alisol(Arenic, Hyperdystric, Rhodic)
BFI-02	7.715N	1.692W	Tall savanna woodland	358	25.4	1.29	Brunic Arenosol (Alumic, Hyperdystric)
BFI-03	7.705N	1.696W	Tall savanna woodland	350	25.4	1.29	Brunic Arenosol (Alumic, Hyperdystric)
BFI-04	7.707N	1.698W	Tall forest	350	25.4	1.29	Haplic Nitosol (Dystric)
KOG-01	7.302N	1.180W	Tall savanna woodland	201	26.3	1.25	Haplic Arenosol (Dystric)
MLE-01	9.304N	1.857W	Savanna woodland	134	27.9	1.03	Brunic Arenosol (Dystric)
AFRICA: Burkina Faso							
BBI-01	12.731N	1.165W	Savanna woodland	275	28.3	0.69	Haplic Luvisol (Epidystric, Endosiltic)
BBI-02	12.733N	1.164W	Savanna woodland	275	28.3	0.69	Pisolithic Plinthosol (Eutric)
BDA-01	10.940N	3.150W	Shrub-rich savanna woodland	264	27.8	0.98	Acric Plinthosol (Magniferric, Dystric, Siltic)
BDA-02	10.940N	3.154W	Shrub-rich savanna woodland	258	27.9	0.98	Pisolithic Plinthosol (Magniferric, Dystric, Siltic)
BDA-03	10.865N	3.073W	Grassland	295	27.6	0.98	Gleyic Leptosol
AFRICA: Mali							
HOM-01	15.344N	1.468W	Savanna grassland	306	29.9	0.35	Rubic Arenosol (Dystric, Aridic)
HOM-02	15.335N	1.547W	Savanna grassland	310	30.0	0.35	Rubic Arenosol (Dystric, Aridic)
SOUTH AMERICA: Bolivia							
ACU-01	15.251S	61.245W	Tall forest	271	24.1	1.27	Nitic Acrisol (Epieutric, Chromic)
LFB-01	14.579S	60.831W	Tall forest	238	23.9	1.45	Geric Acric Ferralsol (Dystric)
LFB-02	14.577S	60.832W	Tall forest	238	23.9	1.45	Geric Acric Ferralsol (Dystric)
LFB-03	14.600S	60.849W	Shrub-rich savanna woodland	215	24.0	1.44	Geric Acric Gibbsic Ferralsol (Dystric)
OTT-01	16.391S	61.212W	Tall closed woodland	455	23.2	1.15	Plinthic Acrisol (Epieutric, Epiarenic)
OTT-02	16.414S	61.189W	Savanna woodland	437	23.3	1.15	Haplic Ferralsol (Dystric, Xanthic)
OTT-03	16.416S	61.191W	Tall savanna woodland	437	23.3	1.15	Umbric Ferralsol (Dystric)
OTT-04	16.399S	61.196W	Grassland	442	23.2	1.15	Umbric Planosol (Ferric, Albic, Dystric)
TUC-01	18.524S	60.812W	Stunted forest	312	24.8	0.82	Haplic Cambisol (Hypereutric, Greyic, Siltic)
TUC-02	18.533S	60.634W	Shrub-rich woodland	319	24.8	0.85	Acric Ferralsol (Dystric, Arenic)
TUC-03	18.183S	60.859W	Savanna woodland	302	24.7	0.89	Ferallic Cambisol (Hypereutric)
SOUTH AMERICA:Brazil							
ALC-01	2.5287S	54.909W	Savanna woodland	29	25.9	2.02	Hyperalbic Arenosol (Alumic, Hyperdystric)

Plot	Latitude	Long.	$\mathbb{V}$	E_V (m)	T_A (°C)	P_A (m)	WRB Soil Classification
ALC-02	2.4905S	54.960W	Savanna woodland	30	26.0	1.97	Hyperalbic Arenosol (Alumic, Hyperdystric)
ALF-01	9.5983S	55.937W	Tall forest	264	25.5	2.35	Vetic Acrisol (Hyperdystric)
ALF-02	9.5784S	55.918W	Tall forest	253	25.6	2.35	Haplic Regosol (Hypereutric, Epiarenic)
FLO-01	12.812S	51.854W	Forest	377	25.5	1.61	Geric Ferralsol (Alumic, Hyperdystric, Epiarenic, Rhodic)
IBG-01	15.950S	47.871W	Scrub savanna	1126	20.6	1.61	Posic Geric Ferralsol (Humic, Alumic, Hyperdystric, Epiclayic, Rhodic)
IBG-02	15.952S	47.872W	Scrub savanna	1144	20.5	1.59	Posic Geric Ferralsol (Humic, Alumic, Hyperdystric, Epiclayic, Rhodic)
IBG-03	15.930S	47.873W	Scrub savanna	1154	20.5	1.61	Posic Geric Ferralsol (Humic, Alumic, Hyperdystric, Clayic, Rhodic)
IBG-04	15.945S	47.861W	Savanna woodland	1140	20.6	1.60	Posic Geric Ferralsol (Humic, Alumic, Hyperdystric, Clayic, Rhodic)
NXV-01	14.708S	52.352W	Savanna woodland	318	24.9	1.51	Vetic Acric Ferralsol (Alumic, Hyperdystric, Arenic, Xanthic)
NXV-02	14.700S	52.351W	Tall closed woodland	318	24.9	1.51	Vetic Acric Ferralsol (Alumic, Hyperdystric, Epiarenic)
SMT-01	12.819S	51.770W	Savanna woodland	332	25.8	1.60	Hypoluvic Ferralic Arenosol (Hyperdystric)
SMT-02	12.825S	51.769W	Savanna woodland	332	25.8	1.60	Hypoluvic Ferralic Arenosol (Hyperdystric)
SMT-03	12.835S	51.766W	Savanna woodland	319	25.9	1.60	Hypoluvic Ferralic Arenosol (Hyperdystric)
TAN-04	12.921S	52.373W	Forest	386	25.0	1.66	Geric Ferralsol (Humic, Alumic, Hyperdystric, Clayic)
VCR-01	14.831S	52.160W	Tall forest	301	25.2	1.52	Geric Ferralsol (Alumic, Hyperdystric, Clayic, Rhodic)
VCR-02	14.832S	52.169W	Forest	289	25.2	1.51	Geric Plinthic Ferralsol (Alumic, Hyperdystric, Endoclayic, Rhodic)
AUSTRALIA							
FMS-01	18.092S	144.840E	Shrub-rich savanna woodland	234	21.1	0.73	Pisolithic Plinthosol (Dystric)
FMS-02	18.108S	144.823E	Stunted shrub-rich forest	759	21.5	0.69	Haplic Leptosol (Dystric)
RSC-01	20.156S	146.536E	Stunted forest	274	23.2	0.67	Haplic Regosol (Arenic, Skeletic)
EKP-01	18.068S	145.993E	Tall savanna woodland	8	24	2.59	Endogleyic Umbrisol (Hyperdystric, Arenic)
KBL-01	17.764S	145.544E	Tall forest	761	20.5	1.75	Haplic Regosol (Siltic, Hyperdystric)
KBL-02	17.849S	145.532E	Tall savanna woodland	860	20.1	1.43	Geric Acrisol (Hyperdystric, Rhodic)
KBL-03	17.685S	145.535E	Tall forest	1055	19.1	1.34	Haplic Nitisol (Hyperdystric, Rhodic)
DCR-01	17.026S	145.597E	Tall savanna woodland	683	21.2	1.45	Haplic Cambisol (Orthodystric, Alumic)
DCR-02	17.021S	145.584E	Tall savanna woodland	653	21.3	1.46	Arenic Cambisol (Epieutric)
KCR-01	17.107S	145.604E	Tall forest	813	20.5	1.96	Haplic Cambisol (Dystric, Alumic)
CTC-01	16.103S	145.447E	Tall forest	90	25.2	3.20	Haplic Cambisol (Hyperdystric, Alumic, Skeletic)

Table S1. Study plot coordinates, Torello-Raventos et al. (2013) vegetation classification ( ), elevation above sea level (E_V), mean annual temperature (T_A), mean annual precipitation (P_A) and Wold Reference Base (WRB) soil classification.

Appendix B: Tree Distributions:

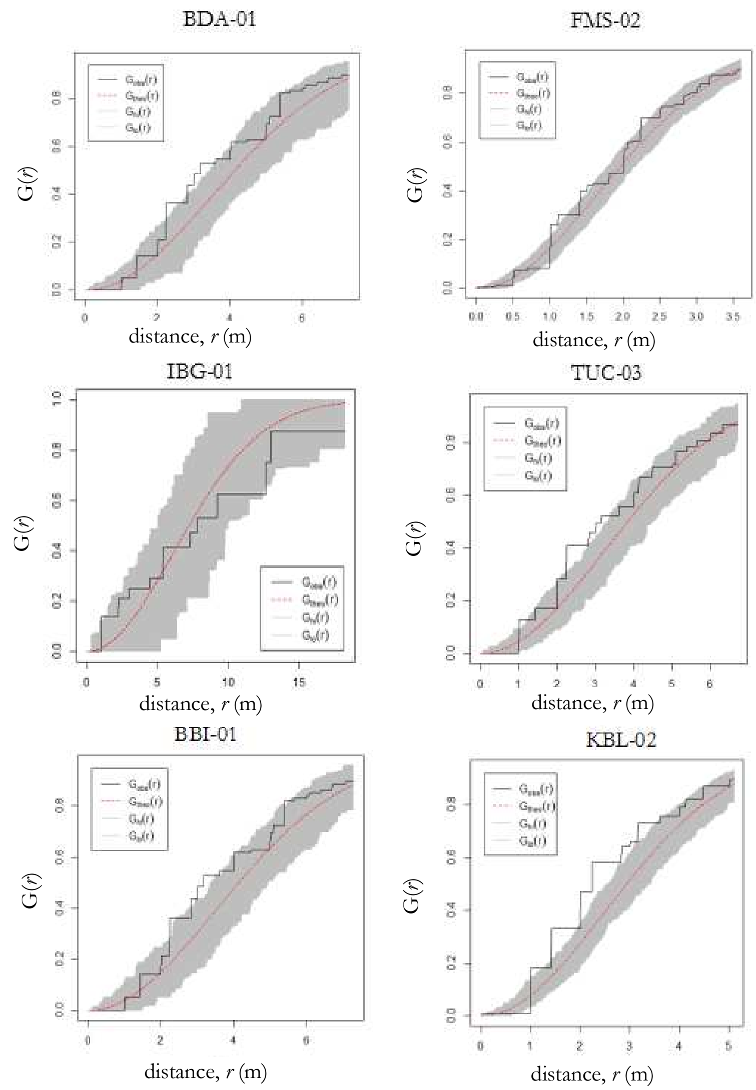

Fig. S1. Estimation of the nearest neighbour distance distribution function (also called the "*event-to-event*" or "*inter-event*" distribution). Here the actual cumulative distribution function *G* of the distance (*r* in metres) from a typical randomly selected tree to the next nearest tree (black line) is compared with that expected for a totally spatially random distribution (red dotted line) with the grey shaded area indicating 0.95 quantile confidence intervals. Results are shown for six representative savanna/dry forest sites (taken from all three continents and across a range of tree densities), none of which show any significant indications of tree clustering.

Appendix C: Allometric equations:

	Equation	Applied to	Source	Units
S1	$\hat{B} = \exp[-2.187 + 0.916 \ln(\rho D^2 H)]$	all forest trees ($D \geq 25$mm)	Chave *et al.* (2005)	kg, cm, m, g cm^{-3}
S2	$\hat{B} = \exp[-2.77 + 1.33\ln(A_B)]$	all forest shrubs ($D < 25$mm)	this study	kg, cm^2
S3	$\hat{B} = \exp[-2.85 + 2.69\ln(D_C)]$	all forest shrubs ($D \geq 25$mm)	this study	kg, cm
S4	$\hat{B} = \exp[-1.484+2.657 \ln(D)]$	all lianas ($D \geq 25$mm)	Schnitzer *et al.* (2006)	kg, cm
S5	$\hat{B} = 0.6\exp[-1.754+2.665 \ln(D)]$	all palms ($D \geq 25$mm)	De Castilho *et al.* (2006)	kg, cm
S6	$\hat{B} = \exp[0.06+2.012\ln(D)+ 0.710\ln(H)]$	African savanna trees ($H \geq 10$m)	Malimbwi *et al.* (1994)	kg, cm, m
S7	$\hat{B} = \exp[-3.368+2.129\ln(D) + 0.403\ln(H)]$	African savanna trees ($H < 10$m)	this study	kg, cm, m
S8	$\hat{B} = \exp[-3.189+2.358 \ln(D)]$	African savanna trees (if H unknown)	this study	kg, cm
S9	$\hat{B} = \exp[-0.510 + 1.426\ln(A_C)]$	*Cochlospermum planchonii* (Africa only)	this study	kg, m^2
S10	$\hat{B} = \exp[1.07+1.03 \ln(A_C)]$	African savanna shrubs (drier sites)	Skarpe (1990)	kg, m^2
S11	$\hat{B} = \exp[-3.3369+2.7635 \ln(D) + 0.4059 \ln(H) + 1.2439 \ln(\rho)]$	South American savanna ($D \geq 25$mm)	Ribeiro *et al.* (2011)	kg, cm, m, g cm^{-3}
S12	$\hat{B} = \exp\{-2.0596+2.1561 \ln(D) + 0.1362 [\ln (H)]^2\}$	Australian savannas ($D \geq 25$mm)	Williams *et al.* (2005)	kg,cm, m
S13	$\hat{B} = \exp[-2.26+2.4 \log(D)^{0.8}]$	African Sahelian plots	Henry *et al.* (2011)	kg,cm
S14	$\hat{B} = 0.1263+0.1006 (A_B)$	African Sudan savanna	Henry *et al.* (2011)	kg,cm^2

Table S2. Allometric equations used for estimating for estimating forest and savanna above ground biomass in kg per tree ($\hat{B}$). Input variables: ρ (wood density) ; D (diameter at breast height) ; H (tree or shrub height); D_C (crown diameter) A_C (crown area), A_B (basal area) and D_B (basal diameter).

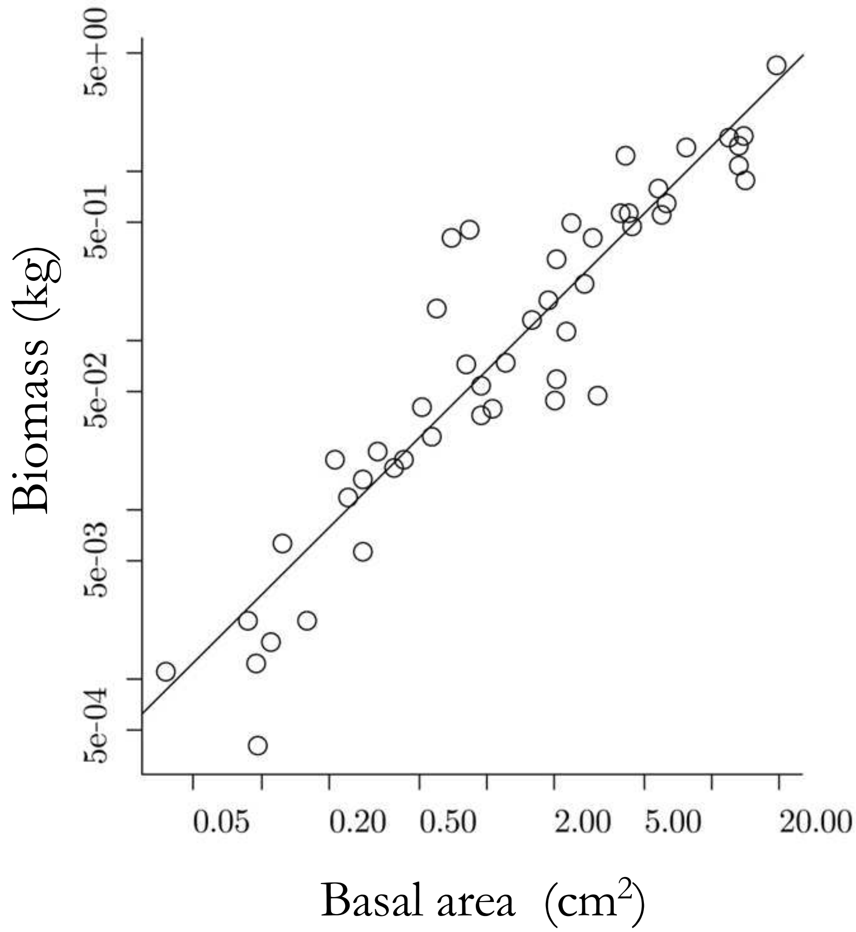

Fig. S2: Relationship between basal area (cm^2) and biomass (kg) for forest shrubs (D < 25mm) as developed in his study (equation S2).

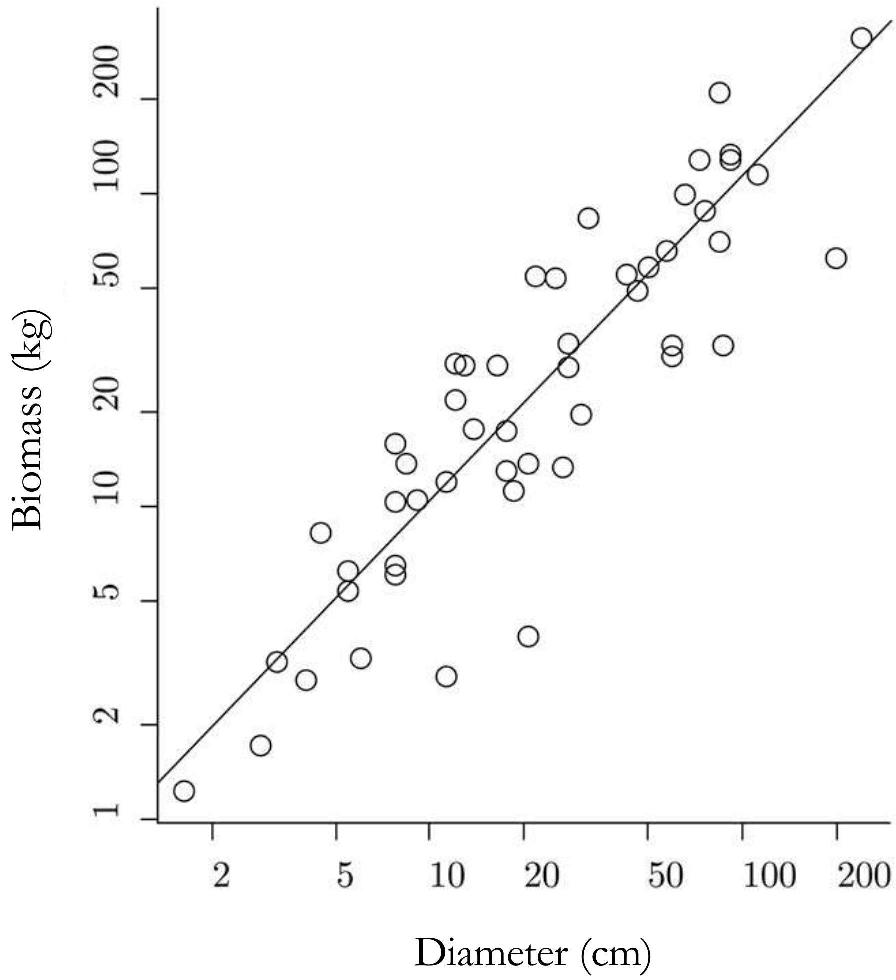

Fig. S3: Relationship between diameter at breast height *D* (cm) and biomass, *B* (kg) for African savanna trees when height was unknown as developed in this study (equation S8).

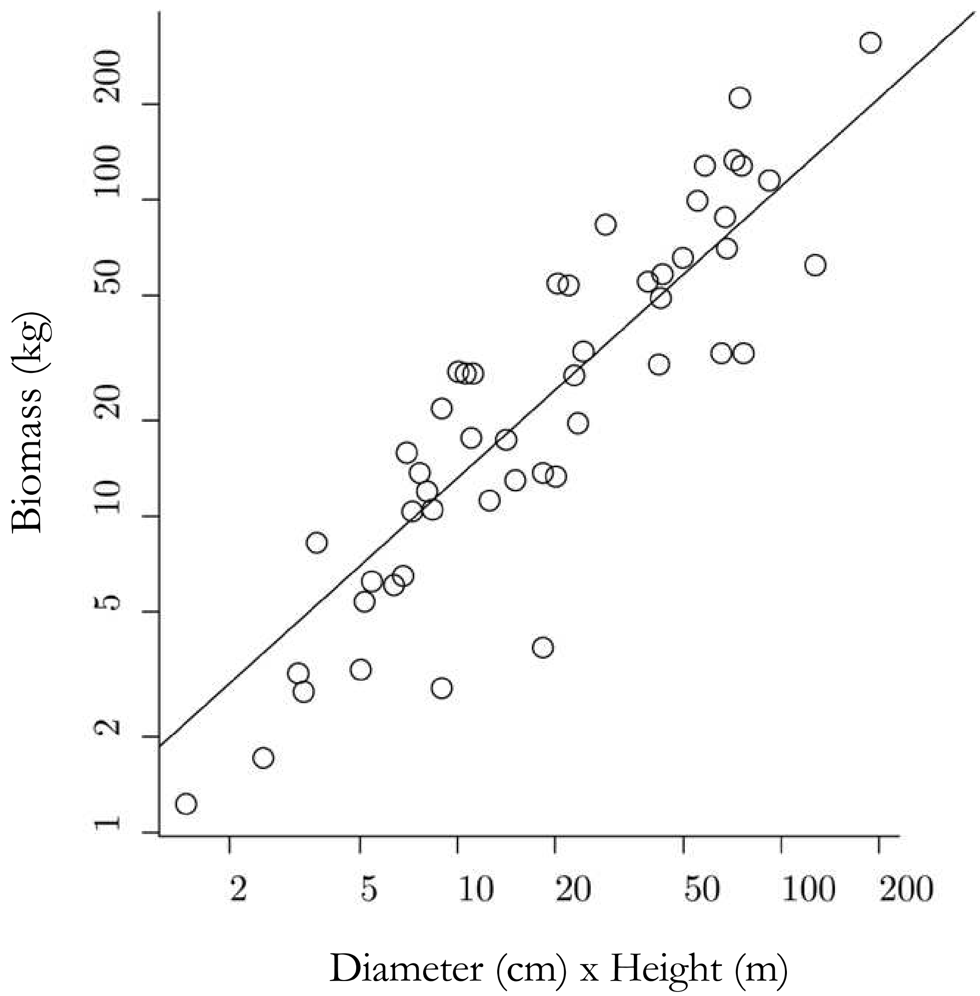

Fig. S4: Relationship between both *D* (cm) and H (m) and biomass (kg) forl African savanna trees when H is known developed in this study (equation S7).

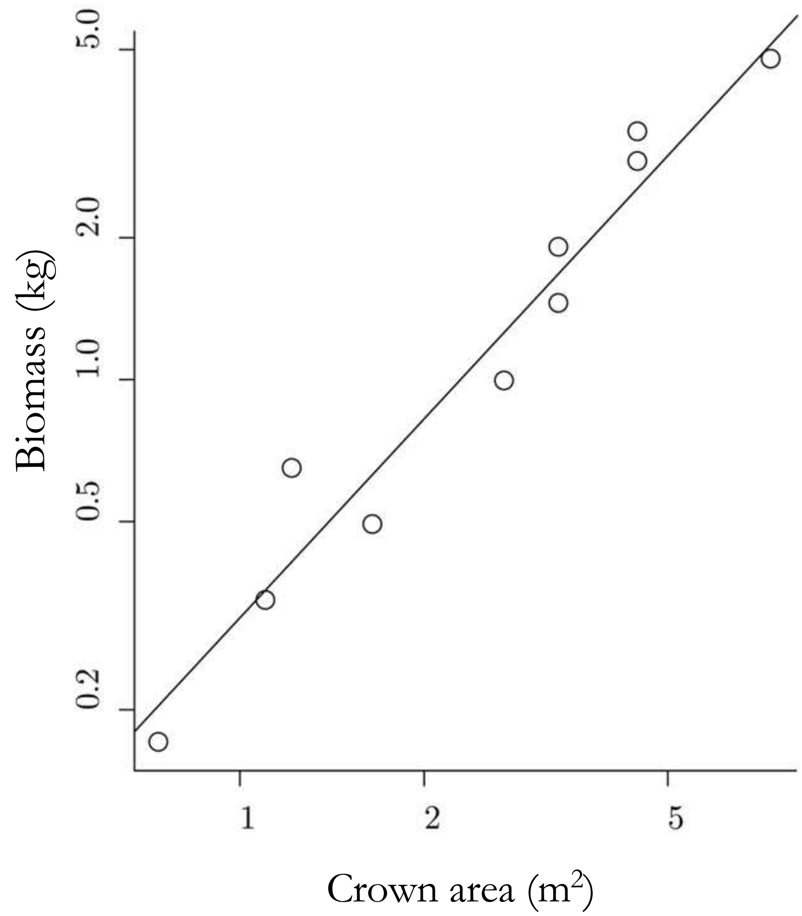

Fig. S5: Relationship between crown area (m^2) and biomass (Kg) for the species *Cochlospermum planchonii* in Africa developed in this study (equation S10).

Appendix D: Additional Figures

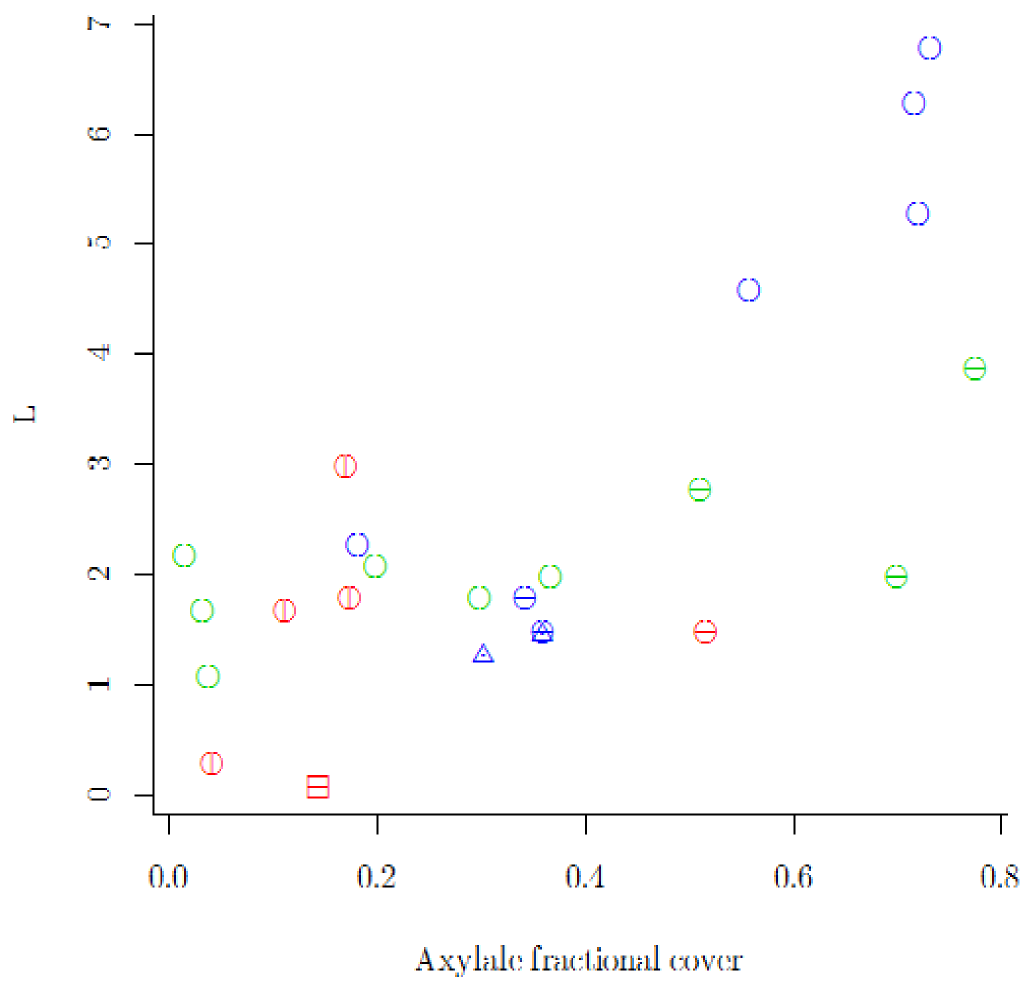

Fig. S6. Relationship between axylale fractional cover and its leaf area index (*L*). Symbols as in the main text.

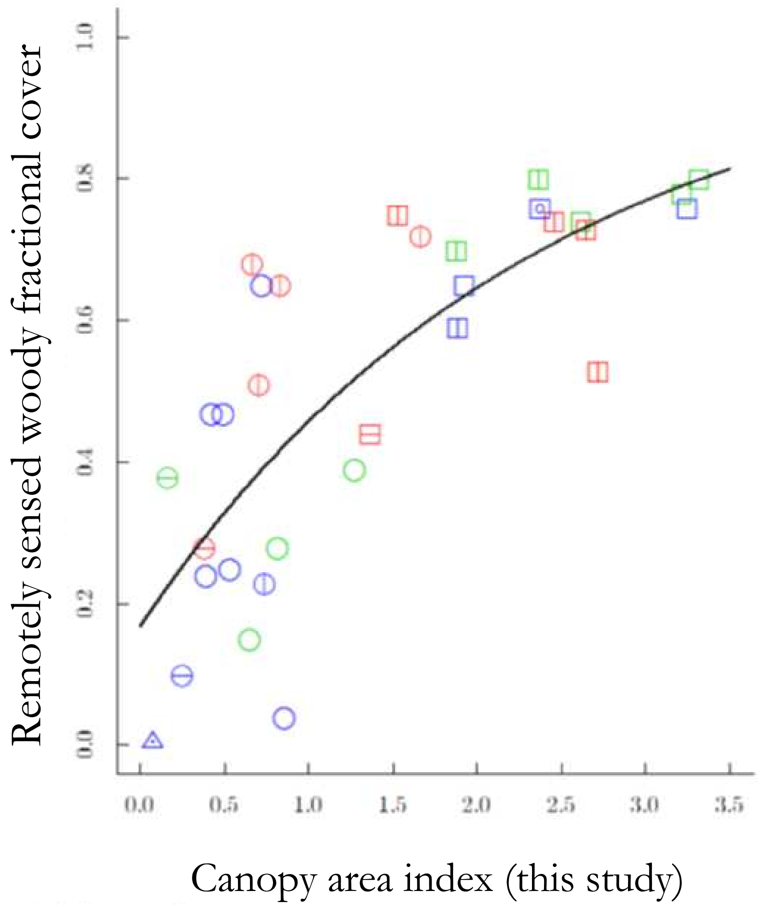

Fig. S7. Relationship between our canopy area index measurements and the remotely sensed fractional cover of the corresponding grid square (Hansen *et al.* 2003). Symbols as in the main text.

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